

online issn: 1307-6892



irc 2022
XVI. international research conference
proceedings

open science index 16 2022

october 06-07, 2022 tokyo japan
international scholarly and scientific research & innovation



Open Science

Open Science Philosophy

Open science encompasses unrestricted access to scientific research articles, access to data from public research, and collaborative research enabled by information and communication technology tools, models, and incentives. Broadening access to scientific research publications and data is at the heart of open science. The objective of open science is to make research outputs and its potential benefits available to the entire world and in the hands of as many as possible:

- Open science promotes a more accurate verification of scientific research results. Scientific inquiry and discovery can be sped up by combining the tools of science and information technologies. Open science will benefit society and researchers by providing faster, easier, and more efficient availability of research outputs.
- Open science reduces duplication in collecting, creating, transferring, and re-using scientific material.
- Open science increases productivity in an era of tight budgets.
- Open science results in great innovation potential and increased consumer choice from public research.
- Open science promotes public trust in science. Greater citizen engagement leads to active participation in scientific experiments and data collection.

Open Science Index

The Open Science Index (OSI) currently provides access to over thirty thousand full-text journal articles and is working with member and non-member organizations to review policies to promote and assess open science. As part of the open science philosophy, and by making open science a reality; OSI is conducting an assessment of the impact of open science principles and restructuring the guidelines for access to scientific research. As digitalization continues to accelerate science, Open science and big data hold enormous promise and present new challenges for policymakers, scientific institutions, and individual researchers.

OSI is helping the global scientific research community discover, evaluate, and access high-quality research output. Renowned for its editorially curated and refereed collection of the highest-quality publications, OSI has always been and will remain free-of-charge.

OSI provides an efficient and thorough discovery process to the open science research database and provides links and free access to full-text articles. There are 50 open access journal categories that are curated and refereed by international scientific committees, the in-house editorial team, and trusted partners. Since its inception in 2007, OSI has made more than thirty thousand peer-reviewed open access full-text journal articles (PDF versions) freely available online without cost, barriers, or restrictions.

Open Science Access

With the Open Science Index, researchers can discover and access trusted peer-reviewed open access full-text scientific research articles with confidence. OSI helps researchers find appropriate non-profit open access journals to publish their work.

OSI gives one-click access to online full-text PDFs and expands the reach to global society by giving users free access from anywhere around the globe. Through cutting-edge open science collaboration, in an innovative public partnership, the non-profit OSI is devoted to making science open and reusable.

To learn more, visit online at waset.org

Open Science

Open Society

An open society allows individuals to change their roles and to benefit from corresponding changes in status. Open science depends to a greater or lesser extent on digital technologies and innovations in structural processes by an open society. When realized, open science research and innovation can create investment opportunities for new and better products and services and therefore increase competitiveness and employment. Open science research and innovation is a key component of thematic open science priorities. Central to the open science digital infrastructure is enabling industry to benefit from digital technology and to underpin scientific advances through the development of an open society. Open science research and innovation can also contribute to society as a global actor because scientific relations can flourish even where global relations are strained. Open science has a critical role across many areas of decision making in providing evidence that helps understand the risks and benefits of different open science choices. Digital technology is making the conduct of open science and innovation more collaborative, more global, and more open to global citizens. Open society must embrace these changes and reinforce its position as the leading power for science, for new ideas, and for investing sustainably in the future.

It is apparent in open society that the way science works is fundamentally changing, and an equally significant transformation is taking place in how organizations and societies innovate. The advent of digital technology is making research and innovation more open, collaborative, and global. These exchanges are leading open society to develop open science and to set goals for research and innovation priority. Open science goals are materializing in the development of scientific research and innovation platforms and greater acceptance of scientific data generated by open science research. Open science research and innovation do not need help from open society to come up with great ideas, but the level of success ideas ultimately reach is undoubtedly influenced by regulation, financing, public support, and market access. Open society is playing a crucial role in improving all these success factors.

Open Science

Open science represents a new approach to the scientific process based on cooperative work and new ways of diffusing knowledge by using digital technologies and collaborative tools. These innovations capture a systemic change to the way science and research have been carried out for the last fifty years. Science is shifting from the standard practice of publishing research results in scientific publications after the research and reviews are completed. The shift is towards sharing and using all available knowledge at an earlier stage in the research process. Open science is to science what digital technology is to social and economic transactions: allowing end users to be producers of ideas, relations, and services and in doing so, enabling new working models, new social relationships and leading to a new modus operandi for science. Open science is as important and disruptive as e-commerce has been for the retail industry. Just like e-commerce, the open science research paradigm shift affects the whole business cycle of doing science and research. From the selection of research subjects to the carrying out of research, to its use and re-use, to the role of universities, and that of publishers are all dramatically changed. Just as the internet and globalization have profoundly changed the way we do business, interact socially, consume culture, and buy goods, these changes are now profoundly impacting how one does research and science.

The discussion on broadening the footprint of science and on novel ways to produce and spread knowledge gradually evolved from two global trends: Open Access and Open Source. The former refers to online, peer-reviewed scholarly outputs, which are free to read, with limited or no copyright and licensing restrictions, while open source refers to software created without any proprietary restriction and which can be accessed and freely used. Although open access became primarily associated with a particular publishing

Open Science

or scientific dissemination practice, open access already sought to induce a broader practice that includes the general re-use of all kinds of research products, not just publications or data. It is only more recently that open science has coalesced into the concept of a transformed scientific practice, shifting the focus of researchers' activity from publishing as fast as possible to sharing knowledge as early as possible. Open science is defined as the idea that scientific knowledge of all kinds should be openly shared as early as is practical in the discovery process. As a result, the way science is done in the future will look significantly different from the way it is done now. Open science is the ongoing evolution in the modus operandi of doing research and organizing science. This evolution is enabled by digital technology and is driven by both the globalization of the scientific community and increasing public demand to address the societal challenges of our times. Open science entails the ongoing transitions in the way research is performed, researchers collaborate, knowledge is shared, and science is organized.

Open science impacts the entire research cycle, from the inception of research to its publication, and on how this cycle is organized. The outer circle reflects the new interconnected nature of open science, while the inner circle shows the entire scientific process, from the conceptualization of research ideas to publishing. Each step in the scientific process is linked to ongoing changes brought about by open science, including the emergence of alternative systems to establish a scientific reputation; changes in the way quality and impact of research are evaluated; the growing use of scientific blogs; open annotation; and open access to data and publications. All institutions involved in science are affected, including research organizations, research councils, and funding bodies. The trends are irreversible, and they have already grown well beyond individual projects. These changes predominantly result from a bottom-up process driven by a growing number of researchers who increasingly employ social media in their research and initiate globally coordinated research projects while sharing results at an early stage in the research process.

Open science is encompassed in five schools of thought:

- the infrastructure school, concerned with technological architecture
- the public school, concerned with the accessibility of knowledge creation
- the measurement school, concerned with alternative impact assessment
- the democratic school, concerned with access to knowledge
- the pragmatic school, concerned with collaborative research

According to the measurement school, the reputation and evaluation of individual researchers are still mainly based on citation-based metrics. The h-index is an author-level metric that attempts to measure both the productivity and citation impact of the publications of a scientist or scholar. The impact factor is a measure reflecting the average number of citations to articles published in an academic journal and is used as a proxy for the relative importance of a journal.

Numerous criticisms have been made of citation-based metrics, primarily when used, and often misused, to assess the performance of individual researchers. These metrics:

- are often not applicable at the individual level
- do not take into account the broader social and economic function of scientific research
- are not adapted to the increased scale of research
- cannot recognize new types of work that researchers are performing

Web-based metrics for measuring research output, popularized as altmetrics, have recently received much attention: some measure the impact at the article level, others make it possible to assess the many outcomes of research in addition to the number of scientific articles and references. The current reputation and evaluation system has to adapt to the new dynamics of open science and acknowledge and incentivize

Open Science

engagement in open science. Researchers engaging in open science have growing expectations that their work, including intermediate products such as research data, will be better rewarded or taken into account in their career development. Vice-versa, the use, and reuse of open data will require appropriate codes of conduct requiring, for example, the proper acknowledgment of the original creator of the data.

These ongoing changes are progressively transforming scientific practices with innovative tools to facilitate communication, collaboration, and data analysis. Researchers that increasingly work together to create knowledge can employ online tools and create a shared space where creative conversation and collaboration can occur. As a result, the problem-solving process can be faster, and the range of problems that can be solved can be expanded. The ecosystem underpinning open science is evolving very rapidly. Social network platforms for researchers already attract millions of users and are being used to begin and validate more research projects.

Furthermore, the trends towards open access are redefining the framework conditions for science and thus have an impact on how open innovation is produced by encouraging a more dynamic circulation of knowledge. It can enable more science-based startups to emerge thanks to the exploitation of openly accessible research results. Open science, however, does not mean free science. It is essential to ensure that intellectual property is protected before making knowledge publicly available in order to subsequently attract investments that can help translate research results into innovation. If this is taken into account, fuller and broader access to scientific publications and research data can help to accelerate innovation. Investments that boost research and innovation in open science would benefit society with fewer barriers to knowledge transfer, open access to scientific research, and greater mobility of researchers. In this context, open access can help overcome the barriers that innovative organizations face in accessing the results of research funded by the public.

Open innovation

An open society is the largest producer of knowledge, but the phenomenon of open science is changing every aspect of the scientific method by becoming more open, inclusive, and interdisciplinary. Ensuring open society is at the forefront of open science means promoting open access to scientific data and publications alongside the highest standards of research integrity. There are few forces in this globe as engaging and unifying as science. The universal language of science maintains open channels of communication globally. Open society can maximize its gains through maintaining its presence at the highest level of scientific endeavor, and by promoting a competitive edge in the knowledge society of the information age. The ideas and initiatives described in this publication can stimulate anyone interested in open science research and innovation. It is designed to encourage debate and lead to new ideas on what and open society should do, should not do, or do differently.

An open society can lead to a research powerhouse; however, open society rarely succeeds in turning research into innovation and in getting research results to the global market. Open society must improve at making the most of its innovation talent, and that is where open innovation comes into play. The basic premise of open innovation is to open up the innovation process to all active players so that knowledge can circulate more freely and be transformed into products and services that create new markets while fostering a stronger culture of entrepreneurship. Open innovation is defined as the use of purposive inflows and outflows of knowledge to accelerate internal innovation. This original notion of open innovation was primarily based on transferring knowledge, expertise, and even resources from one company or research institution to another. This notion assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they seek to improve their performance. The concept of open innovation is continually evolving and is moving from linear, bilateral transactions and collaborations

Open Science

towards dynamic, networked, multi-collaborative innovation ecosystems. This means that a specific innovation can no longer be seen as the result of predefined and isolated innovation activities but rather as the outcome of a complex co-creation process involving knowledge flows across the entire economic and social environment. This co-creation takes place in different parts of the innovation ecosystem and requires knowledge exchange and absorptive capacities from all the actors involved, whether businesses, academia, financial institutions, public authorities, or citizens.

Open innovation is a broad term, which encompasses several different nuances and approaches. Two main elements underpin the most recent conceptions of open innovation: the users are in the spotlight and invention becomes an innovation only if users become a part of the value creation process. Notions such as user innovation emphasize the role of citizens and users in the innovation processes as distributed sources of knowledge. This kind of public engagement is one of the aims of open science research and innovation. The term 'open' in these contexts has also been used as a synonym for 'user-centric'; creating a well-functioning ecosystem that allows co-creation and becomes essential for open innovation. In this ecosystem, relevant stakeholders are collaborating along and across industry and sector-specific value chains to co-create solutions for socio-economic and business challenges. One important element to keep in mind when discussing open innovation is that it cannot be defined in absolutely precise terms. It may be better to think of it as a point on a continuum where there is a range of context-dependent innovation activities at different stages, from research to development through to commercialization, and where some activities are more open than others. Open innovation is gaining momentum thanks to new large-scale trends such as digitalization and the mass participation and collaboration in innovation that it enables. The speed and scale of digitalization are accelerating and transforming the way one designs, develops, and manufactures products, the way one delivers services, and the products and services themselves. It is enabling innovative processes and new ways of doing business, introducing new cross-sector value chains and infrastructures.

Open society must ensure that it capitalizes on the benefits that these developments promise for citizens in terms of tackling societal challenges and boosting business and industry. Drawing on these trends, and with the aim of helping build an open innovation ecosystem in open society, the open society's concept of open innovation is characterized by:

- combining the power of ideas and knowledge from different actors to co-create new products and find solutions to societal needs
- creating shared economic and social value, including a citizen and user-centric approach
- capitalizing on the implications of trends such as digitalization, mass participation, and collaboration

In order to encourage the transition from linear knowledge transfer towards more dynamic knowledge circulation, experts agree that it is essential to create and support an open innovation ecosystem that facilitates the translation of knowledge into socio-economic value. In addition to the formal supply-side elements such as research skills, excellent science, funding and intellectual property management, there is also a need to concentrate on the demand side aspects of knowledge circulation, making sure that scientific work corresponds to the needs of the users and that knowledge is findable, accessible, interpretable and reusable. Open access to research results aims to make science more reliable, efficient, and responsive and is the springboard for increased innovation opportunities, e.g. by enabling more science-based startups to emerge. Prioritizing open science does not, however, automatically ensure that research results and scientific knowledge are commercialized or transformed into socio-economic value. In order for this to happen, open innovation must help to connect and exploit the results of open science and facilitate the faster translation of discoveries into societal use and economic value.

Open Science

Collaborations with global partners represent important sources of knowledge circulation. The globalization of research and innovation is not a new phenomenon, but it has intensified in the last decade, particularly in terms of collaborative research, international technology production, and worldwide mobility of researchers and innovative entrepreneurs. Global collaboration plays a significant role both in improving the competitiveness of open innovation ecosystems and in fostering new knowledge production worldwide. It ensures access to a broader set of competencies, resources, and skills wherever they are located, and it yields positive impacts in terms of scientific quality and research results. Collaboration enables global standard-setting, allows global challenges to be tackled more effectively, and facilitates participation in global value chains and new and emerging markets.

To learn more, visit online at waset.org

Open Science

Scholarly Research Review

The scholarly research review is a multidimensional evaluation procedure in which standard peer review models can be adapted in line with the ethos of scientific research, including accessible identities between reviewer and author, publishing review reports and enabling greater participation in the peer review process. Scholarly research review methods are employed to maintain standards of quality, improve performance, provide credibility, and determine suitability for publication. *Responsible Peer Review Procedure:* Responsible peer review ensures that scholarly research meets accepted disciplinary standards and ensures the dissemination of only relevant findings, free from bias, unwarranted claims, and unacceptable interpretations. Principles of responsible peer review:

- Honesty in all aspects of research
- Accountability in the conduct of research
- Professional courtesy and fairness in working with others
- Good stewardship of research on behalf of others

The responsibilities of peer review apply to scholarly researchers at all stages of peer review: Fairness, Transparency, Independence, Appropriateness and Balance, Participation, Confidentiality, Impartiality, Timeliness, Quality and Excellence, Professionalism, and Duty to Report.

Scholarly Research Review Traits:

- Scholarly Research Review Identities: Authors and reviewers are aware of each other's identity
- Scholarly Research Review Reports: Review reports are published alongside the relevant article
- Scholarly Research Review Participation: The wider academic community is able to contribute to the review process
- Scholarly Research Review Interaction: Direct reciprocal discussion between author(s) and reviewers, and/or between reviewers, is allowed and encouraged
- Scholarly Research Pre-review Manuscripts: Manuscripts are made immediately available in advance of any formal peer review procedures
- Scholarly Research Review Final-version Reviewing: Editorial revision of the language and format is conducted on the final version of the manuscript for publication
- Scholarly Research Review Platforms: The scholarly research review process is independent of the final publication of the manuscript and it is facilitated by a different organizational entity than the venue of publication

All submitted manuscripts are subject to the scholarly research review process, in which there are three stages of evaluation for consideration: pre-review manuscripts, chair-review presentation, and final-review manuscripts. All submitted full text papers, that may still be withstand the editorial review process, are presented in the conference proceedings. Manuscripts are tracked and all actions are logged by internal and external reviewers according to publication policy. External reviewers' editorial analysis consists of the evaluation reports of the conference session chairs and participants in addition to online internal and external reviewers' reports. Based on completion of the scholarly research review process, those manuscripts meeting the publication standards are published 10 days after the event date.

To learn more, visit online at waset.org

TABLE OF CONTENTS

1	Modelling Tyre Rubber Materials for High Frequency FE Analysis <i>Bharath Anantharamaiah, Tomas Bouda, Elke Deckers, Stijn Jonckheere, Wim Desmet, Juan J. Garcia</i>	1
2	Spectral Recognition of Vaginal Fluids Alterations: The Integration of a Handheld Raman Device and a SERS-Based Sensor for Diagnosis of Vaginal Infections <i>Sylwia Magdalena Berus, Beata Młynarczyk-Bonikowska, Monika Adamczyk-Popławska, Tomasz Szymborski, Agnieszka Kamińska</i>	2
3	High Precision 65nm CMOS Rectifier for Energy Harvesting using Threshold Voltage Minimization in Telemedicine Embedded System <i>Hafez Fouad</i>	3
4	Overview of Multi-Chip Alternatives for 2.5 and 3D Integrated Circuit Packagings <i>Ching-Feng Chen</i>	13
5	Environmental Performance, Financial Constraints, and Capital Investment <i>Hong V. Nguyen</i>	21
6	Economical and Environmental Impact of Deforestation for Charcoal Production in Gaza Province <i>Paulo Cumbe</i>	22
7	The Study of Thai Millennial Attitude toward End-of-Life Planning, Opportunity of Service Design Development <i>Mawong R., Bussracumpakorn C.</i>	23
8	Using a Neural Network to Identify Pornographic Materials Involving Minors: Case Study <i>Wojciech Oronowicz-Jaśkowiak, Piotr Girdwoyń, Piotr Wasilewski</i>	33
9	An Experimental Study on the Development of High-Strength, Self-Compacting, Alkali-Activated Slag Concrete Mixes Under Ambient Curing <i>Shivam Kumar, Pramod Kumar Gupta, Mohammad Ashraf Iqbal</i>	41
10	Urban Morphology and Sustainability: Case Study in Lavra, Portugal <i>Patrícia Diogo, Joana Diogo, Maria Diogo, Manuel Diogo</i>	45
11	Vibration Transmission across Junctions of Walls and Floors in an Apartment Building: An Experimental Investigation <i>Hugo Sampaio Libero, Max de Castro Magalhaes</i>	46
12	Measuring the Likeability of Robots among Seniors: A Field Research <i>Balaji Viswanathan, Tim Oates</i>	52
13	An Assessment of Rice Yield Improvement Among Smallholder Rice Farmers in Asunafo North Municipality of Ghana <i>Isaac Diaka, Matsui Kenichi</i>	53
14	Assessing Smallholder Rice and Vegetable Farmers' Constraints and Needs to Adopt Small-Scale Irrigation in South Tongu District, Ghana <i>Tamekloe Michael Kossivi, Kenichi Matsui</i>	54
15	The Impact of Illegal Firearms Possession, Limited Security Staff and Porosity of Border on Human Security in Ipokia Local Government Area, Ogun State <i>Ogunmefun Folorunsho Muyideen, Aluko Tolulope Evelyn</i>	55

	Understanding Disney Gender Roles and Stereotypes Through a Generational Lens <i>Veronica Williams, Leo Aguilar, Sebastian Aguilar, Cristina Barrientos, Maria Enriquez Chavez, Hector Espinoza, Arturo Faz, Amado Gonzalez, Lytia Gonzalez, Francisco Guerra, Roxana Lopez, Keren Maldonado, Emiliano Martinez, Onesimo Martinez, Araceli Moyeda, Melina Padilla, Bianca Perez, Mariana Rodriguez, Gerado Romero, Jonnell Saucedo, Camila Trevino, Dalia Vazquez</i>	68
16	A Narrative of Nationalism in Mainstream Media: The US, China, and COVID-19 <i>Rachel Williams, Shiqi Yang</i>	69
17	Controlled Digital Lending, Equitable Access to Knowledge and Future Library Services <i>Xuan Pang, Alvin L. Lee, Peggy Glatthaar</i>	78
18	Natural Learning Model: Disruption in Education Paradigm <i>Pramod Maithil</i>	79
19	Successful Public-Private Partnership Through the Impact of Environmental Education: A Case Study on Transforming Community Conflict into Harmony in the Dongpian Community <i>Men An Pan, Ho Hsiung Huang, Jui Chuan Lin, Tsui Hsun Wu, Hsing Yuan Yen</i>	80
20	The Integration and Practice of Indigenous Knowledge System and Sustainable Environmental Education Concept <i>Shih-Tsung Chen, Yenchin Hsiao</i>	81
21	Promoting Teaching and Learning Structures Based on Innovation and Entrepreneurship in Valahia University of Targoviste <i>Gabriela Teodorescu, Ioana Daniela Dulama</i>	83
22	Linguistic Politeness in Higher Education Teaching Chinese as an Additional Language <i>Leei Wong</i>	84
23	A Review of Critical Thinking Formative Assessment Framework: Coping with Teachers Resistance to Critical Pedagogy <i>Chenhui Wang, Chwee Beng Lee</i>	85
24	Rethinking Higher Education Unit Design: Embedding Universal Design for Learning in Online Studies <i>Traci-Ann Garrad, Huw Nolan</i>	86
25	Measuring Moral Rhetoric: A Quantitative Text Analysis of Candidates' Electoral Campaign Speeches In France <i>Clara Alexandra Husson, Nicola Palma</i>	96
26	Subjective Temporal Resources: On the Relationship Between Time Perspective and Chronic Time Pressure to Burnout <i>Diamant Irene, Dar Tamar</i>	98
27	The Impact of Employee Assistance Program on New Hire Well Being and Turnover <i>Steffira Anjani, Agnes Dessyana, Luciyana Lesmana</i>	99
28	An Analysis and Some Ways of Treatment for the Deeply Disadvantaged Rural Areas in Post-socialist Economies. Case Study: Argeş County, Romania <i>George Secăreanu, Ioan Ianoş, Igor Sîrodoev, Cristina Merciu, Aurelian Giugăl</i>	100
29	Post Covid-19 Landscape of Global Pharmaceutical Industry <i>Abu Zafor Sadek</i>	101
30	An Easy Approach for Fabrication of Macroporous Apatite-Based Bone Cement Used As Potential Trabecular Bone Substitute <i>Vimal Kumar Dewangan, T. S. Sampath Kumar, Mukesh Doble, Viju Daniel Varghese</i>	102
31	Recurrent Torsades De Pointes Post Direct Current Cardioversion for Atrial Fibrillation with Rapid Ventricular Response <i>Taikchan Lildar, Ayesha Samad, Suraj Sookhu</i>	103
32		

33	Analysis of Autoantibodies to the S-100 Protein, NMDA, and Dopamine Receptors in Children with Type 1 Diabetes Mellitus <i>Yuri V. Bykov, V. A. Baturin</i>	104
34	Duplicated Common Bile Duct: A Recipe for Injury <i>David Armany, Matthew Allaway, Preet Gosal, Senarath Edirimanne</i>	105
35	Marple Syrup Urine Disease with Central Diabetes Incipidus: Case Report <i>Rini Andriani, Cut Nurul Haffah, Antonius H. Pudjiadi, Sudung O. Pardede, Damayanti R. Sjarif</i>	106
36	Antimicrobial Properties of <i>Catha edulis</i> (Miraa) against Select Bacterial and Fungal Pathogens, an in-vitro Experimental Study <i>Dennis Kithinji, Susan Maina, Stanley Ndwigah, Hannington Mugo, Julius Oyugi</i>	112
37	Non Pharmacological Approach to IBS (Irritable Bowel Syndrome) <i>A. Aceranti, L. Moretti, S. Vernocchi, M. Colorato, P. Caristia</i>	113
38	Exercise Intervention For Women After Treatment For Ovarian Cancer <i>Deirdre Mc Grath, Joanne Reid</i>	114
39	Analysis of Maternal Death Surveillance and Response: Causes and Contributing Factors in Addis Ababa, Ethiopia, 2022 <i>Sisay Tiroro Salato</i>	115
40	A Comparative Study of Maternal Health among Urban Slums and Non-Slums Women (Special Reference to Indore City, Madhya Pradesh, India) <i>Shiksha Thakur, Rashmi Jain</i>	116
41	Antiviral Properties of Indian Medicinal Plants for the Management of COVID-19 (Sars CoV 2): A Review <i>Peramachi Sathiyamoorthy</i>	141
42	The Accessibility and Probability of Encountering Catastrophic Health Expenditure by Lao Patients in Thai Hospital <i>Somdeth Bodhisane, Sathirakorn Pongpanich</i>	160

Modelling Tyre Rubber Materials for High Frequency FE Analysis

Bharath Anantharamaiah, Tomas Bouda, Elke Deckers, Stijn Jonckheere, Wim Desmet, Juan J. Garcia

Abstract— Automotive tyres are gaining importance recently in terms of their noise emission, not only with respect to reduction in noise, but also their perception and detection. Tyres exhibit a mechanical noise generation mechanism up to 1 kHz. However, owing to the fact that tyre is a composite of several materials, it has been difficult to model it using finite elements to predict noise at high frequencies. The currently available FE models have a reliability of about 500 Hz, the limit which, however, is not enough to perceive the roughness or sharpness of noise from tyre. These noise components are important in order to alert pedestrians on the street about passing by slow, especially electric vehicles. In order to model tyre noise behaviour up to 1 kHz, its dynamic behaviour must be accurately developed up to a 1 kHz limit using finite elements. Materials play a vital role in modelling the dynamic tyre behaviour precisely. Since tyre is a composition of several components, their precise definition in finite element simulations is necessary. However, during the tyre manufacturing process, these components are subjected to various pressures and temperatures, due to which these properties could change. Hence, material definitions are better described based on the tyre responses. In this work, the hyperelasticity of tyre component rubbers is calibrated, using the design of experiments technique from the tyre characteristic responses that are measured on a stiffness measurement machine. The viscoelasticity of rubbers are defined by the Prony series for rubbers, which are determined from the loss factor relationship between the loss and storage moduli, assuming that the rubbers are excited within the linear viscoelasticity ranges. These values of loss factor are measured and theoretically expressed as a function of rubber shore hardness or hyperelasticities.

From the results of the work, there exists a good correlation between test and simulation vibrational transfer function up to 1 kHz. The model also allows flexibility, i.e., the frequency limit can also be extended, if required, by calibrating the Prony parameters of rubbers corresponding to the frequency of interest. As future work, these tyre models are used for noise generation at high frequencies and thus for tyre noise perception.

Keywords— tyre dynamics, rubber materials, prony series, hyperelasticity.

Spectral Recognition of Vaginal Fluids Alterations: The Integration of a Handheld Raman Device and a SERS-Based Sensor for Diagnosis of Vaginal Infections

Sylwia Magdalena Berus, Beata Młynarczyk-Bonikowska, Monika Adameczyk-Popławska, Tomasz Szyborski, Agnieszka Kamińska

Abstract—Surface-Enhanced Raman Spectroscopy (SERS) is based on the inelastic scattering of incident light by molecules adsorbed onto a roughened metal substrate (SERS substrate). SERS has been proved as a beneficial method due to its ultra-sensitivity and non-destructive nature that reveals specific fingerprint-like information down to the molecular level. This technique does not require expensive reagents, and the preparation of samples is fast and simplified. A lot of research has been done showing the potential of SERS to analyze biological systems, e.g., label-free differentiation among human tissues, tumor cells, and even fungi and bacteria cells at species and strain level [1].

Vaginal infections (vaginitis) are among the most common and problematic disorders that affect almost 70% of women during their whole lifetime at least once. Vaginitis is associated with the feeling of discomfort or anxiety but, what is worse, can cause many severe diseases and complications such as premature rupture of membranes, postpartum endometritis, and postoperative infections. The most prevalent infection is bacterial vaginosis (BV) affecting 20-50% of women and vulvovaginal candidiasis (VVC) affecting 17-39%. The implementation of appropriate medicines is an inherent element in successful treatment and provides impressive protection against recurrence of infection. The whole situation is complicated by the fact that vaginal discharge may be altered due to physiological and pathological conditions such as desquamative inflammatory vaginitis (DIV), vulval dermatoses, or allergic irritation - not caused by biological agents. All this makes the differential diagnosis of vaginal infections of the utmost importance [2].

In this study, we used SERS and chemometric method - Partial least Squares Discriminant Analysis (PLSR) to track the spectral response of vaginal fluids caused by different types of infections. We proved that the biochemical alterations that result from infections can be translated into a specific spectral image that is unique for each infection and hence their differentiation is possible. The undoubted advantage of this approach is that it does not involve advanced sample preparation and chemical reagents while maintaining ultra-high sensitivity. As the time of analysis is reduced to 15 minutes, this technique becomes competitive with those currently used. The integration of SERS-based sensors with a small, portable Raman spectrometer leads to the development of a handheld point-of-care device.

Keywords—SERS, Vaginal infections, chemometric analysis, Raman portable device.

High Precision 65nm CMOS Rectifier for Energy Harvesting using Threshold Voltage Minimization in Telemedicine Embedded System

Hafez Fouad ¹

¹ *Microelectronics Dept, Electronics Research Institute, Cairo, Egypt
hafez@eri.sci.eg*

Abstract —

Telemedicine applications have very low voltage which required High Precision Rectifier Design with high Sensitivity to operate at minimum input Voltage. In this work, we targeted 0.2V input voltage using 65 nm CMOS rectifier for Energy Harvesting Telemedicine application. The proposed rectifier which designed at 2.4GHz using two-stage structure found to perform in a better case where minimum operation voltage is lower than previous published paper and the rectifier can work at a wide range of low input voltage amplitude. The Performance Summary of Full-wave fully gate cross-coupled rectifiers (FWFR) CMOS Rectifier at $F = 2.4$ GHz: The minimum and maximum output voltages generated using an input voltage amplitude of 2 V are 490.9 mV and 1.997 V, maximum VCE = 99.85 % and maximum PCE = 46.86 %. The Performance Summary of Differential drive CMOS rectifier with external bootstrapping circuit rectifier at $F = 2.4$ GHz: The minimum and maximum output voltages generated using an input voltage amplitude of 2V are 265.5 mV (0.265V) and 1.467 V respectively, maximum VCE = 93.9 % and maximum PCE= 15.8 %.

Keywords__ High Precision Rectifier, Wide-Band Active Rectifier, Energy Harvesting, Embedded system, IoT Telemedicine System, Threshold voltage minimization, Differential drive CMOS rectifier, Full-wave fully gate cross-coupled rectifiers (FWFR) CMOS Rectifier

I. INTRODUCTION

The wireless power transfer techniques suffer from extremely low power transfer efficiency due to poor coupling, skin absorption, and narrow band-pass. Thus, it is necessary to use an efficient rectification method to process the power received from the secondary winding of the coupling coil. Telemedicine Embedded systems in some cases receive low voltage levels of vital signs from human body to diagnose the health condition of the patients. So, we need to design rectifier with low threshold voltage which can sense the low input voltage. What parameters will affect the threshold voltage? In

Fig.1, Threshold voltage depends on the following parameters : 1. Gate material , 2. Gate insulator material , 3. Thickness of Gate insulator , 4. Channel doping , 5. Impurities at Silicon-Insulator interface , 6. Voltage between source and substrate , 7. Temperature.

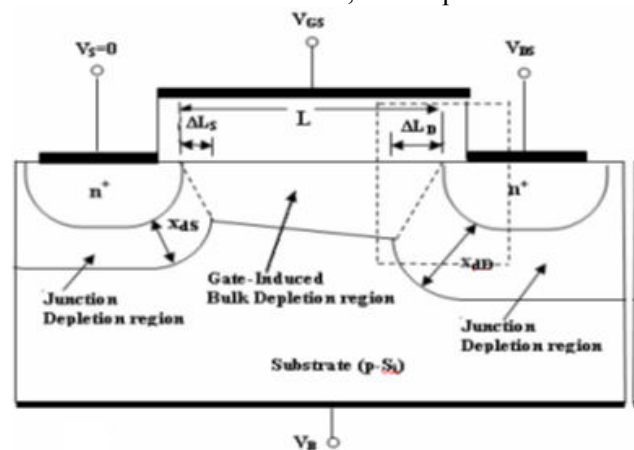


Fig.1a Simplified geometry of MOSFET channel region, with gate-induced bulk depletion region and pn-junction depletion region. (b) Close-up view of drain diffusion edge [1].

Based on the results obtained we can further see impact of each single physical parameter on the total value of threshold voltage. Moreover we can see which of these parameters will have significant and small impact on the threshold voltage. An important value which characterizes MOSFET transistors is the value of threshold voltage. According to the MOSFET type the value of threshold voltage can take positive and negative value. This value can be controlled during the fabrication process of MOSFET transistors. Influence of channel length L, the depth x_j of drain (source) regions and drain-to-source voltage (V_{DS}) on the voltage term $\Delta\text{-OVt0}$, are shown in Fig.1, Fig.2 and Fig.2

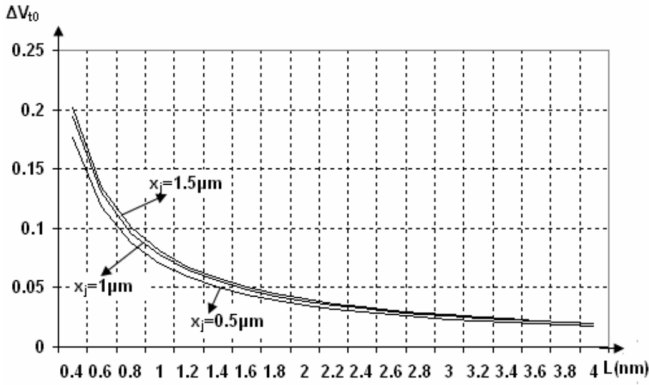


Fig.2 Dependence of OV_{t0} on length L for parametric values of depth x_j , when $N_A = 1016 \text{ cm}^{-3}$, $N_D = 1018 \text{ cm}^{-3}$, $t_{ox} = 20 \text{ nm}$ and $V_{DS} = 0V$ [--].

Based on acquired values which are represented in Fig. 1, Fig.2 and Fig.3, for $L \approx x_j$ the OV_{t0} will have influence in reduction of the threshold voltage V_{t0} . While if $L \gg x_j$ the OV_{t0} is not significant, the NMOS is defined as long-channel device. The increase the value of parameters N_A and x_j will have small influence in term of the threshold voltage OV_{t0} . The V_{DS} voltage will have significant influence in the term OV_{t0} , which results in larger value for higher value of V_{DS} [--].

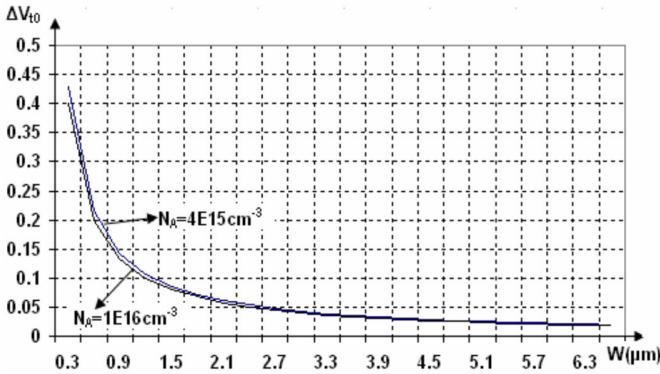


Fig.3 Dependence of OV_{t0} on channel width (W) for parametric values of N_A , when $N_D=1018\text{cm}^3$ and $t_{ox}=20 \text{ nm}$. In Fig.3 is shown the dependence of voltage term OV_{t0} on the channel width and we can say: when $W \approx x_{dm}$ the OV_{t0} term will have influence in the increase of the total threshold voltage, while $W \gg x_{dm}$ the OV_{t0} term is not significant

A. Calculation of threshold voltage of NMOS with short-channel

A MOSFET transistor is defined as a short-channel device if its channel length is on the same order of magnitude as the depletion regions thicknesses of source and drain junction. Otherwise MOSFET can be defined

as a short-channel device if effective channel length L_{eff} is approximately equal to the S and D junction depth x_j , Fig.1. When NMOS is defined as a short-channel device the length of channel will have impact on the threshold voltage. A short-channel will reduce the threshold voltage of OV_{t0} compare with long-channel device [2, 5, 8, 9].

$$V_{t0}(\text{short-channel}) = V_{t0} - \Delta V_{t0} \quad (9)$$

Let OLS and OLD represent the lateral extend of the depletion regions associated with the source junction and the drain junction, as in Fig 3. Then, the bulk depletion region charge contained within the trapezoidal region is:

$$Q_{B0} = -\left(1 - \frac{\Delta L_S + \Delta L_D}{2 \cdot L}\right) \sqrt{2qN_A \epsilon_{Si} | -2\phi_F |}$$

After calculation the ΔL_S and ΔL_D , the amount of threshold voltage reduction ΔV_{t0} can be found as [2, 5]:

$$\Delta V_{t0} = \frac{1}{C_{ox}} \sqrt{2q\epsilon_{Si}N_A | -2\phi_F |} \frac{x_j}{2L} \left[\left(\sqrt{1 + \frac{2x_{ds}}{x_j}} - 1 \right) + \left(\sqrt{1 + \frac{2x_{dD}}{x_j}} - 1 \right) \right] \quad (11)$$

$-x_{ds}$, x_{dD} represent the depth of depletion regions at source and drain as results of pn junction, respectively.

B. Calculation the threshold voltage of NMOS with narrow-channel

A MOSFET transistor is defined as a narrow-channel device if its channel width is on the same order of magnitude as the maximum depletion regions thickness into the substrate (x_{dm}). This effect will have influence in the threshold voltage and results in higher value for OV_{t0} if compared with long-channel device [2, 5].

$$V_{t0}(\text{narrow-channel}) = V_{t0} + \Delta V_{t0} \quad (12)$$

The voltage term OV_{t0} as results of narrow-effects if shapes of the depletion region edges are modeled by quarter-circular arcs can be found as [2]:

$$V_{t0}(\text{narrow-channel}) = V_{t0} + \Delta V_{t0} \quad (12)$$

The voltage term ΔV_{t0} as results of narrow-effects if shapes of the depletion region edges are modeled by quarter-circular arcs can be found as [2]:

$$\Delta V_{t0} = \frac{1}{C_{ox}} \sqrt{2q\epsilon_{Si}N_A | -2\phi_F |} \frac{\pi \cdot x_{dm}}{2W} \quad (13)$$

After calculation the OLS and OLD, the amount of threshold voltage reduction OV_{t0} can be found as [2, 5]:

-xdS, xdD represent the depth of depletion regions at source and drain as results of pn junction, respectively. For long-channel device the threshold voltage will decrease when: the substrate doping decreases (NA), the oxide thickness decreases (tox), the oxide-interface charge increases (will have little effect; Nox)[--]. For short-channel device we will have reduction of the threshold voltage by (Vt term compared with the long-channel device, which depends of: the length of channel (L), the junction depth (xj), drain diffusion doping (small effect) and drain-to-source voltage (VDS). For narrow channel device we will increase the threshold voltage by (Vt term compared with the long-channel device, which is dependent of: the width channel (W), the maximal depletion region thickness (xdm). The positive source-to-substrate voltage VSB (body effect, as in IC) will cause the increment on total value of threshold voltage. Finally, for MOSFETs which have a small channel length and a small channel width, the threshold voltage variations due to short- and narrow channel effects may tend to cancel each other out[--].

II. Threshold Voltage Minimization of CMOS Rectifier

Optimize the effective parameter on Vth cancellation

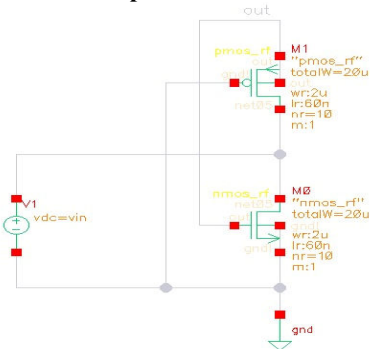


Fig.4 Threshold Voltage cancellation of CMOS Rectifier

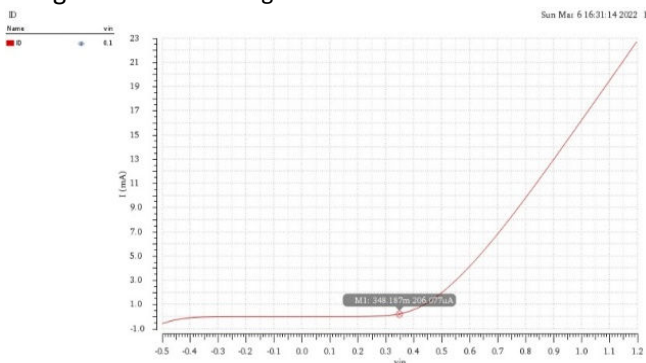


Fig.5 optimize the most effect parameter on Vth cancellation

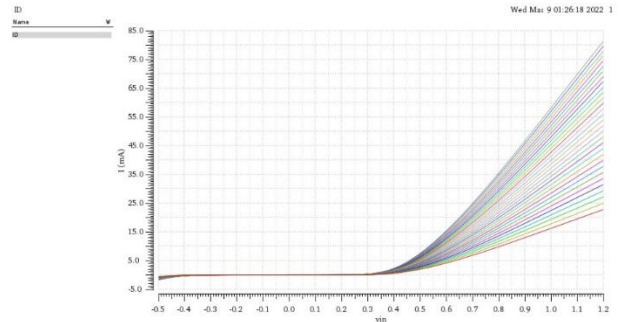


Fig.6. Sweep Analysis of Gate width W with Vth
A slightly change of Vth due to Optimize the Gate width W

Voltage Conversion Efficiency (VCE) of CMOS rectifier, and Power Conversion Efficiency (PCE) are affected by the circuit topology, diode-device parameters, input RF signal frequency and amplitude, and output loading conditions. The VCE is the fraction of the output DC voltage V_{OUT} and the input peak voltage amplitude $|V_{AC}|$, which can be represented as:

$$VCE = \frac{V_{OUT}}{|V_{AC}|} = \frac{V_{OUT}}{V_{OUT} + V_{do}} \quad (1)$$

where V_{do} is the total dropout voltage along the conducting path of the rectifier. Further, PCE is defined as the ratio of the output power P_{OUT} and the input power P_{IN} . In fact, the PCE of the rectifier is generally given as

$$PCE = \frac{P_{OUT}}{|P_{IN}|} = \frac{V_{OUT}}{|V_{AC}|} \times \frac{I_{OUT}}{I_{IN}} \quad (2)$$

where I_{OUT} is the output DC current and I_{IN} is the total input current of the rectifier.

III. Optimization of Four Rectifiers Design and Simulation Results

The circuits of Four proposed rectifiers have been designed in 65nm CMOS technology as shown in Table.1. Circuits simulations were done using *Cadence Tools* to optimize the performance and get the required specifications for the proposed Designs.

In the first method, the threshold voltage of the MOSFETs is cancelled by applying a gate bias voltage generated from the output voltage of the rectifier itself as in Fig.4. This technique offers simple architecture at the cost of high reverse leakage. An improved version of SVC method is provided in [8]. 2-The cross-coupled differential CMOS architecture provided in [8] results in better PCE than the SVC method. However, it does not provide the promised VCE. In [9], a 3-CMOS inverter based active rectifier architecture is proposed. It provides

the favorable VCE and PCE by reducing both the reverse leakage and threshold voltage. In [10,11], 4-bootstrapped capacitor-based technique is adopted. It reduces the effective threshold voltage of the main pass transistor, thus increasing the VCE and PCE.

Table.1 Four Suggested Rectifier Designs

1	Self-VTh Cancellation (SVC) Rectifier	
2	Cross-coupled differential CMOS Rectifier	
3	CMOS Negative Voltage Converter Rectifier	
4	Bootstrapped capacitor-based Rectifier	

A. Self-VTh Cancellation (SVC) Rectifier Design

In order to reduce the effective threshold voltage for achieving high VCE and PCE, several VTh cancellation techniques were proposed in recent years. Fig. 1 shows an SVC rectifier [6,7]. In the SVC rectifier, the gate electrodes of the nMOS and pMOS transistors are connected to the output and ground terminals, respectively. It offers a simple rectifier architecture with high PCE at a low input power. In this configuration, static gate-source voltages are applied to the MOS transistors to reduce the effective VTh. For high DC bias voltage, this architecture increases the reverse leakage current, thus affecting the overall VCE and PCE. A modified architecture is presented by the same authors in [8]. The threshold voltage of the MOSFETs is cancelled by applying a gate bias voltage generated from the output voltage of the rectifier itself. Fig.8a Self-Vth Cancellation (SVC) Rectifier Design. Fig.8b Waveforms of SVC, The input is the blue curve while the red one is the output, the input minimum voltage is better but the maximum is reduced a lot. The min input Volt is 0.267 V while the max input Volt is 1.478 V

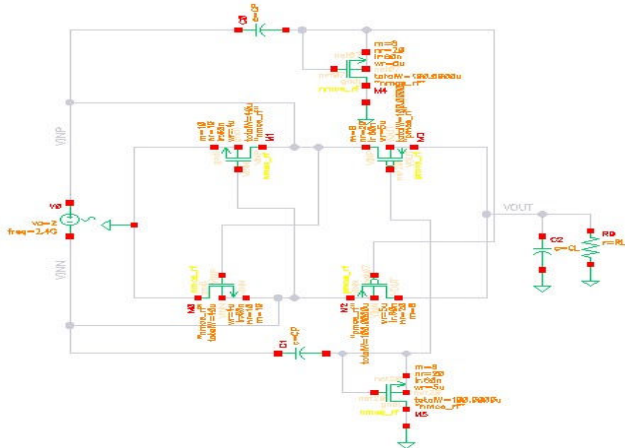


Fig.8a Self-Vth Cancellation (SVC) Rectifier Design

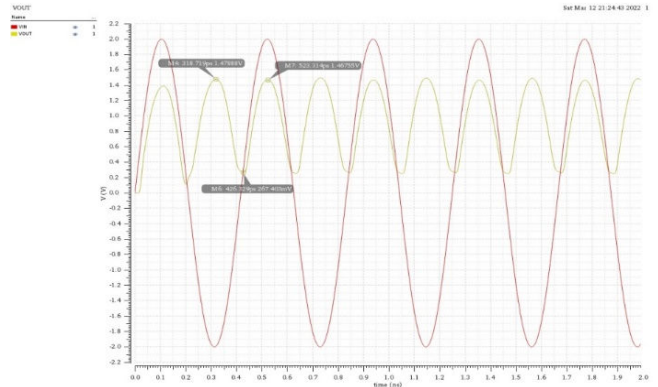


Fig.8b Waveforms of SVC, The input is the blue curve while red one is the output, the input minimum voltage is better but the maximum is reduced. The min input Volt is 0.267 V while the max input Volt is 1.478 V

Since the input signal fed from the secondary winding of a wireless power transfer system is quite small, low-turn on voltage is the key factor for the diode device. The performance of a diode-connected MOS-device is limited by its relatively high threshold voltage. The VCE and PCE can be increased dramatically by using threshold cancellation techniques. Reverse leakage is another factor limiting the performance of the MOS-based diodes. Therefore, different threshold and reverse leakage cancellation techniques have been proposed in recent years for MOS-based diodes to improve the overall performance. A Self-Vth Cancellation (SVC) technique has been proposed in [6,7].

B. Differential-drive CMOS Rectifier Architecture

Fig.2 shows the differential-drive CMOS rectifier architecture, it is cross coupled. Cross coupled differential CMOS configuration with a bridge structure. In this differential scheme, the gates of the MOS transistors are actively biased by a differential-mode signal. This method effectively decreases the MOS transistor turn on voltage, and the reverse leakage current can be immediately suppressed by a negative gate bias. Although this architecture offers high PCE, it fails to achieve a good VCE. To achieve a good VCE multiple stages are required which can impose constraints on area. Thus, this architecture is not a appropriate candidate for modern miniaturized bio-implantable devices.

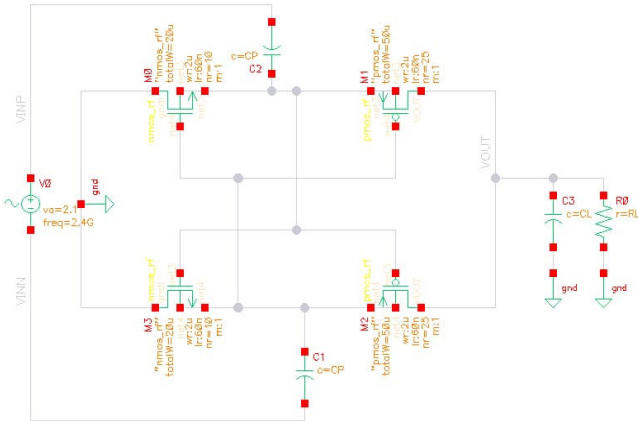


Fig.9a Design 2 - Differential drive CMOS rectifier

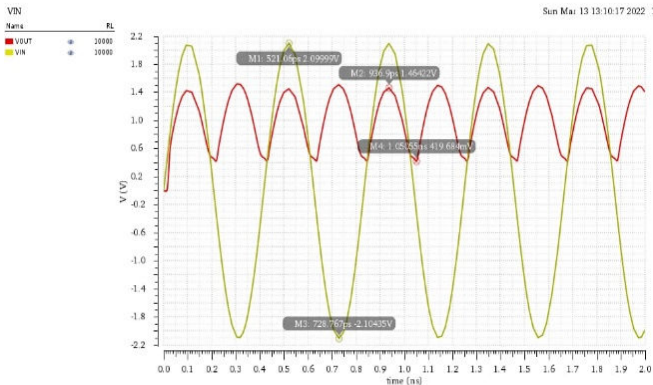


Fig.9b Waveforms of Differential drive CMOS rectifier

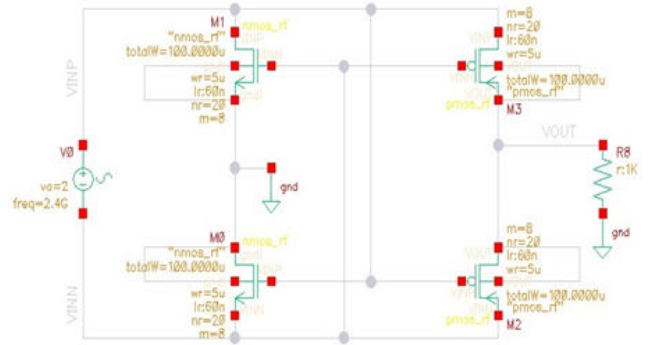


Fig.7a. CMOS Negative Voltage Converter

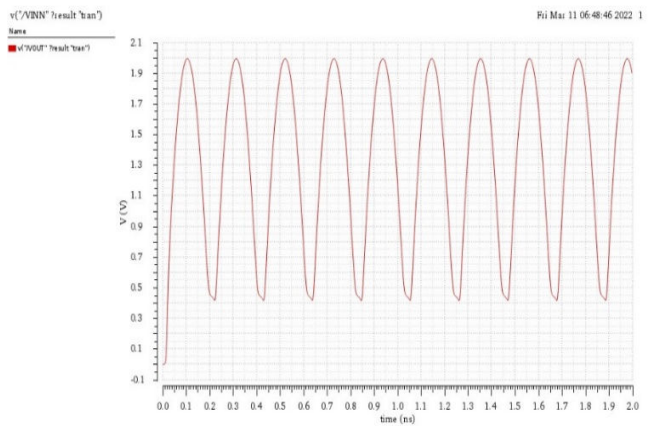


Fig.7b. Waveform of CMOS Negative Voltage Converter. input voltage minimum was 0.35V

C. CMOS Negative Voltage Converter Rectifier

The first stage of rectifier design is called negative voltage converter and used to convert the negative half cycles of the input sinusoidal wave into positive ones, which is done with two PMOS and two NMOS transistors shown in Fig.7 During the whole period of the input, node 1 is always the high potential and node 2 is the low potential. Consequently, the bulk of the PMOS transistor can be directly connected to node 1 and the NMOS to node 2. In this case, no voltage drop V_{th} occurs. The voltage loss is only $V_{dsp} + V_{dsn}$ during each conductive branch, where V_{dsp} and V_{dsn} are caused by the on-resistance of the transistors. Thus, the dropout voltages can be minimized by using *large transistor size* to decrease the resistance so as to get a *small voltage drop*.

D. Design 3 Bootstrapped capacitor-based rectifier :

It uses bootstrapped capacitors to reduce the effective threshold voltage and a CMOS inverter to minimize the reverse leakage The designed architecture provides high Power Conversion Efficiency (PCE) at the cost of low dropout voltage. The proposed architecture is Suitable for low-voltage power supplies and large load current applications. The proposed rectifier is implemented in standard 65nm CMOS technology in **cadence environment**. Simulation results demonstrate an improved voltage and power conversion efficiency with a small layout area compared with the best recently published results of CMOS rectifiers.

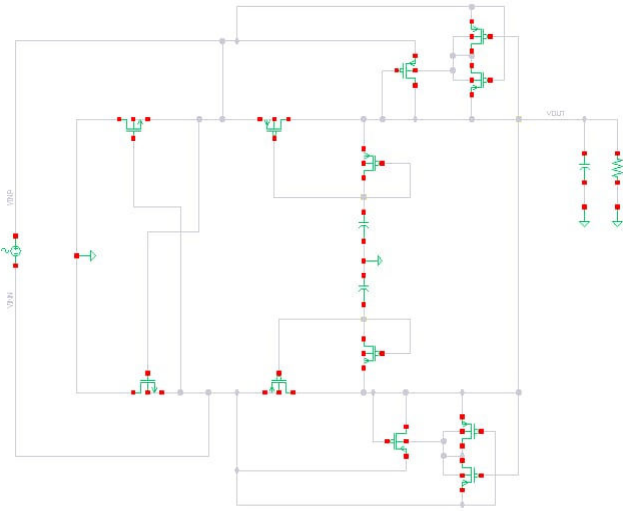


Fig.10.a Design 3 Bootstrapped Capacitor-based rectifier

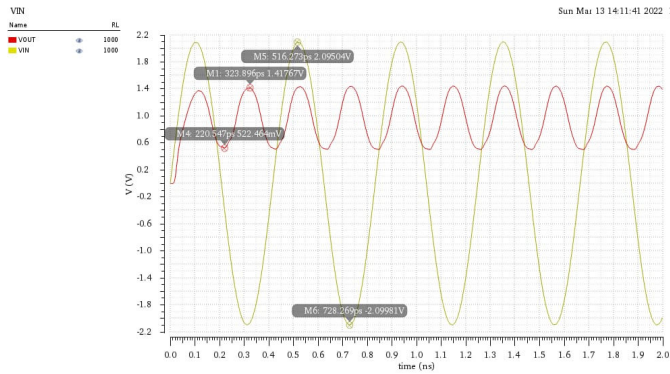


Fig.10.b Waveforms of Bootstrapped capacitor-based rectifier

The minimum operation voltage is lower than previous published paper and the rectifier can work at LIV (Low Input Voltage) of a wide range of input voltage amplitudes of 0.1V up to 2.2V compared with 0.5V to 1V in [39] and 0.28V to 0.7V in [40]. This allows the rectifier to work in Different Types of vibration energy harvesting system, Electrostatic harvester, Electromagnetic Energy Harvesting, Piezoelectric Energy Harvester.

The voltage efficiency η_v is defined as the fraction of the output DC voltage V_{out} and the input voltage amplitude $|V_{in}|$, which is shown in Eq. (1). The output voltage efficiency of the rectifier is higher with larger load resistors due to its high output voltage drop.

$$\eta_v = V_{out} / |V_{in}| = 100\% \quad (1)$$

Power Efficiency of the Rectifier is calculated by

$$\eta_P = \frac{\int_{t_1}^{t_1+T} v_{out}(t) \cdot i_{out}(t) dt}{\int_{t_1}^{t_1+T} v_{in}(t) \cdot i_{in}(t) dt} 100\% \quad (2)$$

where T is one period of the input signal and t_1 is the start time. With **increasing** R_{Load} , the efficiency **decreases**, because the current through the ohmic load decreases and tends to the current through the comparator. The load capacitor is adapted for the applied frequency, so a capacitance of 10uF and a load of 50K Ω are used. The voltage efficiency for the lower frequency is better than 1kHz case. Since higher frequency will result in the delay of the comparator and increasing reverse current. However, at typical energy harvesting frequencies, the working **frequency range** of this rectifier is sufficient for most applications. The power consumption of the rectifier is simulated. The results show that the power consumption at 0.45V is 0.23 uW, which is about 30% smaller than the best recently published result.

Output Range	PCE%	VCE%	Output Range Score	PCE% Score	VCE% Score	Average Score	Overall Score
1 419.684 mV -> 1.464 V	30.55	94.4	69.30%	65.20%	94.50%	76.30%	Second
2 522.46 mV -> 1.4176 V	13.85	64.19	59.40%	29.60%	64.30%	51.10%	Fourth
3 265.515 mV -> 1.467 V	15.787	93.91	79.80%	33.70%	94.10%	69.20%	Third
4 490.868 mV -> 1.997 V	46.855	99.849	100%	100%	100%	100%	First

Output Range	PCE%	VCE%	Output Range Score	PCE% Score	VCE% Score	Average Score	Overall Score
1 419.684 mV -> 1.464 V	30.55	94.4	69.30%	65.20%	94.50%	76.30%	Second
2 522.46 mV -> 1.4176 V	13.85	64.19	59.40%	29.60%	64.30%	51.10%	Fourth
3 265.515 mV -> 1.467 V	15.787	93.91	79.80%	33.70%	94.10%	69.20%	Third
4 490.868 mV -> 1.997 V	46.855	99.849	100%	100%	100%	100%	First

IV. Proposed Design of CMOS Rectifiers : This section will involve the schematic, the detailed explanation and layout of two proposed CMOS rectifiers using 65 nm CMOS technology.

A. Differential drive CMOS rectifier with external bootstrapping circuit

A.1 Description:

The proposed full-wave differential drive rectifier schematic is shown in Fig.1. The nMOS diode-connected transistor M2 conducts in the positive half cycle of the differential input voltage V_{in} to provide the required current to charge the bootstrapped capacitor C_{p2} to $(V_{in} - V_{thn})$. The summation of the single-ended input voltage V_{in} and the C_{p2} capacitor voltage is used to drive the pMOS switch M_{p2} in the conduction phase. The same action is repeated for pMOS switch M_{p1} . Thereby the gate bias voltages of pMOS transistors (M_{p1} , M_{p2})

become more negative than the conventional mode causing the rectifier to start up with lower input voltage. The body terminals of all transistors are connected to increase their threshold voltages during the off state and reduce it during the on-state to satisfy the dynamic threshold compensation mechanism.

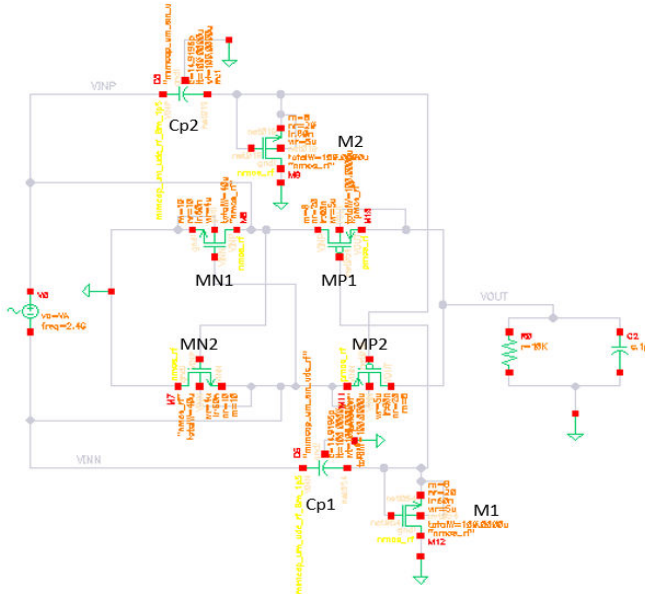


Fig.11: Schematic View of Differential drive CMOS rectifier with external bootstrapping circuit

Fig.11 shows the schematic of the rectifier working at a center frequency of 2.4 GHz. The transistor sizes of the NMOS are 400 μm but the bootstrapping transistors are 800 μm same as the PMOS transistors. The bootstrapping capacitors are 15 pF. All transistors use the minimum length 60 nm.

Advantages:

- The gate bias voltages of pMOS transistors (Mp1, Mp2) become more negative than the conventional mode causing the rectifier to start up with lower input voltage.

Disadvantages:

- Large area due to the usage of capacitors and two diode connected transistors in addition to the 4 transistors used in rectifying the signal.

A.2 Simulated Results

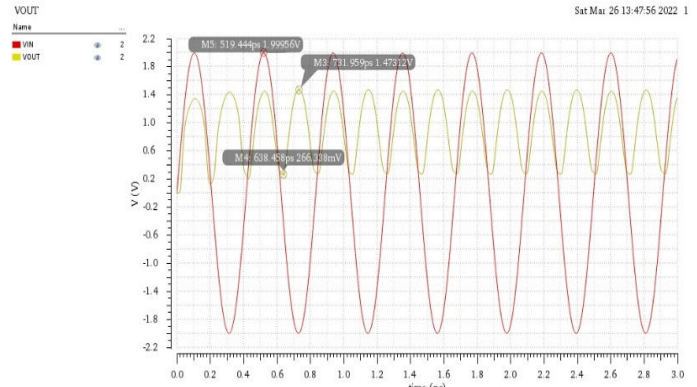


Fig.2: Input and output waveforms at F = 2.4 GHz

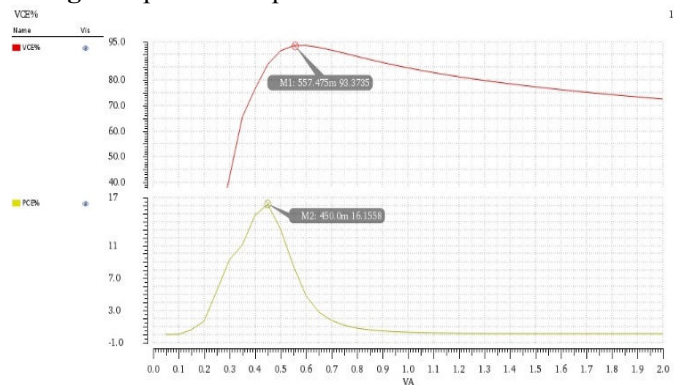


Fig.3: VCE and PCE at F = 2.4 GHz

A.3 Performance Summary of Differential drive CMOS rectifier with external bootstrapping-circuit rectifier at F = 2.4 GHz:

The minimum and maximum output voltages generated using an input voltage amplitude of 2V are 265.5 mV (0.265V) and 1.467 V respectively, maximum VCE ($\frac{V_{out}}{V_{in}}$) = 93.9 % and maximum PCE ($\frac{P_{out}}{P_{in}}$) = 15.8 %.

A.4 Layout of the Differential drive CMOS rectifier with external bootstrapping circuit

Fig. 4 shows the layout of Differential drive CMOS rectifier with external bootstrapping circuit. The area of the layout is 0.183 mm x 0.324 mm = 0.059 mm². The layout is built using Cadence tools.

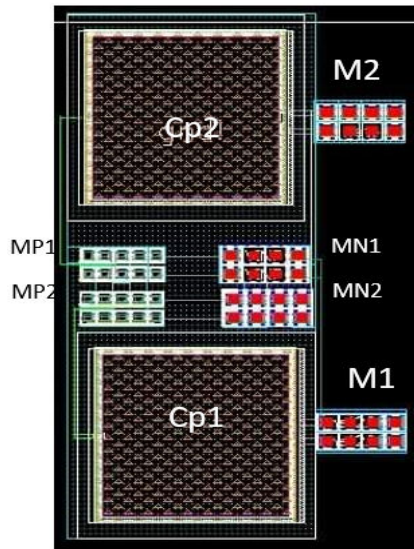


Fig.4: Layout of the Differential drive CMOS rectifier with external bootstrapping circuit

- This circuit solves the problem of threshold voltage drop by diode tied MOS transistors

Disadvantages:

- This structure doesn't have good power efficiency due to flow-back current from the storage capacitor to the antenna, and other parasitics.

B.2 Simulated Results

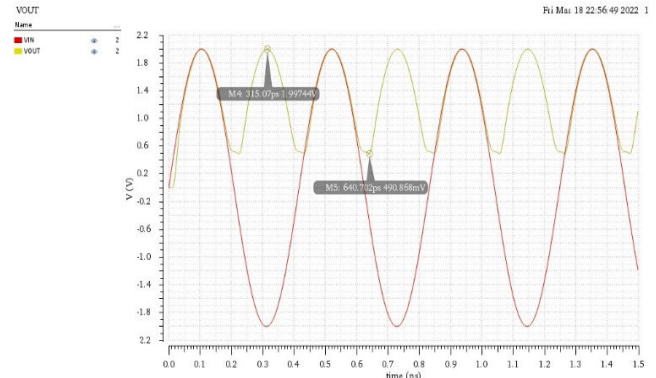


Fig.6: Input and output waveforms at F = 2.4 GHz

B. Full-wave fully gate cross-coupled rectifiers (FWFR)

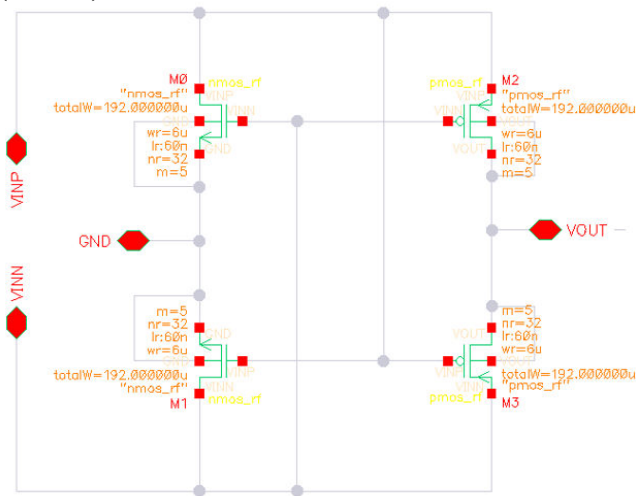


Fig.5: Schematic View of FWFR CMOS Rectifier

B.1 Description:

Here transistors act as switches in the positive half cycle M1, M2 transistors are ON and M0, M3 are OFF in the negative half cycle M0, M3 transistors are ON and M1, M2 transistors are OFF. The FWFR proposed design will be given in this section. Figure 5 shows the schematic of the rectifier working at a center frequency of 2.4 GHz. The transistor sizes of the NMOS and PMOS are 960 μm and all transistors use the minimum length 60 nm.

Advantages:

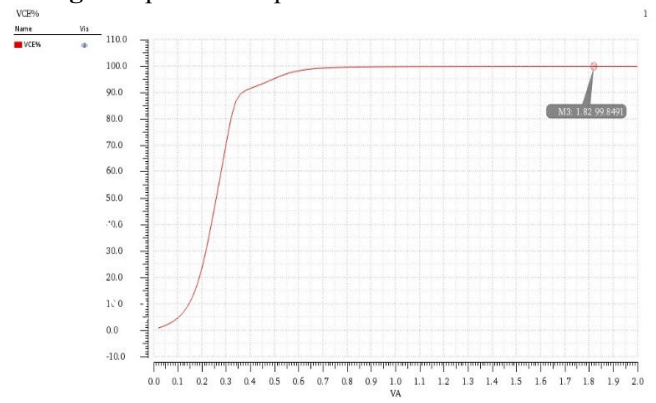


Fig.7: VCE at F = 2.4 GHz

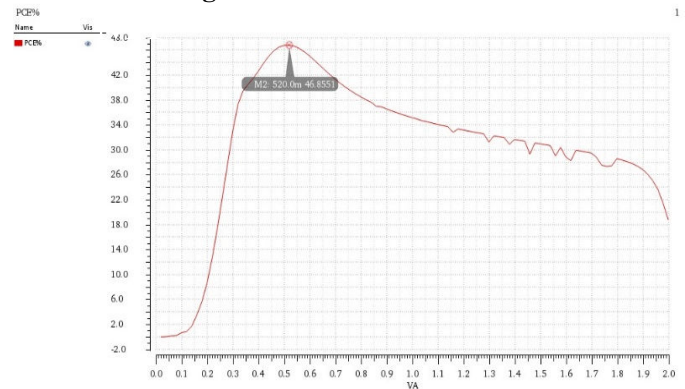


Fig.8: PCE at F = 2.4 GHz

B.3 Performance Summary of FWFR CMOS Rectifier at F = 2.4 GHz:

The minimum and maximum output voltages generated using an input voltage amplitude of 2 V are 490.9 mV and 1.997 V respectively, maximum VCE ($\frac{V_{out}}{V_{in}}$) = 99.85 % and maximum PCE ($\frac{P_{out}}{P_{in}}$) = 46.86 %.

B.4 Layout of the FWFR CMOS Rectifier

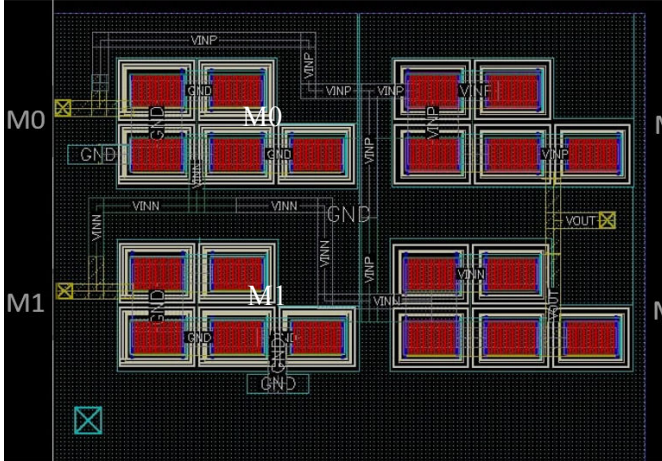


Fig.9: Layout of the FWFR CMOS Rectifier

Figure 9 shows the layout of the second proposed CMOS rectifier. The area of the layout is $0.117 \text{ mm} \times 0.079 \text{ mm} = 0.009 \text{ mm}^2$. The layout is built using Cadence.

Table 1: Comparison between two proposed circuits

Points of Comparison	Differential drive CMOS rectifier with external bootstrapping circuit	FWFR CMOS Rectifier
Minimum Output Voltage	265.5 mV	490.9 mV
Maximum Output Voltage	1.467 V	1.997 V
Maximum VCE	93.9 %	99.85 %
Maximum PCE	15.8 %	46.86 %
Layout design Area	0.059 mm^2	0.009 mm^2

Table 1 shows the comparison between the two circuits. The first circuit achieves a better minimum output voltage but the second one achieves a better maximum output voltage, a better maximum VCE, a better maximum PCE and a smaller area.

6. Performance comparisons

Table 4 shows the performance comparisons of this work with other previously reported rectifiers. The lowest operation voltage of previous rectifiers is 0.5V in [36] with a 500mV low threshold voltage 0.35um CMOS

process. However, it cannot work when the input voltage is larger than 1V, which blocks the application field. The rectifier proposed in this paper overcome these drawbacks. It can not only work at a 0.45V input voltage, but also operate at a wide range input voltage amplitudes of 0.45V up to 1.95V compared with 0.5V to 1V in [35] and 0.28V to 0.7V in [36]

Table.2. Performance Parameters Comparisons between Low Voltage Rectifiers

Performance Parameters	IEICE 2012 [15]	IEEE TCAS I 2011 [16]	Differential CMOS Rectifier	FWFR CMOS
Technology	0.18um CMOS	0.18um CMOS		65nm CMOS
Input Voltage Amplitude	0.28V-0.7V	0.5V-1V		0.2V - 1.45V
Working Frequency	10Hz-3KHz	10Hz-10KHz		2.4GHz
Vmin	0.28V	0.5V		0.2V
Voltage Efficiency	76%-97% ($R_{Load}=40 \text{ k}$)	90% ($R_{Load}=50 \text{ k}$)		71%-81% ($R_{Load}=50 \text{ k}$)
Power Efficiency	78%-95%	Up to 95%		73% -79%

In this paper, a wide range input voltage amplitude and highly efficient rectifier for energy harvesting system was proposed. The rectifier is well suited for an input amplitude as low as 0.2V and can work at a wide range of input voltage amplitudes of 0.2V up to 2.1V under a standard 0.18um CMOS process. The proposed rectifier can achieve peak voltage conversion efficiency of over 81% and power efficiency over 79%. Simulated power consumption of the rectifier is 0.23 uW at 0.45V, which is about 28% smaller than the best recently published results.

7. Conclusions :

Performance improvements in battery technology and the power requirements of electronics are not keeping pace with the increasing demands of many wireless sensor networking applications. For this reason, there has been considerable interest in the development of systems capable of extracting usable electrical energy from existing environmental sources. Such sources include ambient electromagnetic energy, thermal gradients, vibration and other forms of motion. The energy harvesting research falls into two key areas. One is developing optimal structures of energy harvesting and the other is designing electronic circuits that are efficient enough to store the generated charge. So Regarding the

designing of electronic circuits, the optimum Performance of Energy Harvesting Solutions for 65nm CMOS Circuits in Embedded Electronics Design is achieved by Low Voltage Rectifier using improved precision active diode. The proposed rectifier is designed for 2.4GHz using two-stage structure and an improved precision active diode under a standard 65nm CMOS process can perform the minimum operation voltage is lower than previous published paper and the rectifier can work at a wide range of input voltage amplitudes of 0.45V up to 1.95V. This allows the proposed rectifier to work in Different Types of vibration energy harvesting system, Electrostatic Energy harvester., Electromagnetic Energy Harvester, piezoelectric Energy Harvester. The proposed rectifier can achieve peak voltage conversion efficiency of over 81% and power efficiency over 79%. Simulated power consumption of the rectifier is 0.23 uW at 0.45V, which is about 28% smaller than the best recently published results. The advantage of using mechanical vibrations to harvest energy is that they are the most prevalent energy source available in many environments.

References

- [1] J. M. Gilbert and F. Balouchi. Comparison of energy harvesting systems for wireless sensor networks. *International Journal of Automation and Computing*, 5, N. 4:334–347, October **2018**.
- [2] V. Raghunathan, A. Kansal, J. Hsu, J. Friedman, and M. B. Srivastava, “Design considerations for solar energy harvesting wireless embedded systems,” in *Proc. IPSN*, Apr. 25–27, **2015**, pp. 457–462.
- [3] G. K. Ottman, H. F. Hofmann, A. C. Bhatt, and G. A. Lesieutre, “Adaptive piezoelectric energy harvesting circuit for wireless remote power supply,” *IEEE Trans. Power Electron.*, vol. 17, no. 5, pp. 669–676, Sep. **2012**.
- [4] Muhammed Emin Başak, Firat Kaçar "A New Fully Integrated High Frequency Full Wave Rectifier Realization" *Journal of Microelectronics, Electronic Components and Materials* Vol. 45, No.2 **2015**, 101-109, [http://www.midem-drustvo.si/Journal%20papers/MIDEM_45\(2015\)2p101.pdf](http://www.midem-drustvo.si/Journal%20papers/MIDEM_45(2015)2p101.pdf)
- [5] C. Sauer, M. Stanac'evic', G. Cauwenberghs, and N. Thakor, “Power harvesting and telemetry in CMOS for implanted devices,” *IEEE Trans. Circuits Syst. I, Reg. Papers*, vol. 52, no. 12, pp. 2605–2613, Dec. **2015**.
- [6] P. Li and R. Bashirullah, “A wireless power interface for rechargeable battery operated medical implants,” *IEEE Trans. Circuits-Syst.II, Exp.Briefs*, Vol.54, no.10, pp.912–916, Oct.**2017**
- [7]<https://pdfs.semanticscholar.org/5bd4/e7981c8db68d570b3f17c1300e09e5c5597c.pdf>
- [8] Cevik, I., Huang, X., Yu, H., Yan, M., & Ay, S. U. An ultra-low power CMOS image sensor with on-chip energy harvesting and power management capability. *Sensors*, 15(3), **2015**, p5531
- [9] B. C. Yen and J. H. Lang, “A variable-capacitance vibration-to-electric energy harvester,” *IEEE Trans. Circuits Syst. I, Reg. Papers*, vol. 53, no. 2, pp. 288–295, Feb. 2006. DOI:10.1109/TCSI.2005.856043; Corpus ID: 13862951
- [10] Guo, S.; Lee, H. An efficiency-enhanced CMOS rectifier with unbalanced-bias comparators for transcutaneous power high-current implants. *IEEE J. Solid State Circuits* 2009, 44, 1796–1804.
- [11] Din, A.U.; Chung, D.; Park, D.; Lee, H.; Lee, J.-W. A high extraction self-controllable CMOS resonant rectifier circuit for piezoelectric energy scavenging system. In *Proceedings of the 2014 International SoC Design Conference (ISOCC)*, Jeju, Korea, 3–6 November **2014**; pp. 40–41.
- [12] Lu, C.; Tsui, C.Y.; Ki, W.H. Vibration energy scavenging system with maximum power tracking for micropower applications. *IEEE Trans. Very Large Scale Integr. (VLSI) Syst.* 2011, 19, 2109–2119.
- [13] Lu, C.; Tsui, C.Y.; Ki, W.H. Vibration energy scavenging and management for ultra low power applications. In *Proceedings of the ACM/IEEE International Symposium on Low Power Electronics and Design (ISLPED)*, Portland, OR, USA, 27–29 August **2017**; pp. 316–321.
- [14] Do, X.-D.; Nguyen, H.H.; Han, S.K.; Lee, S.-G. A rectifier for piezoelectric energy harvesting system with series synchronized switch harvesting inductor. In *Proceedings of the 2013 IEEE Asian Solid-State Circuits Conference (A-SSCC)*, Singapore, 11–13 November **2013**; pp. 10–13.
- [15] Kwon, D.; Rincón-Mora, G.A.F. A single-inductor 0.35 m CMOS energy-investing piezoelectric harvester. *IEEE J. Solid State Circuits* **2014**, 49, 2277–2291.
- [17] Cook BW, Lanzisera S, Pister KSJ. SoC issues for RF smart dust. *Proc IEEE* 2006;94:1177–96.
- [18] Mitcheson PD, Yeatman EM, Rao GK, Holmes AS, Green TC. Energy harvesting from human and machine motion for wireless electronic devices. *Proc IEEE* 2008;96:1457–86.
- [31] Zhao, T.; Fu, Y.; He, H.; Dong, C.; Zhang, L.; Zeng, H.; Xing, L.; Xue, X. Self-powered gustation electronic skin for mimicking taste buds based on piezoelectric–enzymatic reaction coupling process. *Nanotechnology* **2018**, 29, 075501.
- [32] Jin, W.; Wang, Z.; Huang, H.; Hu, X.; He, Y.; Li, M.; Li, L.; Gao, Y.; Hu, Y.; Gu, H. High-performance piezoelectric energy harvesting of vertically aligned Pb(Zr,Ti)O₃ nanorod arrays. *RSC Adv.* **2018**, 8, 7422–7427.
- [34] Qiang Li, Renyuan Zhang, Zhangcai Huang, and Y. Inoue, “A low Voltage CMOS rectifier for wirelessly powered devices,” *IEEE international Symposium on Circuits and Systems*, pp.873-876, May 2010.
- [35] C.Peters, J. Handwerker, D. Maurath, Y. Manoli, “A Sub-500 mV Highly Efficient Active Rectifier for Energy Harvesting Applications,” *IEEE Trans. Circuits Syst. I, Reg. Papers*, vol. 58, no. 7, pp. 1542- 1550, July. 2011.
- [36] Dan Niu, Zhangcai Huang, Minglv Jiang, Yasuaki Inoue, “A Sub-0.3V highly efficient CMOS rectifier for energy harvesting applications,” *IEICE NOLTA*, vol. 3, no. 3, pp. 405-416, July 2012.

Overview of Multi-Chip Alternatives for 2.5D and 3D Integrated Circuit Packagings

Ching-Feng Chen^{1,*}, Ph.D. Candidate

^{1*} Civil and Disaster Prevention Engineering, National Taipei University of Technology

* Corresponding author: e-mail: keho0821@gmail.com

Abstract—With the size of the transistor gradually approaching the physical limit, it challenges the persistence of Moore’s Law due to the development of the high numerical aperture (high-NA) lithography equipment and other issues such as short channel effects. In the context of the ever-increasing technical requirements of portable devices and high-performance computing (HPC), relying on the law continuation to enhance the chip density will no longer support the prospects of the electronics industry. Weighing the chip’s power consumption-performance-area-cost-cycle time to market (PPACC) is an updated benchmark to drive the evolution of the advanced wafer nanometer (nm). The advent of two and half- and three-dimensional (2.5 and 3D)- Very-Large-Scale Integration (VLSI) packaging based on Through Silicon Via (TSV) technology has updated the traditional die assembly methods and provided the solution. This overview investigates the up-to-date and cutting-edge packaging technologies for 2.5D and 3D integrated circuits (ICs) based on the updated transistor structure and technology nodes. The author concludes that multi-chip solutions for 2.5D and 3D IC packagings are feasible to prolong Moore’s Law.

Keywords—Moore’s Law, High Numerical Aperture (High-NA), Power Consumption-Performance-Area-Cost-Cycle Time to Market (PPACC), 2.5 and 3D- Very-Large-Scale Integration (VLSI) Packaging, Through Silicon Via (TSV)

1. Background

Following the transistor size gradually approaching the physical limit, it has challenged the continuation of Moore’s Law [1]-[3] due to the demand for high NA lithography equipment and other dilemmas such as quantum tunneling issues.

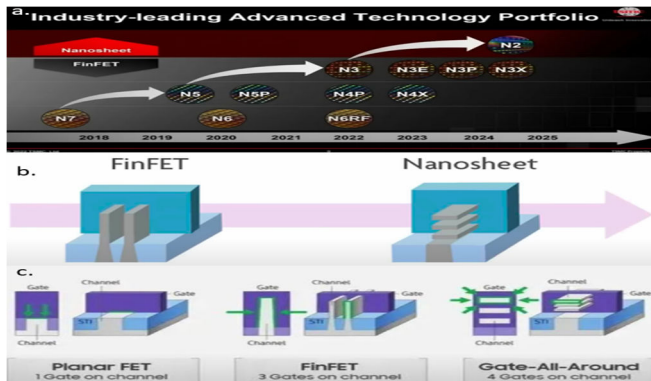
While the technical requirements of portable devices and HPC are growing, expecting the law’s persistence to improve the chip density will no longer make headway in the semiconductor industry. The PPACC is an up-to-date criterion to drive the progress in the advanced nm wafer process. The emergence of stereoscopic stacking Integration circuit (IC) assembling according to TSV technology has replaced traditional die packaging approaches and granted the solution.

2. Technical Review

2.1 Evolutions of Transistor Structure and Technology Node in Wafer Process

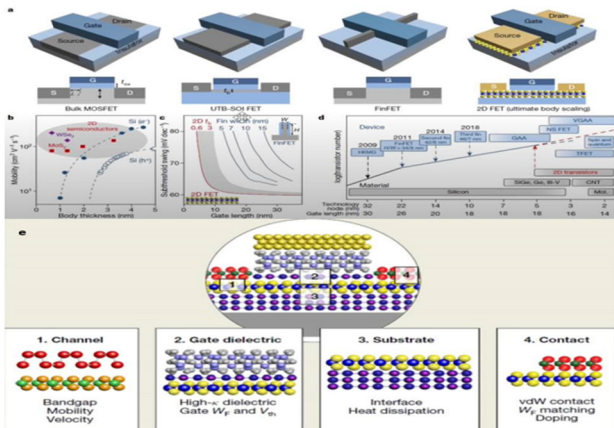
Moore’s law describes that the technical nodes of the wafer process double the chip transistor number every 18 to 24 months [1]-[3]. It has dominated the development of semiconductors. However, when the engineers reduce the transistor’s gate width (electron channel length) to 20 nanometers (nm), effects such as threshold voltage drop of the control switch, reduction of the drain potential energy barrier, carrier surface scattering, electron velocity saturation, ionization, and thermionic effects will occur. Consequently, some large-scale foundries, such as Intel, Taiwan Semiconductor Manufacturing Company Limited (TSMC), and Samsung, have adopted Fin Field-effect Transistor (FinFET) and Gate-All-Around FET (GAAFET) to cope with technical bottlenecks in evolution to persist the rule. Below 3 nm, the physical limits are significantly constraining [4]. Fig. 1 shows technical

development from 7 nm (N7) to 2 nm (N2) and the transistor structures of the various wafer processes. Fig. 2 illustrates TSMC’s technology node evolution.



Notes: >20nm: MOSFET; <20nm: FinFET; <3nm: Gate All Around Fet (GAAFET)

Fig. 1. Transistor Structure development [5]



Notes: UTB-SOI:Ultra-thin body Silicon on Insulator; vdW: Van der Waals Contacts

Fig. 2. Transistor Structure and Technology Node Evolution in Wafer Process (TSMC) [5]

Table 1 shows the changes in power consumption-performance-area (PPA) of TSMC under different processes. From the comparison of N3E (Node 3E) and N5, and N2 and N3E, the chip density only increase by 30% and more than 10%, respectively (Fig. 3). It implies that it is not simple for foundries to continue Moore’s Law. With the exponential increase in cost, it is increasingly difficult to increase the chip density. If manufacturers consider the wafer production yield and the increasingly rare pyramid-shaped situation of customers, the investment risk will be higher

and higher. A leading foundry’s timeframe will not be easy to maintain to lead the competition. In this context, in addition to gaining a better market share ahead of its rivals, it has spawned technological innovation to optimize PPA and generate a state of the art techniques that meet customer needs. For example, TSMC’s N3 includes N3, N3E, N3P, and N3X. TSMC further divides N3E into three processes, 2-1Fin, 2-2 Fin, and 2-3 Fin, based on the same chip to satisfy customers’ design flexibility (Fig. 4) and PPA requirements [5].

Table 1. TSMC's PPA Changes under Different Processes [5]

T S M C				
	N5	N3	N3E	N2
	vs N7	vs N5	vs N5	vs N3E
Power	-30%	-25-	-34%	-25-
Performance	+15%	30%	+18%	30%
Chip Density*	?	?	~1.3X	>1.1X
Volume	Q2	H2	Q2/Q3	H2
Manufacturing	2022	2022	2023	2025

Note: Chip density of the mixed chips containing 50% of logic, 30% SRAM, and 20% analog (TSMC)

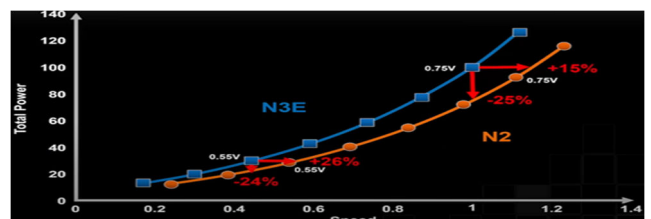


Fig. 3. Comparison of performance and Power Consumption of N2 and N3E, Cortex-A72 [5]

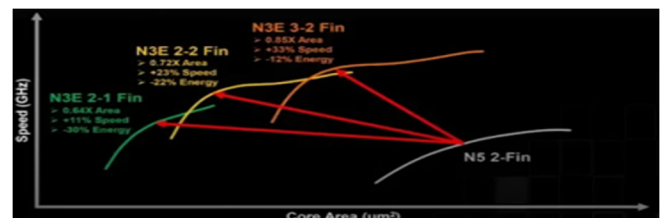


Fig. 4. From Vmax/Fmax to low-Vdd/power-efficient compute cores-all on the same die[5]

To echo the requirement of epoch-making technology, the wafer producers generally use two methods to endure the regulation: Introduce EUV (extreme ultraviolet lithography) and transfer circuit patterns to wafers through high-energy,

short-wavelength light sources. Another approach is to stack crystals vertically through "heterointegration."

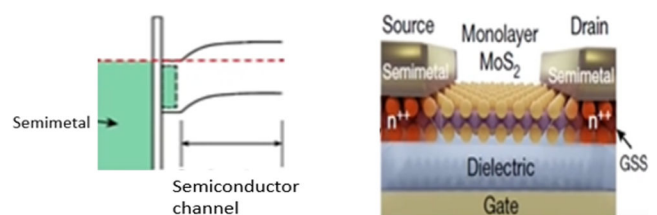
For heterogeneity, manufacturers rely on advanced packaging technology to integrate chiplets with different properties and functions and stack them in 2.5D or 3D packaging. The advantage is that it can package processors, memory, communication, sensing, and even laser chips. These heterogeneous chiplets and materials in the same integrated circuit (IC) enhance the function of the chip module, save the printed circuit board (PCB) area, and facilitates complementary properties between dissimilar materials. Under the premise that the semiconductor industry has clarified this development trend, the future wafer foundry industry is essential for integrating heterogeneous chiplets and advanced packaging, which can also improve the IC's PPA. As a high chip area reduces yield, the solutions to stack the chips help reduce their interconnect length. The overall wafer decreases delay and increases speed and performance [4]. This possible solution could be a paradigm shift in the present and future fabrication process, creating a new era of chip fabrication architecture and continuing the guideline.

With the emergence of 3D VLSI, although it provides solutions to increased speed and lessened power consumption, it also presents challenges that differ from traditional single-chip packaging. Chip assembly equipment is one of them. As any error will affect the yield of the production line and even cause the product of the entire production line to be defective, it must retain high precision, machine shock resistance, and intelligent management to ensure machine stability and product quality while maintaining high-speed operation.

As mentioned earlier, when the designer shrinks

the transistor's gate length to 20 nm, effects such as threshold voltage drop of the control switch, reduction of the drain potential energy barrier, carrier surface scattering, electron velocity saturation, ionization, and thermionic effects will occur.

To overcome these technical dilemmas, manufacturers introduce costly lithography equipment in hundreds of millions of US dollars, such as Deep Ultraviolet (DUV) with a wavelength of 193 nm and Extreme Ultraviolet (EUV) with a wavelength of 13.5 nm. Massachusetts Institute of Technology (MIT), TSMC, and National Taiwan University (NTU) (2021) discovered that optimizing the bismuth (Bi) deposition process in two-dimensional materials and using Helium-ion beam lithography can approach the quantum limit to make the metals the transistor reaching ohmic contact (meager resistance). A stable ohmic contact with low resistance and a linear and symmetrical current-voltage characteristic curve (I-V curve) is a critical factor affecting the performance and stability of the current-voltage characteristic curve of an integrated circuit. It improves the current transmission between the source and drain and successfully narrows the device channel to nanometers (Fig. 5) [6]. In addition to DUV and EUV, other corresponding equipments coupled with the price of wafer tape-out remain high. Consequently, except for a few companies, such as Apple, Intel, and Samsung, only minimal corporations have a few product varieties, and a substantial global market share can be affordable and outsourced.

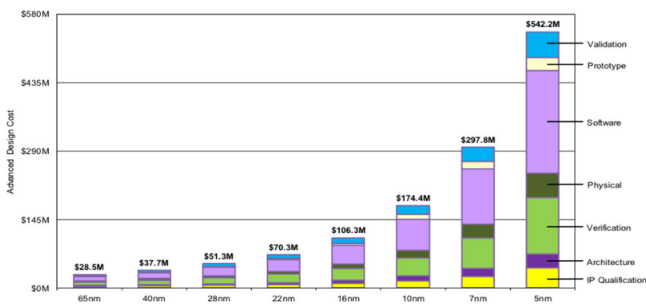


a. Ohmic contact b. Degenerate part of

Bi-contacted MoS2 marked in orange color due to gap-state situation (GSS)

Fig. 5. Schematic of a 2D FET with a monolayer semiconductor (MoS2) channel and semimetal (Bi) contacts [6]

Lapedus'es (2018) survey showed that the expenses of developing a 3 nm chip could be as high as US\$1.5 billion (Fig. 6). However, the benefits of PPA are likely to decrease. International Business Strategies (IBS) also pointed out that the 5 nm development cost exceeds US\$ 542 million. Thus, the business and financial risks of foundries and fabless firms will increase momentarily; the development of 2.5D and 3D heterogeneous stacked packaging seems essential [7].



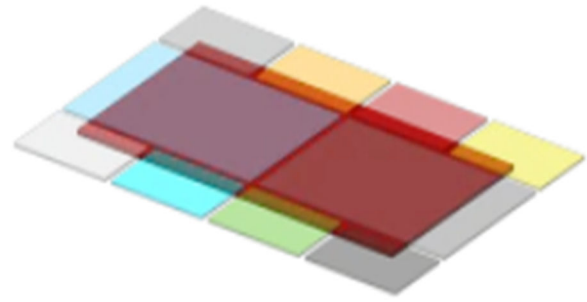
Source: IBS

Fig. 6. IC design costs escalate [7]

2.2 Multi-Chip Alternatives for 2.5D and 3D Chip Assembly

Multi-chip alternatives have various structures, such as 2.5D, Embedded Multi-die Interconnect Bridge (EMIB), Fan-Out Panel Level Packaging (FOPLP), Fan-out wafer-level packaging (FOWLP), Integrated Fan-Out Wafer Level Packaging (InFO), Chip on Wafer on Substrate (CoWos), Small Outline IC (SOIC), System in Wafer-Level Package (SiWLP), and Embedded wafer fan-out (eWFO) to assemble the chips and formulate new architectures [8].

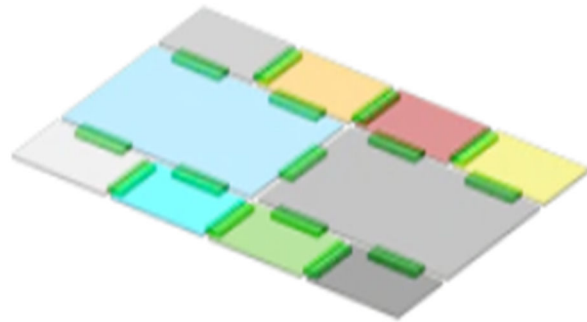
The 2.5D is a packaging methodology for including multiple dice inside the same package (Fig. 7) [9].



Source: Intel

Fig. 7. Industry Standard 2.5D [9]

EMIB is an elegant and cost-effective approach to in-package high-density interconnect of heterogeneous chips. The substrate fabrication process embeds a tiny bridge die with multiple routing layers (Fig. 8) [9].



Source: Intel

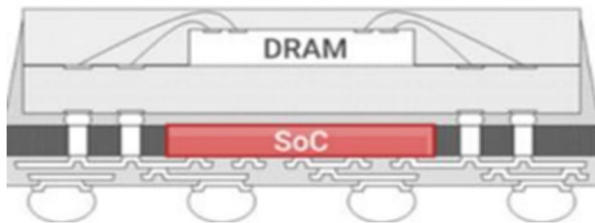
Fig. 8. EMIB [9]

FOPLP is one of the latest packaging trends in microelectronics. It has a high potential for significant package miniaturization concerning volume and thickness. The technological core of FOWLP is the formation of a reconfigured molded wafer combined with a thin film redistribution layer to yield an SMD-compatible package [10].

FOWLP is an integrated circuit packaging technology that enhances standard wafer-level packaging (WLP) solutions. In fan-out WLP, the wafer is diced first. However, the dies are precisely re-positioned on a carrier wafer or panel, with space for fan-out kept around each die. The carrier is then reconstituted by molding, making a redistribution layer atop the entire molded area

(both atop the chip and the adjacent fan-out area) and then forming solder balls [11].

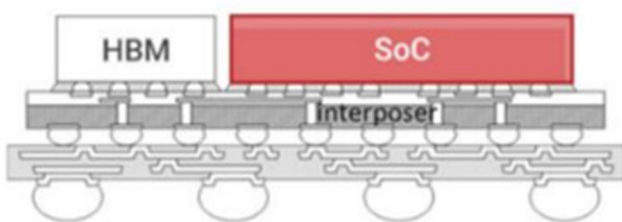
InFO is an innovative wafer-level system integration technology platform featuring a high-density Redistribution Layer (RDL) and TIV (Through InFO Via) for high-density interconnect and performance for various applications, such as mobile and high-performance computing. Fig. 9 shows two different die types, a System on a Chip (SOC) and a Dynamic Random Access Memory (DRAM) in the case of InFO. Each may utilize a different feeding source, potentially with one device fed directly from the wafer and another from the Joint Electron Device Engineering Council (JEDEC) tray [12].



Source: TSMC

Fig. 9. InFO-POP Architecture

CoWoS is a 2.5D wafer-level multi-chip packaging technology that incorporates multiple dies on a silicon interposer to achieve better interconnect density and performance (Fig. 10). Individual chips are bonded through micro-bumps on a silicon interposer, forming a chip-on-wafer (CoW). The CoW is then subsequently thinned such that the Through Silicon Via (TSV) perforations are exposed, followed by C4 bumps formation and singulation. Makers can complete a CoWoS package through bonding to a package substrate [13].



Source: TSMC

Fig. 10. CoWoS Architecture

Surface-mounted integrated circuit (SOIC)

package occupies an area about 30–50% less than an equivalent dual in-line package (DIP), with a typical thickness being 70% less [14].

System in wafer-level Package (SiWLP) is fabricated using “RDL-first” technology for fan-out wafer-level packages (FO-WLPs) and provides the density of the high chip-Input/Output (I/O), design flexibility, and package miniaturization [15], [16].

Embedding wafer and fan-out (eWFO) is fabricated in either wafer fabs using back end of line (BEOL) tools, materials, and processes or Outsourced Semiconductor Assembly and Test’s (OSAT’s) built-up fabs and tools [17].

2.3 Cutting-edge Packaging Technology

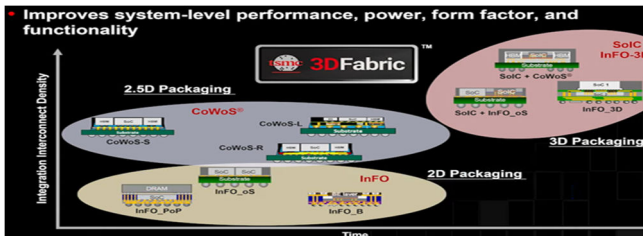
Due to the high investment cost in the advanced wafer process, the short channel effect and the nonlinear Schottky contact issues are challenging to overcome. So far, only TSMC, INTEL, and Samsung can invest in foundries below 7 nm (inclusive). Intel’s EMIB (2.5D) and Foveros (3D) packaging technologies are similar to TSMC [18], [19]. They are more applicable than Samsung’s 3D high-bandwidth memory (HBM) stacking technology to product heterogeneity as they can widely assemble various heterogeneous chips to achieve better power consumption, performance, area, cost, and cycle time to market (PPACC) [20].

Nevertheless, Samsung encapsulates 12-layer HBM chips in a package with a thickness of only 720 μm . Researchers consider it one of the most challenging technology. A common feature of the three foundries’ wafer stacking technology is the extensive use of TSV technology.

2.3.1 TSMC’s 3DFabric

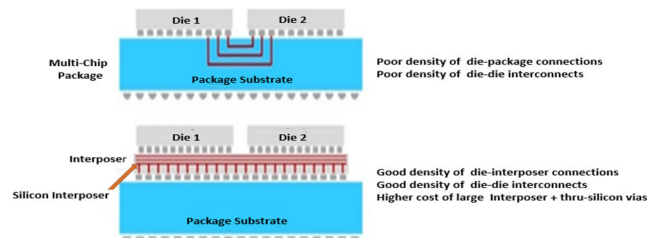
Fig. 11 illustrates the evolution of TSMC from 2D InFO to 2.5D CoWoS and then to 3D SoIC InFO packaging. Off-chip coupling (Fig. 12) has higher interconnection and specific capacitance

densities with ultra-low bonding latency for energy-efficient computing systems. It brings the merits of the large reticle size in fan-out and performance in High-Performance Computing (HPC) and AI networks. Fig. 13 shows that the SoIC™ bonding pitch is intrinsically exceptional to conventional 3D IC packaging [21].



Source: 2022 IEEE VLSI Symposium on Technology and Circuits [5]

Fig. 11. TSMC 3DFabric™ Integration [21]



Source: 2022 IEEE VLSI Symposium on Technology and Circuits

Fig. 12. Heterogeneous Integration Options (2D Multi-Chip and 2.5D CoWoS Packages) [20]

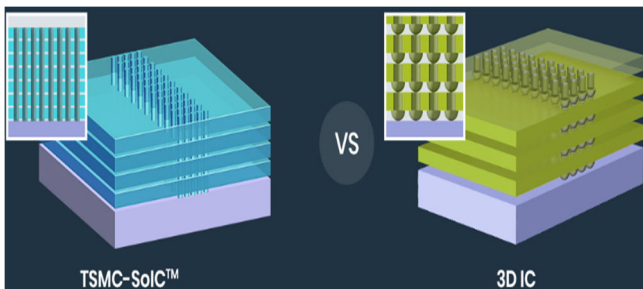


Fig. 13. Heterogeneous Integration Option (System on Integrated Chips (SoIC™) versus 3D Multi-Chip Integration) [21]

2.3.2 Intel’s EMIB (2.5 D), Foveros (3D), and Power Via

Fig. 14 demonstrates that Intel’s EMIB’s Silicon Interposer is significantly smaller than TSMC’s CoWoS. It has the advantage of low cost. Foveros enables the foundry to integrate processors with computing units piled vertically, providing more excellent performance in a miniaturized package (Fig. 15). It helps the manufacturer optimize the

cost and power efficiency and allows the fine interconnect pitch. In addition, the chip’s back Power Via can implement the backside power delivery and optimize signal transmission by eliminating the requirement for power routing on the front side of the wafer (Fig. 16).

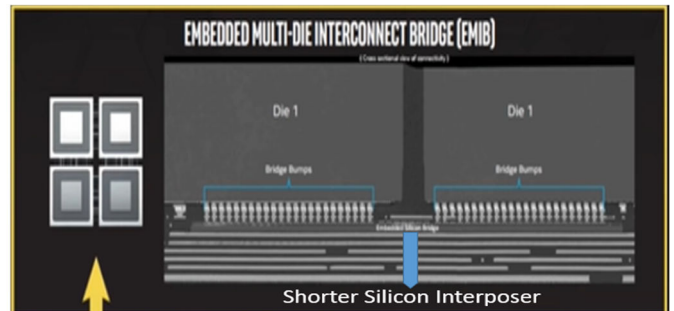
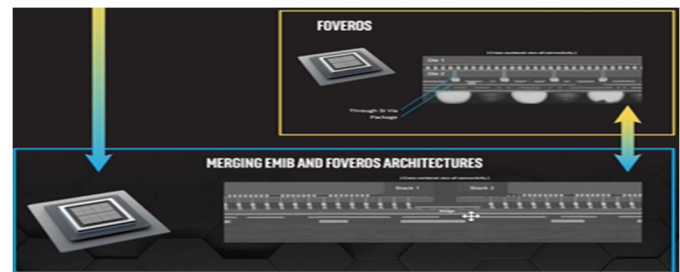
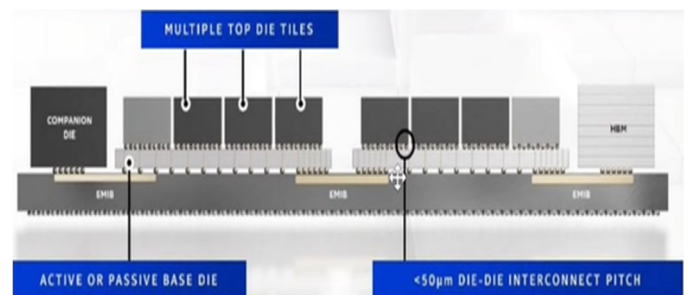


Fig. 14 EMIB (Intel) [9]

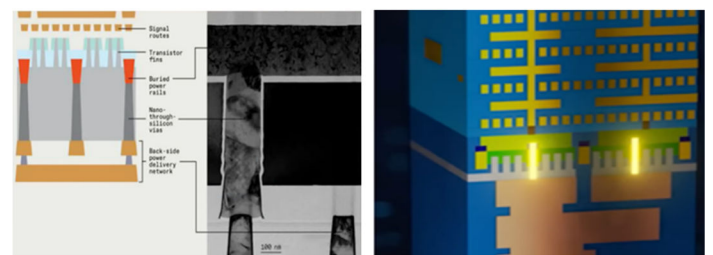


(a) EMIB and Foveros Architecture



(b) EMIB and Foveros Configuration

Fig. 15 Merging EMIB and Foveros Architecture (a) and Configuration (b) [9], [18], [19]



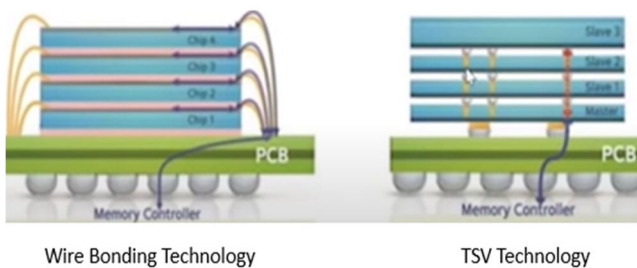
(a)

(b)

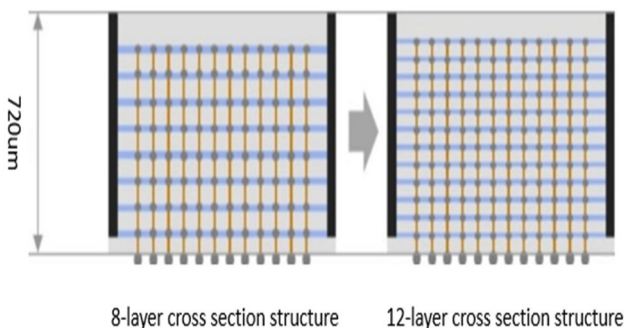
Fig. 16. (a) Fervos Profile [19]; (b) Power VIA (Intel) [22]

2.3.3 Samsung’s 12-Layer 3D TSV for High Bandwidth Memory (HBM)

The 12-layer 3D TSV technology can increase the stacking of 24 GB HBM chips from 8 to 12 layers. Because the 3D structure through 60,000 TSV holes is vertically interconnected, high-precision alignment is required. Researchers see this technology as one of the most challenging packaging technologies for mass-producing high-performance chips. Compared with current wire bonding technology, it can shorten the data transfer time between chips, reduce power consumption and increase speed. Fig. 17 shows a thickness of 720 microns, the same thickness as the current 8-layer HBM [20].



(a) Conventional Wire Bonding vs. TSV Technology



(b) 8-layer vs. 12-layer cross section structure

Fig. 17. 12-Layer 3D TSV technology [20]

3. Conclusions

The continuation of Moore's Law is related to the development of semiconductor processes and provides a guideline for foundries. The more they follow the regulation, the more they can achieve market shares and professional leadership. However, factors such as short channel effects limit the persistence of the law. Multi-chip alternatives for 2.5D and 3D IC packaging are feasible for developing the semiconductor and

electronic industries. They benefit from lessening financial and business risks for foundries and their customers.

References

- [1] Moore, G.E., Cramming more components onto integrated circuits. *Electronics*, 38, (1965)
- [2] Moore, G.E., The microprocessor: engine of the technology revolution. *Communications of the ACM* 40 (2), pp. 112-114 (1997)
- [3] Moore, G.E., Moore, G.E., Cramming More Components Onto Integrated Circuits. *IEEE Xplore*, 86, pp. 82-85 (1998)
- [4] Manimegalai, R.; Soumya, E.S.; Muralidharan, V.; Ravindran, B.; Kamakoti, V. Placement and Routing for 3D-FPGAs using Reinforcement Learning and Support Vector Machines (2005).
- [5] 2022 IEEE Symposium on VLSI Technology and Circuits (VLSI Technology and Circuits) <https://ieeexplore.ieee.org/xpl/conhome/9830116/proceeding> (retrieved on 31 July 2022)
- [6] Shen, P.C., Su, C., Lin, Y., Chou, A.S., Chong, C.C., Park, J.H., Chou, M.H., Lu, A.Y., Tang, H.L., Tavakoli, M.M., Pinter, G., Ji, X., Cai, Z., Mao, N., Wang, J., Tung, V., Li, J., Bokor, J., Zettl, A., Wu, C.I., Palacios, T., Li, L.J., Kong, J. Ultralow contact resistance between semimetal and monolayer semiconductors. *Nature*, 593, pp. 211-217 (2021)
- [7] Lapedus, M. Big Trouble At 3nm. *Semiconductor Engineering* (2018)
- [8] Farris, G. EMERGING PROCESS AND ASSEMBLY CHALLENGES IN ELECTRONICS MANUFACTURING (2022)
- [9] Intel Corporation. Embedded Multi-Die Interconnect Bridge. <https://www.intel.com/content/www/us/en/silicon-innovations/6-pillars/emib.html> (retrieved on 31 July 2022)
- [10] Lau, J.H., Ko, C.T., Peng, C.Y., Yang, K. M., Xia, T., Lin, P. B., Chen, J.J., Huang, P.C., Tseng, T.J., Lin, E., Chang, L., Lin, C., Lu, W. Chip-Last (RDL-First) Fan-Out Panel-Level Packaging (FOPLP) for Heterogeneous Integration. *Journal of Microelectronics and Electronic Packaging*, 17 (3), pp. 89-98 (2020)
- [11] Fukushima, T., Alam, A., Hanna, A., Jangam, S.C., Bajwa, A. A. and Iyer, S.S. Die-First FOWLP for High-Performance and Scalable Heterogeneous System Integration. *IEEE TRANSACTIONS ON COMPONENTS, PACKAGING AND MANUFACTURING TECHNOLOGY*, 8 (10) (2018)
- [12] Tseng, C.F., Liu, C.S., Wu, C.H., Yu, D. InFO (wafer level integrated fan-out) technology. 2016 IEEE 66th Electronic Components and Technology Conference (ECTC), pp. 1-6 (2016)
- [13] Huang, P.K., Lu, C. Y., Wei, W.H., Chiu, C.,

- Ting, K.C., Hu, C., Tsai, C.H., Hou, S.Y., Chiou, W.C., Wang, C.T., and Yu, D. Wafer Level System Integration of the Fifth Generation CoWoS®-S with High Performance Si Interposer at 2500 mm², 2021 IEEE 71st Electronic Components and Technology Conference (ECTC) (2021)
- [14] Meeldijk, V. Integrated Circuit Packages. The Electronic Packaging Handbook (2017)
- [15] Lau, J. H. FOWLP: Chip-Last or RDL-First. In Fan-Out Wafer-Level Packaging. Springer, Singapore, pp. 195-206 (2018).
- [16] Motohashi, N., Kimura, T., Mineo, K., Yamada, Y., Nishiyama, T., Shibuya, K., ... & Kawano, M. System in wafer-level package technology with RDL-first process. In 2011 IEEE 61st Electronic Components and Technology Conference (ECTC), pp. 59-64 (2011)
- [17] Tummala, R., Sundaram, V., Raj, P. M., & Smet, V. Future of embedding and fan-out technologies. In 2017 Pan Pacific Microelectronics Symposium (Pan Pacific) IEEE, pp. 1-9 (2017).
- [18] Intel Corporation. Intel's Foveros technology <https://www.intel.com/content/www/us/en/corporate/usa-chipmaking/news-and-resources/video-intel-foveros-technology-explained.html> (retrieved on 31 July 2022)
- [19] Prasad, C., Chugh, S., Greve, H., Ho, I. C., Kabir, E., Lin, C., ... & Pantuso, D. Silicon reliability characterization of Intel's Foveros 3D integration technology for logic-on-logic die stacking. In 2020 IEEE International Reliability Physics Symposium (IRPS) pp. 1-5. (2020).
- [20] Samsung Electronics. Samsung Electronics Develops Industry's First 12-Layer 3D-TSV Chip Packaging Technology. <https://news.samsung.com/global/samsung-electronics-develops-industrys-first-12-layer-3d-tsv-chip-packaging-technology> (retrieved on 31 July 2022)
- [21] Taiwan Semiconductor Manufacturing Company Limited (TSMC). TSMC-SoIC^{o,R} <https://3dfabric.tsmc.com/chinese/dedicatedFoundry/technology/SoIC.htm>
- [22] Intel Corporation. Introducing PowerVia and RibbonFET. <https://www.intel.com.tw/content/www/tw/zh/silicon-innovations/6-pillars/process.html> (retrieved on 31 July 2022)

Environmental Performance, Financial Constraints, and Capital Investment

Hong V. Nguyen

Abstract—This study examines the relation between capital investment and environmental performance. Specifically, I am interested in testing whether environmental performance has real effects, either directly through input substitution and production technology, or indirectly through the impact of changes in financial risks. Using a sample of the S&P 500 firms, the empirical results show that environmental performance has a direct impact on capital investment. Additionally, I find that greener firms are less financially constrained in relation to measures of cash flow and leverage. Possible explanations for the finance channel include favorable loan covenants, lower cost of equity capital, and favorable regulatory environment. Different environmental performance metrics are used in this study, including greenhouse gas emissions. The paper contributes to the literature on the real effects of environmental performance by examining its direct and indirect channels.

Keywords—Capital investment, environmental performance; greenhouse gas emissions; financial constraints

Economical and Environmental Impact of Deforestation for Charcoal Production in Gaza Province

Paulo Cumbe

Abstract—This work analyzes the economic and environmental impact of the exploitation of forest resources on populations and their sustainability in the regions where they occur. It is from this charcoal production activity that is based in the districts of Massingir and Mabalane and destined to supply energy to the city of Maputo; it is the main source of income for several families. However, this practice, to be carried out intensively and continuously, causes a negative environmental impact on biodiversity. To deepen this question, we analyzed different studies carried out in these communities that are dedicated to this exploitation with the direct actors, studies that measure the level, speed, and impact of forest degradation, and other related studies. Crossing the results of the various studies available shows enormous devastation in an area of approximately many hectares per day. The degraded area in five years would take too years to restore it to the current level, which is unsustainable from an environmental point of view. Populations must seek new areas for the same practice to maintain their livelihood, progressing with ecosystem degradation and increasing emissions of carbon dioxide into the atmosphere. Environmental education, creation, and dissemination of new forms of exploitation, less aggressive to the environment, and more profitable forest repopulation actions need to be carried out to guarantee the sustainable development of the populations.

Keywords—deforestation, emissions, sustainability, charcoal.

The Study of the Thai Millennial Attitude towards End-of-Life Planning: An Opportunity of Service Design Development

Mawong R., Bussracumpakorn C.

Abstract— Millions of young people around the world have suffered negative psychological and social effects as a result of the COVID-19 pandemic. Millennials' stresses have been shaped by a few global issues, including climate change, political instability, and financial crises. In particular, the spread of COVID-19 has effect psychological and socioeconomic scars on them. When end-of-life planning turns into more widely discussed before people think it is the stigma and taboos. End-of-life planning is defined as a future life plan and includes financial, legacy, funeral, and memorial planning. This plan would help Millennials to discover the value and meaning of life. This study explores the attitudes of Thai Millennials towards end-of-life planning as a new normal awareness of life to initiate a service design concept to fit with their values and meaning. The study conducts an in-depth interview with 12 potential participants who have awareness or action on the plan. The framework of the customer journey map is used to analyze the responses to examine trigger points, barriers, beliefs, and expectations. The findings pointed to a service concept that is suggested for a new end-of-life planning service that is suited to Thai Millennials in four different groups, which are: 1. Social-Conscious as a socially aware who to donate time and riches to make the world and society a better place, their end-of-life planning value is inspired by the social impact of giving something or some action that they will be able to do after life or during life which provides a variety of choices based on their preference to give to society. 2. Life Fulfillment who make a life goal for themselves and want to achieve it before their end-of-life comes to make end-of-life planning value is to be inspire life value with a customizable plan and provide guidance of personal life goal to suggest them to achieve before the end of time. 3. Prevention of the After-Death Effect who want to plan to avoid the effects of their death as patriarch, head of the family, and anchor of someone, so they want to have a plan that brings confidence and feel relief while they are still alive and they want to find some reliable end-of-life service that they can leave their death will or personal asset to the service to taking care and mange to their family and the loved one., and 4. No Guilty Planning who want to plan end-of-life time for help worry-free as they think their own life and death is their self-responsible, they want to have the end-of-life planning service which is easy to understand as a mange stuff or will and easy to access the service. The overall finding of the study is to understand the service concept of end-of-life planning which to improve knowledge of significant life worth rather than death planning, encouraging people to reassess their lives in a positive way, leading to higher self-esteem and intrinsic motivation for this generation in this time of global crisis.

Keywords— design management, end-of-life planning, millennial generation, service design solution

Mawong R. is with the Graduate Program of Design and Planning, Bangkok, Thailand (corresponding author, phone: +6694-486-9369; e-mail: rawissara.m@mail.kmutt.ac.th).

I. INTRODUCTION

IN 2019-2022, the total number of recorded deaths from COVID-19 rose to 6 million people around the world. The coronavirus has affected the way we grieve in recent years [1], limiting attendance at funerals or pushing people to social media. Simultaneously, it is causing living people to talk about death. In recent years, internet media outlets have increasingly sparked concerns about death-related discussion groups. Since the beginning of the pandemic in Thailand, we have seen an increase in interest, including in advance care planning content, as the severity of the pandemic forces people to consider what would happen if they became so sick that they could not communicate their wishes for treatment or a good death. Discussing and arranging end-of-life choices can be useful, and it is generally believed that the optimum time to do so is when individuals are well.

The global crisis has pushed millennials to a crossroads in their lives, as they enter their quarter life, the stage of life when they begin to become adults and start families. Millennials have a different perspective than previous generations, preferring to live their own lives, not having children, and having the rights to live or die. They are more versatile and less constrained by tradition. Millennials are a thrifty generation that appreciate comparing prices and recognize the need of planning ahead of time to prevent hasty, emotional decisions and unanticipated circumstances. They try to avoid doing things the same way they have always been done, especially now that social media has removed many of the taboos associated with death. There is a movement known as "death positivity," which has some millennials talking about funeral preparations and wills even while they are healthy.

Death planning services, which assist clients in planning funerals, disposing of remains, and processing sorrow, were in high demand during this time period. Millennials have become more anxious about their death after COVID-19, are more open to discussing it, and are more likely to be grieving or know someone who is. We can feel a little more control over life's greatest uncertainty when we can personalize our deaths the same way we personalize our weddings and clothes.

Bussracumpakorn C. is the head of Design Management, Graduate Program of Design and Planning, Bangkok, Thailand (corresponding author, e-mail: chokeanand@gmail.com).

"End of life planning" is an action that has evolved over time to become a trend, an advanced plan to achieve ego integrity at the last stage of their lives. As the "end-of-life planning" service and process continues to evolve in a variety of ways and features. The key questions are: what are the cultural perceptions of death and advanced death planning? What are the forces that shape Millennial attitudes and beliefs around death and death planning? And, how does the "end of life planning" solution suit the Millennial perspective in contemporary society?

The purpose of this study is to explore the attitude of end-of-life planning within Thai Millennials as a new awareness of the value of life and death and to get an idea of a service solution for them.

II. SCOPE OF STUDY

A. Scope of Study

This proposal is designed to understand the attitude to end-of-life planning service in the contemporary society which will focus on qualitative focus group interview with 12 Thai Millennials that do not have any severe physical and mental illness participants (born in 1981-1996) with open mind of perspective for discussion of end-of-life planning. After that will get the insight, trend, and service opportunities to do the service design testing.

B. Research Outcome

This study aims to establish a new service solution of an end-of-life planning for Thai Millennials as driven by the current evidence of the COVID-19 pandemic situation impact on people's awareness, consideration, and action of advance end of life planning.

C. Limitation Of Research

To determine the scope of this thesis, various constraints and limitations are defined with the goal in mind. First, the study is limited to sampling group of millennials in Bangkok, Thailand, which can be viewed as a delimitation as well as a limitation. With only a few cases or perhaps a single case, it should be possible to generalize from a qualitative study. Due to time constraints, restricted accessible of COVID-19 situation, and the sensitivity of the research issues, it was also necessary to concentrate just on these groups who could most easily access the data gathering session.

In general, the sample group of millennials in Bangkok, Thailand who interest and open minded in end-of-life planning within time limitation and the topic accessibility, with sensitivity issue for not all millennial will get survey implies that most elements of this study were prepared for the ethical research review procedure over 4 months, resulting in delayed access to primary data in accordance with the thesis project timeline. The study's available labor hours were confined by one person's working capabilities because the researcher was working alone. The researcher's capacity to travel for interviews or invest much in data gathering or analysis for the thesis project is limited because this study is funded only by the

researcher's own limited budget.

All of these points are significant link between the context's consequences, but it also enables for a qualitative in-depth data examination of the phenomenon.

D. Ethical Review

The ethics of the planning, conduct, and reporting of research that should protect human and animal subjects.

Talking about death and end-of-life planning may influence mental health in persons who have faced these concerns, and it is also a personal issue that few people in this society will bring up in public. The effect of the interviewing session and the privacy of participants' personal information must be protected by participant consent, which must be approved by the KMUTT Institutional Review Board. For the ethical review process the researcher and advisor need to certified research ethical from CITI program (The Collaborative Institutional Training Initiative) or KMUTT ethical research training. The research need to prepare the research structure including survey and qualitative questionnaire to KMUTT Institutional Review Board to review the study and questionnaire to approve that this study will not influence mental health to participants.

Within KMUTT Institutional Review Board also reviewed and gave the feedback to researcher to ask for copyright of PHQ-9 (screening and monitoring test for depression) in Thai version from Faculty of Medicine Ramathibodi Hospital, Mahidol University that researcher use to screen participant before interview and also conduct interview with university psychotherapist to prepare for unpredictable situation during interview or find if participant need supported or cured from expert.

III. LITERATURE REVIEW

A. Death Awareness and Death Perspective Movement

We're all preoccupied with the everyday balancing act of existence at ordinary times. Our days are packed with their own reassuring responsibilities. We concentrate on what is immediately in front of us, such as job or family obligations. It's no surprise that it's difficult to find time to consider the major concerns of life in everyday existence. We have a natural aversion to thinking about and discussing death. We naturally avoid discussing end-of-life issues because of the huge emotional weight they carry, and Thai cultural beliefs and social mores around death make it even more difficult.

According to a recent study by the Thailand Development Research Institute (TDRI) on "Public Awareness and Attitudes about Palliative Care in Thailand," more than 75% of Thais are unaware that palliative care is provided for dying patients. Furthermore, **79% had never heard of a "living will,"** which is a written directive established ahead of time to refuse life-prolonging medical treatment.

Most Thais refuse to prepare themselves for a good death since death remains a taboo subject in Thai culture. Even if one is not terrified of death, bringing it up is regarded a bad omen. Suggestions for the impending death of a family member with chronic or serious sickness are deemed blasphemy, making that

person openly disrespectful in the eyes of others [2].

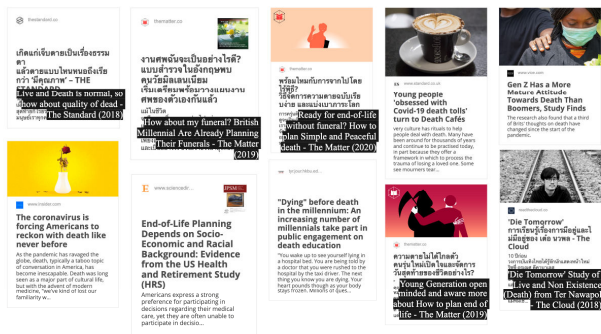
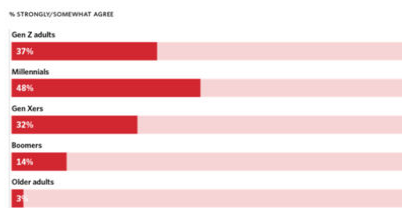


Fig. 1 Death positive content in social media

In the digitalized world we can search and see information in just one click so individuals are reconsidering how we care for people at the end of their lives these days, aware that it may go either way. From the growth of joyous "living funerals" to the comeback of creative house funerals, funerals are becoming less gloomily conventional and funereal and more genuinely personal. People are becoming more interested in alternative wisdom and practices relating to death from civilizations all around the world.

While older generations are more likely to get COVID-19, one-third of Gen Z and Millennials report worsening psychological and mental health throughout the pandemic. Additionally, stress is intensified, and individuals are either increasing or are not being properly controlled. Many people are hurting tremendously, and resilience is not a given. The lasting and hidden consequences of COVID-19's implications for physical and mental health are still developing. [3]

Since Covid-19, this has changed. Millennials are newly anxious about their mortality, increasingly comfortable talking about it and more likely to be grieving or know someone who is.



Source: American Psychological Association

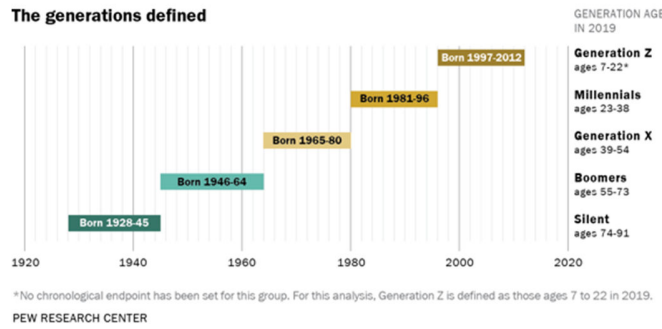
Fig. 2 Chart of COVID-19 changed Millennials' anxious [4]

B. Millennial Generation Background

As the next generation of consumers, who were born between 1981 and 1997, or millennials, are positioned to become an increasingly significant target market for asset managers. For more than a decade, the Pew Research Center has been researching the Millennial generation. The oldest Millennials have long already reached maturity, completed before today's youngest millennials also were born. [5]

As millennials are facing as they go into the future of investing. Moreover, a quarter of the population in Thailand is

a millennial, and by 2025, they will make up half of the labor force.



*No chronological endpoint has been set for this group. For this analysis, Generation Z is defined as those ages 7 to 22 in 2019. PEW RESEARCH CENTER

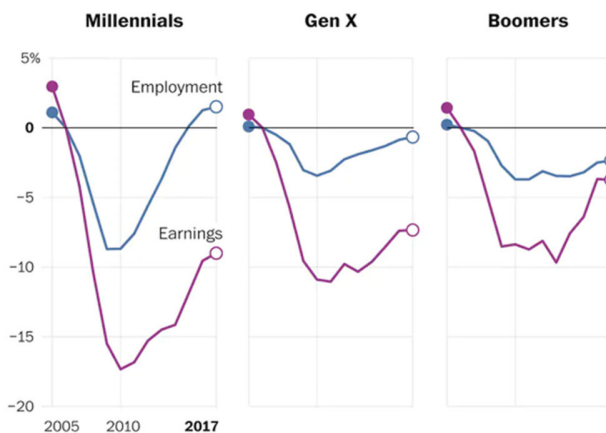
Fig. 3 The generations defined [6]

Due to COVID-19, millennials are feeling financial instability. Due to education and personal debt, this generation has already put off important life transitions including home purchases, medical procedures, having children, and professional shifts. It is not yet known if the epidemic will cause these choices to be further delayed.

Considering regional variations in the length of the Great Recession, Census Bureau economist Kevin Rinz estimated that while millennial employment rebounded from the Great Recession within a decade, millennial incomes never did [7].

Millennial employment recovered. Earnings never did.

Great Recession's effect on employment and earnings, shown as a difference from their average level



Source: Kevin Rinz THE WASHINGTON POST

Fig. 4 The Great Recession effect on employment and earnings [7]

The COVID-19 pandemic has made the future made less clear for older millennials who want to start or extend their families.

According to a recent poll done by The Harris Poll, around a fifth of older millennials believe the epidemic has caused them to delay having children. A total of 1,000 Americans aged 33 to 40 years took part in the poll. Some people choose not to have children at all. According to the Harris study, about 19% of older millennials have opted not to have a kid or further children at this moment because of the epidemic.

When compared to prior generations, millennials are by far the most varied generation. A more racially and ethnically

diverse generation than any before it, millennials were brought to the United States in significant waves in the 1980s and 1990s, particularly from Latin America and Asia [8].

It was clear that Millennials are becoming increasingly concerned about the social impact of their actions, and they are motivated to make a difference while utilizing and growing their existing abilities and expanding their networks. In this sense, the term "philanthropist" is expanding beyond its original definition of rich individuals and established corporate or family foundations to cover a diverse group of people from many backgrounds who share a desire to make a difference in their society [9].

C. Existing End-of-life Planning Services

Before the pandemic, end-of-life start-ups that help clients plan funerals, dispose of remaining objects and grieve had experienced steady to moderate growth. Since COVID-19, the funeral ceremony has changed. Millennials are newly anxious about their mortality, increasingly comfortable talking about it, and more likely to be grieving or know someone who is. Also, this has driven conversation across social media, and spurred interest in "advanced planning" content, event, and social media space to discuss end-of-life positivity and how ideal funerals are responding to the coronavirus and increased traffic to end-of-life content in Thailand.

In the Thai context, End-of-life planning services in a pandemic situation emphasize the benefits of simplicity and convenience. When it comes to End-of-Life planning services, it might refer to funeral services, with various expenses. The cost of a funeral in Thailand presently ranges from 10,000 baht to more than 100,000 baht.

Following the COVID-19 crisis, the worldwide market for Death Care Services, which was anticipated to be worth US\$115.4 billion in 2020, is expected to increase at a CAGR of **4.8% to reach US\$152.8 billion by 2026**. One of the report's sectors, Funeral Homes & Funeral Services, is expected to increase at a 4.6% CAGR to reach US\$103.5 billion by the conclusion of the research period. In the year 2021, the US Death Care Services industry is expected to be worth \$41.5 billion. US currently owns 33.92% of the global market. The second-largest economy in the world, China, is predicted to grow at a compound annual growth rate of 6.2% over the course of the research period to reach an estimated market size of US\$18 billion in 2026. Two more significant regional markets are Japan and Canada, with growth projections of 3.8% and 4.9%, respectively, throughout the course of the study. Germany is expected to develop at a CAGR of around 4% in Europe, while the rest of the European market (as defined in the study) will reach US\$19.1 billion by the conclusion of the analysis period [10].

In 2021, end-of-life start-up businesses appeared in a variety of forms and services. People are more aware of sustainability problems such as environmental friendliness and simplicity, and they have decreased needless ceremonies as well as designed their own funeral ceremonies.

After the COVID-19 pandemic, death awareness has become a trend not only for palliative care services or the elderly, but it

has been widely mentioned in the whole society because everyone will be aware of it. get this status at any time. Talking about death in a positive sense among millennials who do not have a strict religion, believe in, or follow the social norm about death as a taboo opens positivity. The polarity of death to the end-of-life plan. As the new generation of lone residents, modern householders, and philanthropic citizens, they have become the largest consumer group with growing purchasing power in the country. They have also disrupted consumer behavior through their diversity aspect. Designing a service requires understanding what they need, coming up with ideas, and solving their pain points and value in each aspect.

IV. METHODOLOGY

The researcher developed screening questions and an in-depth questionnaire based on the journey map about end-of-life by having a psychotherapist from KMUTT approve the research screening questions and in-depth questionnaire, stating that they will not affect or provoke participants' mental health and that PHQ-9 will be used as a screening tool for people who do not have depression (testing score less than 19).

If the participant is uncomfortable with the session, they can tell the interviewer right away, and the interviewer can contact a psychotherapist right away to provide them with mental health care if they need it. They can also refuse to answer a question that they are uncomfortable with, and they can end the session at any time by following the ethical research guidelines.

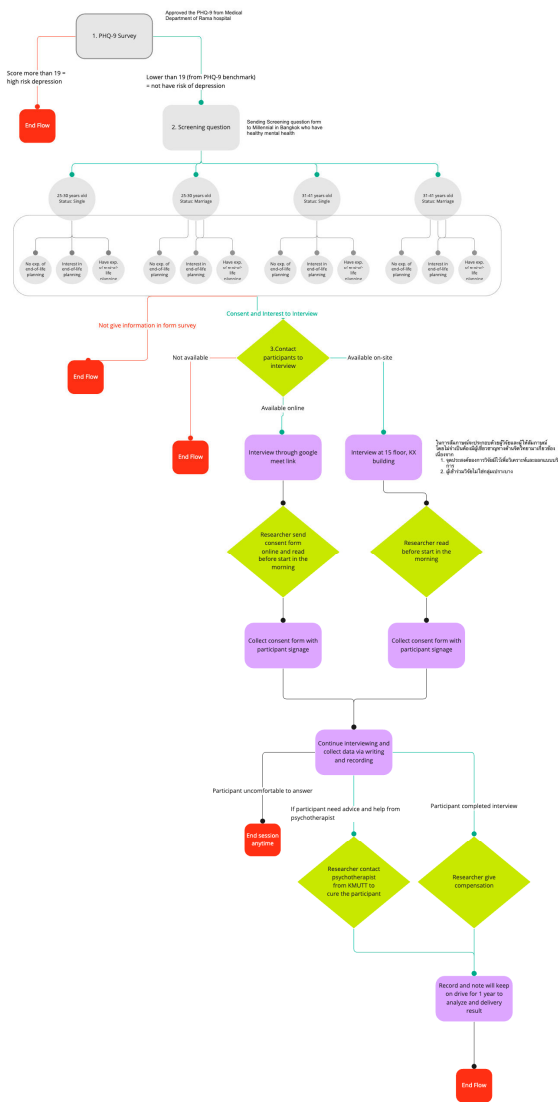


Fig. 6 Diagram of interview method

This is a qualitative study using semi-structured, in-depth interviews to explore participants talking about an attitude toward end-of-life. Using semi-structured interviews as a method is based on the understanding participants' life experiences are essential in understanding end-of-life planning.

The study recruited participants by using a screening question online form and sending it to Thai Millennials in Bangkok (born 1981-1997) who were open-minded in talking about end-of-life planning and death with good mental and physical health.

The screening question will be after participants take the PHQ-9 test and input score and if their score is less than 19 they will be allowed to do the questionnaire.

After getting respondents from screening questions, the researcher plan selection was chosen because of the opportunity to include participants who had various mindsets, including end-of-life planning attitudes and action. In the period May 2022 – June 2022 a total of 12 respondents with various life status and age groups following from Freddie Mac consumer

personas research participated in the study [12].

TABLE I
PARTICIPANT LIST

Group/ Participant	Gender	Age (years old)	Believe	Action Plan
Independent Young Singles (24-30)				
Participant 1	Female	25	No Religion	Action (Will and Diary)
Participant 2	Male	27	Buddhism	No experience
Participant 3	Female	28	Buddhism	Action (Good Folder)
Young Family (24-30)				
Participant 4	Male	28	No Religion	Aware / Interest
Participant 5	Female	29	Buddhism	Aware / Interest
Participant 6	Male	30	Buddhism	No experience
Mature Non-Affluent Socialite Singles (30+)				
Participant 7	Female	35	Buddhism	Aware / Interest
Participant 8	Male	32	No Religion	No experience
Participant 9	Other	31	Buddhism	No experience
Mature Affluent Family and/or Kids (30+)				
Participant 10	Male	36	No Religion	Action (Life Insurance)
Participant 11	Female	33	Buddhism	Action (Financial Projection)
Participant 12	Male	38	Buddhism	Aware / Interest

The research questionnaire contained the content of the life experience and attitude toward end-of-life and end-of-life planning, the existing service solution for end-of-life and the ideal service solution for end-of-life in their mind.

TABLE 2
IN-DEPTH INTERVIEW QUESTION LIST (TRANSLATION FROM THE THAI LANGUAGE)

Life Experience	Introducing self and life stage now
	What's your lifestyle?
	What's your life plan?
	How your life perspective or life expectation
Attitude and understanding about end-of-life planning	What's your understanding about euthanasia?(Right to Die with Dignity)
	What's your perspective toward this right?
	What if this right is legalized in Thailand?
	In your opinion, What's end-of-life planning?

	What's your end-of-life planning and how?
	What is your value of your end-of-life planning
Existing of End-of-life service	If time comes, how important of each task you want to manage. A. Personal asset B. Digital asset C. Social media account and digital account D. Body E. Work and biography F. Family and people-living thing surrounded
	How do you manage these 6 things by yourself?
	What is your proper time to manage or prepare?
Idea of End-of-life planning	If you can design your own service or solution of end-of-life planning, what would it be?
	If you have this, will it make your life better or will it change your life?
Other Attitude toward end-of-life planning	Have your friends or family talked about end-of-life planning?
	Can you define your end-of-life planning style?

The KMUTT Institutional Review Board. approved the study research (KMUTT-IRB-COA-2022-029) by Data storage was handled as necessary. The Declaration of Helsinki was also implemented, and the participants received both verbal and written information regarding the research and their involvement [11]. They gave their approval when the interview was set and before it started, and they were assured of anonymity and privacy. When asked about end-of-life difficulties, the participants were in a vulnerable position because the topic is rarely discussed in public. It is vital to highlight that the participants may not have previously discussed end-of-life planning. Before doing screening question with online from survey the participants need to have PHQ-9 testing result score less than 19 which mean they have no any depression risk which this PHQ-9 test link from Rama hospital [13] that researcher got approve from will from Faculty of Medicine Ramathibodi Hospital to use this test before screen the participants to attend in-dept interview. Furthermore, if participants were uncomfortable with the questioning, it was deemed unethical. Unless the individual addressed it, the interviewer did not use the phrases 'death' or 'dying.'

V.RESULT

Three themes emerged from the analysis of the study findings in part of attitude toward end-of-life planning and the notion of end-of-life planning solution among 12 participants. The participants' attitudes regarding life, death, and end-of-life planning, as well as their comprehension of end-of-life planning and advance preparation in general, are the first finding. The second discusses the participants' end-of-life planning solution and the value of this service model. Lastly is about the group of service types based on existing service mapping with participants' opinion.

Finding 1: End of life planning attitude.

The findings revealed that 12 participants' attitudes toward end-of-life planning fall into four distinct patterns, based on their perceptions of end-of-life planning as a tool in two different ways and the goal of end-of-life planning in two other aspects.

The perceptions of end-of-life planning as a tool

Found that participant giving the opinion of end-of-life planning as a tool in two different ideas from the question that interviewer ask about "What's your end-of-life planning and how?" with the question that ask the end-of-life planning in personal perspective which that can be any stage of planning that help participant to live and died well.

- Tool to set goal for the life

End-of-life planning, according to five out of 12 participants, is a tool for generating a list for a life plan and how to carry it out before death. End-of-life planning is viewed as a goal setter or life checklist by millennials who are self-sufficient and do not rely on family or love.

- Tool to prevent uncontrollable from life situation

Seven out of 12 participants see end-of-life planning is to prevent uncontrollable life, participants think that within today's social situation such as COVID-19 or The death of Thai actress "Tangmo" in February 2022 that have a lot of unpredictable situation happened to them that they need to plan ahead to control and list out everything before they cannot do by themselves especially the participants who have family or be the householder role who taking care of partner or family members.

The aspect of end-of-life planning for someone.

The planning before death question and answer it's from the participant who both independent and family lover within the question from interviewer that "What is your value of your end-of-life planning" lead participant to answer what the personal value point of end-of-life is planning likely to get answer of planning for own self and planning for someone.

- Planning for Own self

From nine out of 12 participants think that planning is for the personal guilt free, worry free and see as the self-responsibility or the to do what they want. Some of participants especially the independent participants, plan for own self to make they relief, and fulfilled.

- Planning for Others

End-of-life planning is viewed as a way for three out of 12 participants who are householders or must care for their family to give back something they can't bring with them when they die to someone else, or to avoid causing problems for others (family) when they cannot be there. For example:

After gathering information from interview and grouping in the idea of planning as a tool and planning for someone or self, research try to map the planning perception matrix in to four groups from combination of different aspect.



Fig. 7 The group of attitudes toward end-of-life planning

Following from this diagram that research map the group of people among value and purpose found four groups of people who have end-of-life planning attitude in different ways

- Social-Conscious

As a socially aware millennial generation, we want to donate our time and riches to make the world and society a better place, and we will establish our life goals for others.

- Life Fulfillment

To make a life goal for themselves, such as what they want to do or who they want to be, and to attempt to achieve it before the time comes.

- Prevention of the After-Death Effect

They want to plan to avoid the effects of their death as patriarch, head of family, and anchor of someone.

- No Guilty Planning

To plan for when they wish to be worry-free as a self-responsible and not guilty to something or someone.

These four groups of people also have value and need of end-of-life planning in different ways so they came up with finding 2 that the researcher will discuss the participants' end-of-life planning solution and the value of this service business model.

Finding 2: Value and need of the end-of-life planning solution

From the question that **“If you could design your own service or solution of end-of-life planning, what would it be?”** and **“If you have this, will it make your life better or will it change your life?”**

We discovered that participants believe end-of-life planning should be a basic part of their lives, and that because it is such a personal topic, the service should make them feel comfortable using it and knowledgeable enough to comprehend how unique everyone is. End-of-life planning can follow the same pattern of consultant, planner, and helper among four distinct categories of participants, but there are still differences in terms of trigger points and critical values. After separating the findings into service characteristic values in each group, we can sum up the value in terms of Maslow's hierarchy of needs to offer a key message between the millennial generation and new end-of-life planning solutions.

From the finding of type of people according to the attitude toward end-of-life planning also find that people in different groups have different values and needs.

In general, the idea behind end-of-life planning is that a planner or assistant provides consultation and customizes the

service based on the asset or task that they want to manage or complete after they pass away, and that once they pass away, this service will be involved and complete the task for them. So, in terms of service model, the same as to explore variations of plan that work with other service providers and the government to register to receive the plan on time, and then the service provider will assist the client in clearing tasks and contacting the trust person

Life fulfillment is the group that makes a life goal for themselves, such as something they want to do or who they want to be, and to attempt to achieve and finish it before the time comes.

Key value will be to inspire life value with customized plan and provide guidance to suggest.

From the pain point that participant feel do not have the idea of life and end-of-life can bring benefit to them yet.

The diagram will show the general service journey of end-of-life planning plus the touch point of the Life fulfillment group which are blue boxes and green is the point that the user will do or tell others.

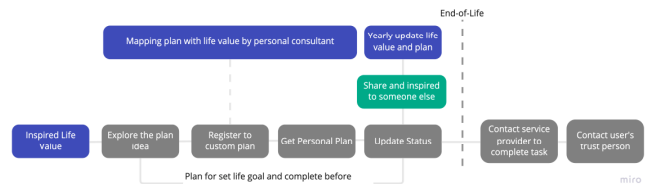


Fig. 8 Life fulfillment service characteristics

As a **socially conscious** millennial generation, their life objective is to offer their time and resources to make the world and society a better place. So, the key value will be Inspired by the social impact of giving something or some action that they will be able to do after life or during life which provide a variety of choice based on their preference to give.

The diagram of socially conscious groups will need to come up with a range of ways to give back or take action that has a positive influence on society that they can do, as well as having someone to help them with paperwork or paperwork. They also aim to inform or inspire others about this service, increasing the value of social consciousness.

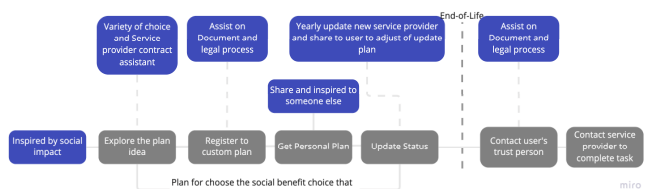


Fig. 9 Social-conscious service characteristics

After death effect prevention, who concern more in their family or the loved one that will get affected from their death they want to have a plan that brings confidence and feel relief while they are still alive, and they want to find some reliable service that they can leave the death will or asset.

The key value is to give a sense of security and controllable for them to adjust or customize their plan and the touchpoint is to update plan and task help with asset management and other contract points. Also, this group of people are more open

minded to talk with family or loved one about end-of-life planning because they think it is the normal thing to do and to discuss.

The plan characteristic of this group is to help them custom plan, update status and help to contact or communicate with family members or loved ones for some who have never talked about this issue before.

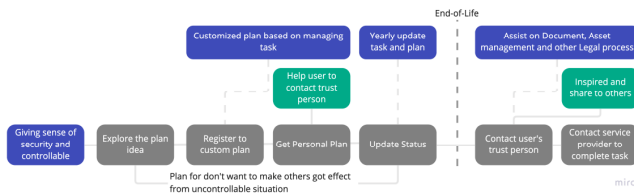


Fig. 10 After death effect prevention service characteristics

The **No guilty group** is to plan for when they wish to be worry-free as a self-responsible and not guilty to something or someone. They also think that it's nice to have this service, but it is for prevention and to make them live without stress. But when talking about plan it seem so far for, they daily basis so they want to have the plan which it easy to understand and easy to access.

Key value of the service for no guilty planning is about being accessible and customized. Once it is simple enough, they can inspired and share to others.

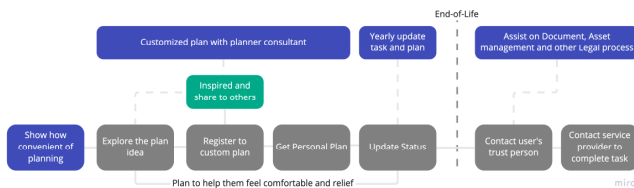


Fig. 11 No guilty planning service characteristics

Value Pyramid

From the interview all participants found the pattern from keywords that they mentioned when comparing the value with Maslow hierarchy including with Basic needs, Psychological Needs and Self-fulfillment needs. In the state of Physiological needs that end-of-life planning needs to provide accessibility and easy to understand. Safety needs to give a sense of security.

Love and Belonging is relief and worry-free to some others. Esteem is uniqueness and lastly is Self-actualization should be to make end-of-life planning be the life goal of knowing what exactly they want and knowing what they are going to be. So that researcher maps the keyword to Maslow's to understand the needs and how they impact motivation [14], [15].



Fig. 12 Value pyramid

Finding 3: Service Pattern

The point of end-of-life planning service compares with existing service as the idea of how millennials perceive and are aware with. From the beginning, existing service will separate into group of Sustainable Cremation and Burial, Digital-age online funeral, Memorialization and Death planning, wills, and estates. Within research also asked about workaround of the planning by asking, "If time comes, how important is each task you want to manage."

- A. Personal asset
- B. Digital asset
- C. Social media account and digital account
- D. Body
- E. Work and biography
- F. Family and people, pet or plant their loved

After that question, the interviewer also asks about "how to manage these six things by own self" to get to know about idea and workaround if participants interest in advance planning and the understanding of to manage before end-of-life.

Memorization is the second thing that they want to manage but not have standard format or guideline yet. Mostly of participant answer would be give trust person to do or will deactivate the social media when they old enough.

Funeral and Cremation is to manage the body and theme of their funeral ceremony all of participants Want to be more sustain or if it's had choice that they can donate to some organization that they want to do but still not sure how to do or contact the organization. Some think that if they told family about this their family won't want to because some religious believe but if they have own choice they will do without tell family.

From interview finding we can group the existing service and popular task into three groups and into occasion that represent understanding and management of them.

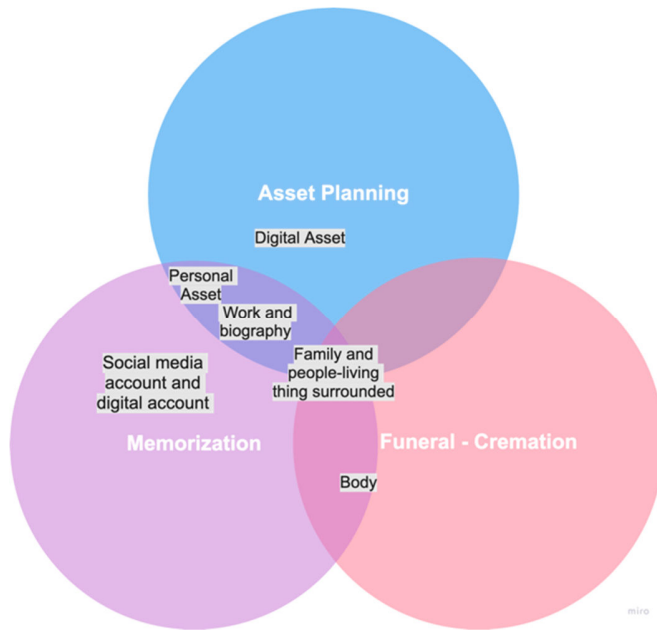


Fig. 13 Group of service

Millennial and Service Purpose

As Millennial generation main characteristic which are Social Conscious according to Nielsen discovered that nearly three out of four respondents from Gen Y are still most prepared to pay more for sustainable services [16].

All of participant decided to have Body Donation or not spend much in funeral and give back to society if it can contribute benefit to the social.

Also, as non-religious background from four out of 12 and others who not strict with the religious not believe in after life and traditional funeral. So that the existing end-of-life service in Thai not fit to them and they don't think to set up the traditional funeral because it wastes a lot of money and if they have chance, they want to have they own design funeral.

Millennial who are Technologically Savvy according to Lucky attitude [16] Since they have always had access to computers and the internet, millennials easily adapt to these technologies. In the year 2022 that digital assets become mainstream and people using social media as part of their life they concern about managing digital asset before their end-of-life because legal does not include these assets. And the social media that they use as a tool to represent their lifestyle. eight of 12 hope that their social media will close the account once they die because they are concerned people will explore, their lifestyle which is some of the content they don't want to show when died.

From four out of 12 participants had no plan about having kids and family which refer to The Harris Poll, around a fifth of older millennials believe the epidemic has caused them to delay having children. and 19% of older millennials choose not to have children at all so that they own personal assets they want to custom their plan to give something to someone that they want not follow from legal that asset will belong to the family.

VI. CONCLUSION

All of the participants agree that end-of-life planning is beneficial for helping people prepare for the future by being aware of both life and death. However, without support from society or the government, end-of-life planning will only be a luxury for those who have the time to think about it and the money to pay for it

While everyday life seemed to be the major focus for the participants in this study, there was also an awareness that end-of-life is the normal thing that everyone will have, and people would need end-of-life planning at some points. Therefore, the findings point toward ways for life planners to work side by side when addressing end-of-life matters. End-of-life planning can support and improve everyday goals, while the service approach can relieve worry related to social problems and life stages. In our study, participants wished not only for improved service function but also to have more energy to engage in social awareness. Future end-of-life planning interventions may also be adapted to the individual needs and wishes of the customers and their relatives; this includes an increased focus on life goals and end-of-life conversations.

ACKNOWLEDGMENT

Thank you to advisor and lab professor, Assoc.Prof.Dr. Chujit Treerattanaphan, for providing the chance to learn master's degree and for all of the advice she has given.

Thank you to thesis committee, Assoc. Prof. Paima Israsena Na Ayudhya for taking the time to be part of the committee.

Thank you to all the interviewees, who so generously took time out of their schedules to participate in my research and make this project possible.

Thank you to Ms. Yaowaluk Dara, Academic Service Officer at the School of Architecture and Design, for all the kind words, hardworking and assistance she has provided for IRB documents and operations.

Thank you to May Pornkamon, the psychotherapist, for advice in psychology and support consultation sessions.

REFERENCES

- [1] Alex W. (2020). How coronavirus is changing the ways we grieve and mourn the dead., <https://www.vox.com/2020/4/7/21202788/funerals-during-coronavirus-burials-mourning>
- [2] Kunakornwong W. (2019) Greying nation must talk about death., <https://www.bangkokpost.com/opinion/opinion/1666132/greying-nation-must-talk-about-death>.
- [3] Andrea F. (2021) The Lasting Impact of COVID-19 by Generation., <https://www.bbinsurance.com/wp-content/uploads/2021/03/Brown-Brown-Lasting-Impact-of-COVID-by-Generation-White-Paper.pdf>
- [4] American Psychological Association (2021). Stress and decision-making during the pandemic. <https://www.apa.org/news/press/releases/stress/2021/october-decision-making>
- [5] Promphaet W. (2020) Thai millennials setting aside for the future. <https://www.bangkokpost.com/business/1911492/thai-millennials-setting-aside-for-the-future>.
- [6] Dimock M. (2019) Defining generations: Where Millennials end and Generation Z begins. <https://www.pewresearch.org/fact-tank/2019/01/17/where-millennials-end-and-generation-z-begins/>
- [7] Rinz K. (2019) Did Timing Matter? Life Cycle Differences in Effects of Exposure to the Great Recession <https://kevinrinz.github.io/recession.pdf>
- [8] William H. Frey. (2015). The millennial generation: A demographic bridge to America's diverse future. <https://www.brookings.edu/research/millennials/>
- [9] Lynsey H. (2016) Millennial Generation Bring Diversity to Philanthropy in Indonesia. <https://sdgfunders.org/blog/millennial-generation-bring-diversity-to-philanthropy-in-indonesia/>

- [10] Strategyr. (2020) Death Care Service World Market Report, <https://www.strategyr.com/market-report-crematoriums-forecasts-global-industry-analysts-inc.asp> [May 6, 2022].
- [11] Heidi B., Malene M. and Hellen T. (2022) Talking about death and dying in a hospital setting - a qualitative study of the wishes for end-of-life conversations from the perspective of patients and spouses <https://bmc-palliatcare.biomedcentral.com/articles/10.1186/s12904-020-00675-1>
- [12] Freddie Mac Single Family. Who Are Millennials? Homeownership Demographic Research. https://sf.freddiemac.com/content/_assets/resources/pdf/fact-sheet/millennial-playbook_who-are-millennials.pdf [April 12, 2022].
- [13] Faculty of Medicine Ramathibodi Hospital, Depression risk test. https://www.rama.mahidol.ac.th/th/depression_risk assessed by April 2022.
- [14] Maslow, A. H. (1987). Motivation and personality (3rd ed.). Delhi, India: Pearson Education.
- [15] Maslow, A. H. (1943). A theory of human motivation. *Psychological Review*, 50(4), 370-96.
- [16] Lucky Attitude (2019). The Ultimate List of Millennial Characteristic. <https://luckyattitude.co.uk/millennial-characteristics/>

Rawissara Mawong from Bangkok, Thailand born September 1996 received the B.F.A. Degree in Industrial Design, King Mongkut's University of Technology Thonburi in 2019, the M.Sc. degree in Design Management electronics engineering from King Mongkut's University of Technology Thonburi. Her research interests user-centered design, design thinking, design psychology, communication design, UX/UI and service design. She currently serves as a UX/UI Designer of Morphosis Apps and Assistant Researcher of King Mongkut's University of Technology Thonburi. She has been involved in research projects for consumer perception, product and service development strategies, and living trend with leading companies and organizations including K bank, Singha Online, CPAll, Central, SCG, NECTEC, Ministry of Public Health, Ministry of Justice, and Thai Health Promotion Foundation.

Assoc.Prof.Dr. Chokeanand Bussracumpakorn is a head of Design Management, Graduate Program of Design and Planning, King Mongkut's University of Technology Thonburi (KMUTT), Thailand. received his M.A. in Design Management, University of Central England (Birmingham), U.K. in 2000 and Ph.D. in Design, Goldsmiths, University of London, U.K. in 2006 He has published "Customer-perceived values by innovative design" and "Value Creation by Design: How Design Creates Distinctive Value for Innovative products" 20th DMI: Academic Design Management 2016 and "Inside the business mind of Startup entrepreneurs in Thai Fashion Industry" 16 – 18 October 2016, pp 87-107, Universal Academic Cluster International Autumn Conference in Kyoto.

Using a Neural Network to Identify Pornographic Materials Involving Minors. Case Study

1. Wojciech Oronowicz-Jaškowiak

Corresponding author

Faculty of Mathematics, Informatics and Mechanics of the University of Warsaw

Stefana Banacha 2, 02-097 Warszawa

Poland

wojciech.oronowicz-jaskowiak@wum.edu.pl

2. Piotr Girdwoyń

Faculty of Law and Administration of the University of Warsaw

Krakowskie Przedmieście 26/28, 00-927

Poland

pgird@uw.edu.pl

3. Piotr Wasilewski

Faculty of Mathematics, Informatics and Mechanics of the University of Warsaw

Stefana Banacha 2, 02-097 Warszawa

Poland

piotr@mimuw.edu.pl

Abstract

The aim of the article is to present the application of a neural network (using both supervised and unsupervised learning) to identify pornographic materials involving minors. In judicial practice, visual and audiovisual materials depicting minors engaging in sexual activity or presenting various degrees of nudity are considered pornographic materials involving minors.

This will be presented as a case study – a summary of a forensic sexological opinion with an appropriate theoretical commentary and description of research methodology.

The subject of the proceedings was the storage of pornographic materials involving minors, therefore, a forensic opinion of a sexology expert was sought in order to determine whether the prosecuted could be diagnosed with sexual preference disorders.

The character and type of the secured materials was an important clinical premise for the expert.

As a result of the preliminary analysis, it was found that the secured material contained a very large number of photographs and videos exceeding the possibility of their manual evaluation. For this reason, it was decided to use a neural network to identify photographs corresponding to a given type of pornography.

A neural network was created using the fast.ai library, an original architecture, and ResNet152 architecture, and both supervised learning (classification of pornographic materials into groups involving only adults and involving minors) and unsupervised learning techniques (using the modified SOM algorithm).

This solution allowed to verify one of the theses put forward by the accused. To the authors' knowledge, this is the first application of a neural network in forensic sexology.

Keywords: child sexual abuse material, forensic sexology, data science

Introduction

Pornographic materials involving both adults and minors are subject to scientific analysis and classification. The main difference between the most common type of materials depicted a classification of pornographic materials involving sexual intercourse between a child and an adult [1] and minors [2] is the focus on the harm to the victim. While during the classification of legal pornographic material, the assessment is made based on the situation depicted in the material¹, during the classification of pornographic material involving minors, the degree of sexualization of the victim is taken into account.

So far, there has been no detailed analysis of the pornographic materials including elements or behaviors that may be sexually arousing for persons with specific preferences. There are no doubts that a child's body causes sexual arousal in people with pedophile preferences [3]. However, the issue seems to be much more complex. Holmes and Holmes [4] also believe that people with pedophilic preferences become sexually aroused when watching advertisements of children's swimwear, underwear or diapers or watching children playing. It has been also suggested that it is not the object itself that causes sexual arousal in persons with pedophilic preferences, but the context of its occurrence. With that in mind, describing types of child sexual abuse materials might also include the type of materials that causes sexual arousal. For this reason, research attempting to establish key features of pornographic materials involving minors will be presented in detail.

Research analyzing pornographic materials involving minors has been focused on categorization of these materials and on estimating the age of children presented on them. A report describing the trends in the distribution of features of the child sexual abuse materials was published [5]. The report was prepared based on qualitative interviews with 18 experts, who were mostly police employees. As the experts came from different areas of the world, the report could not present features of the pornographic material in an integrated way, but only some trends for individual regions. For example, data provided by the Colombian

Police Force suggests that was possible that the age of the victim was decreasing², and girls were more likely to be the victims (depending on the year, female victims consisted between 77 and 88% of all victims). According to the analysis by the Guardia Civil from Spain, the most common type of materials depicted a sexual intercourse between a child and an adult (depending on a child's age, this class consisted from 48.7 to 57.1% of all child sexual abuse materials), and photos of naked children and children in erotic poses were the least common type (from 1.7% to 7.4% of all materials). The analysis was performed using the Sentencing Advisory Panel classification³. However, it lacks a clear and exhaustive description of methodology⁴ and a statistical relationship of these categories with other data.

A study with five experts (four police employees and a researcher) was performed [6]. The study consisted in the classification of a large dataset of pornographic materials using diagnostic scales. Although the quantitative statistical analysis regarding the features of the classified materials has not been presented, the concordance of the experts has been proven to be high. What is particularly important from the point of view of this research proposal, this study identified factors that favorably and unfavorably influenced the estimation of the age of a victim, based on a qualitative analysis. It has been found that favorable factors include good visibility of the genital area and the child's face, child's age under ten, and environment suggesting child involvement (such as a playground). Based on a similar qualitative analysis, factors favoring and unfavoring the degree of sexualization have also been identified. The favorable factors include a marked presence of the adult offender in the material, visible signs of negative emotions of the child, concentration on sexual activity in the material, and the environment that make it unlikely to encounter a third party, as well as other technical information, such as the file name.

A study aiming to determine whether expert knowledge in medicine influences the accuracy of age estimation of girls and women depicted in pornographic materials was conducted among medical experts (including pathologists,

¹ For example, group sexual activity is a subcategory, and materials containing this kind of activity depict more than two persons.

² However, it must be underlined that the study included only a qualitative analysis and no results of statistical tests were presented.

³ This classification includes five qualitative categories of child sexual abuse materials by increasing degree of violence against a minor.

⁴ First of all, no information concerning measurement error, the competences of the assessors (experts), psychometric information on the accuracy of measurement (for example, by reporting the concordance between the experts), is provided.

pediatricians, and gynecologists) [7]. Based on the results, it was concluded that expert knowledge does not influence the accuracy of the age estimation, however, attention should be drawn to several methodological issues. Firstly, the study material consisted of only 11 photographs of women in late adolescence downloaded from a pornographic website. Therefore, the material cannot be considered as sufficiently diverse and corresponding to the general characteristics of real-life pornography materials accessed by the sexual offenders (for example, similar age of the victims). Secondly, determining the difference between girls and women aged 17, 18, and 19 (which was the age range in this study) is not an easy task in itself due to some subtle changes in the female anatomy, as well as a different rate of sexual development [8, 9]. Thirdly, there were issues that made it impossible to infer statistical conclusions between the groups (the group of experts consisted of five persons, and an unspecified control group consisted of 13 persons). Fourthly, the authors did not present their statistical reasoning and only reported the percentage of answers provided in each group for each photograph. For these reasons, the author of the project concludes that the results of this study are not a significant proof against using medical expert in assessing the age of the victim in child pornography.

Using neuronal networks in the field of sexology is a basic reference data that may be useful in a promising area of study, they are believed to be the best forensic sexological practice for interpreting solution for some problems in sexology. Wang and pornographic material involving minors. Such Kosiński presented a model that is able to estimate material may be created and distributed through sexual preference with over 90% accuracy [10]. Ji, both legal and illegal distribution channels. Wang, and Tan are the authors of the model that can appropriate diagnostic tools are used for classify photo if it is presenting nude or sexual activity estimation and categorization of pornographic [11]. It has been also shown that neuronal networks material depending on the degree of sexual might be able to recognize child sexual abuse materials arousal. The adopted estimates allow to obtain [12]. Already in 2015, Moustafa presented a model that information that is relevant for sexual allowed to search for photos and videos that may opinioning, including the type of material, include pornography involving minors, and the which is important for assessing the influence accuracy of the classification was 94% [13]. Perez et al. of the material on the recipient. The following presented a model that detected video pornography case study presents a practical application of involving minors, and their model combined static and modern tools (in this case, a neural network) in dynamic data (body movement) [14].

What is exceptional, machine learning models can be analysis on our data set had more images and used nowadays to detect child sexual abuse materials, videos that would be possible with manual and it is applicable for law enforcement and social evaluation (more than 20.000 materials). For platforms. For example, Canada uses the CEASE.ai this reason, it was decided to use a neural system, which is a convolutional neural network trained network to identify photographs corresponding on the dataset of pornographic material involving to a given type. The presented model allowed to children. Germany was reported to partner with select photographs that were closest to the given Microsoft to create a web traffic scanning model that type of materials.

would automatically detect child pornographic material Assistant Prosecutor [...], having examined the case against [...] who was suspected of an offense under Art. 202 § 4a of the Penalty Code

Considering that neuronal networks are able to estimate age based on photos and videos with high accuracy (see SSR-Net Model) [16], it seems to be a matter of time when neuronal networks might be used in legal cases to estimate the age of sexually abused children presented in pedophilic materials. Given that, it is worth to conduct research focused on the uses of neuronal networks in the field of sexology.

However, it is worth emphasizing the technical limitations of the presented solutions. The existing neural networks used in forensic sexology are relatively simple, most often allowing a binary classification (no-pornography or pornography). However, the judiciary system requires that these solutions fulfill a greater number of tasks. For example, the estimation of the degree of sexualization of persons depicted in a given material according to COPINE scale (Combating Paedophile Information Networks in Europe) may be helpful during judicial proceedings. Another problem is that the solutions that are used are often created by companies that do not share the technological solutions, which significantly limits their transparency. What is more, the lack of cooperation with the judiciary system while creating these solutions (except for CEASE.ai system) can limit their practical value, as the end users are justice professionals (court experts, policemen, prosecutors).

Aim of the study

The presented literature review leads to the conclusion that there are diagnostic scales with appropriate diagnostic tools are used for classify photo if it is presenting nude or sexual activity estimation and categorization of pornographic [11]. It has been also shown that neuronal networks material depending on the degree of sexual might be able to recognize child sexual abuse materials arousal. The adopted estimates allow to obtain [12]. Already in 2015, Moustafa presented a model that information that is relevant for sexual allowed to search for photos and videos that may opinioning, including the type of material, include pornography involving minors, and the which is important for assessing the influence accuracy of the classification was 94% [13]. Perez et al. of the material on the recipient. The following presented a model that detected video pornography case study presents a practical application of involving minors, and their model combined static and modern tools (in this case, a neural network) in dynamic data (body movement) [14].

sexological diagnostic process. Our preliminary analysis on our data set had more images and used nowadays to detect child sexual abuse materials, videos that would be possible with manual and it is applicable for law enforcement and social evaluation (more than 20.000 materials). For platforms. For example, Canada uses the CEASE.ai this reason, it was decided to use a neural system, which is a convolutional neural network trained network to identify photographs corresponding on the dataset of pornographic material involving to a given type. The presented model allowed to children. Germany was reported to partner with select photographs that were closest to the given Microsoft to create a web traffic scanning model that type of materials.

based on Art. 193, 194, 195, 198 of the Code of Criminal Procedure, decided to appoint a sexology expert from the list of the District Court [...] to issue an opinion on the sexual preferences of the suspected and in order to exclude the presence of a paraphilia. To answer these questions, the expert prepared an opinion containing an excerpt from selected case files, results of forensic sexological examinations, and final conclusions containing answers to the questions asked by the client.

Due to fact that presented case is was associated with Polish suspect, the Polish Penal Code will be presented. According to the Polish Penal Code [17], it is punishable by law when a person:

“Produces, records, imports, stores, possesses, distributes or publicly presents pornographic contents involving a minor [...]” (art. 202, § 3), „records pornographic content involving a minor [...]” (art. 202 § 4), and „imports or publicly presents pornographic content involving a minor [...]” (art. 202 § 4a).

According to the police crime statistics [18], the number of criminal investigations concerning art. 202 of the Penal Code that were opened and confirmed in Poland has remained relatively constant. In 2017, 552 investigations were opened, and 1657 crimes were confirmed. The year 2014 was record-breaking in terms of the number of confirmed crimes (2761 crimes in total), and the highest amount of open investigations was noted in 2009 (909 investigations in total) (Crime statistics). Attention should be drawn to the original content of the judgment of the Supreme Court of Nov 23, 2010 (IV KK 173/10), in which pornographic content is defined as [19]:

“[...], it may be assumed that ‘pornographic content’, within the meaning of the Art. 202 of the Penal Code, is a presentation of human sexual activities (especially depicting human sexual organs in their sexual functions) on a tangible medium (e.g. video, photograph, magazine, book, pictures) or not on a tangible medium (e.g. live shows), either in the dimension that is not contradictory to their biological orientation, or human sexual activities inconsistent with socially acceptable patterns of sexual behavior”.

In the Polish legal system, it is the judicial body that ultimately decides whether a given material is considered pornographic, however, law enforcement and judicial authorities often have to consult with court sexology expert, especially in relation to pornographic material involving minors⁵. Court opinioning is inherently related to the expert, who is responsible for their opinion. The opinion’s flaws, shortcomings or errors can be minimized by using a number of tools, including summoning for interrogation, ordering a supplementary opinion, reducing remuneration, and criminal liability for issuing a false opinion. The personal liability of the expert is inalienable, and even opinions issued on behalf of an institution should be, under the current regulations, be signed solely by the expert, and not by the head of the entity.

In principle, the expert is free to choose the methodology and tools used for their opinioning, although they remains under the supervision (including substantive supervision) of the judicial body, as well as under the indirect supervision of the parties. Experts often use equipment and software (e.g. for road accident reproduction, handwriting analysis, genetics, and dactyloscopy) to support their process of issuing opinions to a various degree, but never replacing the expert in the ultimate decision making process. Similarly, the suggestions included in this article do not violate this principle in any way, and are meant to be a tool facilitating finding materials relevant to the opinioning in a large dataset, in a similar manner that the AFIS (Automated Fingerprint Identification System) system identifies images of fingerprints closest to the uploaded pattern.

The forensic opinion of a sexology expert may include an attempt to estimate the age of the persons depicted in the material and their degree of sexualization. It is also important to investigate, from the sexological point of view, the degree to which a given material may elicit sexual arousal in a recipient or a specific group of recipients. In this context, the specific group of recipients could include persons diagnosed with pedophilia, hebephilia, and ephebophilia:

- persons with pedophilic disorder prefer to engage in sexual contact with minors from early childhood to the beginning of adolescence [20],
- persons with ephebophilic disorder prefer to engage in sexual contact with minors in early adolescence [3],

⁵ According to the judgment of the Polish Supreme Court of Nov 23, 2010 (IV KK 173/10, LEX nr 667510), a court expert does not issue his opinion on the

pornographic character of the material, and his task is instead to estimate the impact of the material on the recipient or a specific group of recipients.

- persons with hebephilic disorder prefer to engage in sexual contact with minors in late adolescence [21].

The documentation stated that the examination of the personal computer of the subject revealed files and folders containing pornography involving persons whose appearance may indicate their nonage. Nearly 20,000 files were found, their total size exceeded 100 GB. Additionally, it was indicated that: “[...] some files are tagged or named as PTHC (pre-teen hard core), which may indicate that they contain materials involving persons of a certain age [...]”.

In order to answer the question posed by the client, the expert browsed through the provided pornographic material. After extracting the material, the expert proceeded to the analysis of the provided videos and photographs.

Due to the excessive amount of secured materials, and consequently, the inability to analyze every photograph and video individually, it was decided to perform a statistical analysis of the material. Statistical analysis consists in random sampling of a part of the entire dataset of the secured pornographic photographs and videos. Subsequently, the materials were analysed quantitatively (type of the material, number of persons of a given gender and age group, number of materials in each COPINE group) and qualitatively. According to the defendant’s declaration included in his explanations and in the sexological interview, photographs depicting minor girls were rare in the entire collection, moreover, photographs showing sexual organs of minors were also rare. However, in the randomly selected sample of the data, there were several photographs depicting girls before puberty characterized by a high degree of sexualization (grade 6 and higher in COPINE scale).

In order to determine whether materials of this type was prevalent in the entire database or whether the photographs were selected by chance, neural network was used. Convolutional neural networks remain the gold standard for image recognition. In addition, the previously mentioned papers [11, 12, 13] also used convolutional neural networks to solve similar problems. However, it should be noted that the literature also describes other machine learning techniques that could be used to address the presented problem [22].

Material and methods

A total of 3,000 photos were used as input, including 1,500 pornographic materials involving minors (category 1.), and 1,500 pornographic materials involving adults from sexACT 0.4 database (category 2.) [23]. The photos included in the first category showed minors engaging in sexual activity with adults or other children, as well as children presenting various degrees of nudity, classified as pornographic material. These materials were classified by a sexology court expert. The photos included in the second category depicted adults engaging in sexual activity with other adults, as well as adults presenting various degrees of nudity. These materials were classified by a team of psychologists and sexologists.

Fast.ai library was used to train the neural network [24]. The library is written in Python programming language [25]. An original architecture of the network was used, and ResNet152 architecture [25] was used for evaluation. ResNet152 architecture was used, as in previous studies concerning classification of similar material [26], highest classification accuracy was obtained for this architecture. The original architecture consisted of 152 layers (including: Conv2d, BatchNorm2d, MaxPool2d, AdaptiveAvgPool2d, AdaptiveMaxPool2d, Flatten, BatchNorm1d), used two neural activation functions (ReLU, Linear) and a method preventing overfitting (Dropout). A modified SOM algorithm (Self-Organizing Map) by Kohone was used [27]. The algorithm allows to indicate pictures assessed to be the most similar to a given picture. The training used the one cycle policy, which allows to achieve better model parameters and prevents overfitting, which seems to be particularly important for small datasets, as was the case in this study [28].

To determine network parameters, the dataset was randomly divided into the training set (80%) and validation set (20%). The training set was used to train the neural network. The validation set was used automatically to verify the learning outcomes of the network. This division allows to achieve better model parameters and increases its later accuracy for real-life classification tasks.

The architecture of the neural network and the model was shared in OSF (Open Science Framework) under the following DOI number: /deleted for review/. The consent of the bioethical committee no. /removed for review/ at the Faculty /removed for review/ was obtained. The consent of the following prosecutor’s offices /removed for review/ for the use of materials involving minors to train the neural network was obtained.

Results

Supervised learning (involving differentiation between pornographic photographs involving adults and children) and unsupervised learning (using modified SOM algorithm) were used.

The network was trained for 100 epochs with one cycle policy. After 40 epochs, overfitting was observed, consequently training was interrupted. Chart 1. presents validation (the error after running the validation data) and training loss (the error on the training set of data) with respect to epochs. Table 1. presents model performance after the training has been completed. Table 2. presents confusion matrix regarding the model's predictions.

Chart 1. Validation and training loss with respect to epochs.

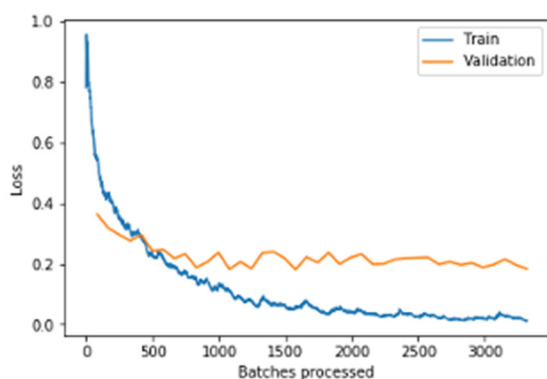


Table 1. Model performance.

Table 2. Confusion matrix for validation set - pornographic photographs involving adults and non-pornographic photographs involving children.

Using the modified SOM algorithm, materials most visually similar to the given type of photographs were returned. The qualitative description of the results is provided in Table 3.

Table 3. Photographs with high similarity to the given photograph, selected from the entire dataset, and not from the tested sample.

Discussion

Presented neural network (so-called artificial intelligence) was trained for tasks concerning pornographic materials involving minors. It is a mathematical and statistical structure that searches relevant, repeating patterns shown in the photographs, which can be used for computer analysis of visual materials., including in particular pornographic materials involving minors, albeit the suggested solution can certainly be used for other purposes. This solution was treated as a supporting tool and the results were manually verified by the expert. For this reason, the network was only used to qualitatively search for the most similar photographs, and not to categorize the database of pornographic materials.

It is worth noting that should the project theoretically become developed enough to categorize a database (which seems plausible), taking into account current criminal processing, in particular the process of opinioning by the expert as a natural person, it is not possible to fully automate the process. On the other hand, the use of the system to classify (categorize) pornographic material should be acceptable, as long as there is a possibility to verify the result at all times. What is more, the prospect of using this tool seems particularly attractive given the possible reduction in time needed to issue an opinion.

The use of neural network allowed to conclude that the photographs sampled from the dataset that depicted pre-pubescent girls with a high degree of sexualization (grade 6 and higher in the COPINE scale) were not isolated, as there were many more similar photographs in the entire database (i.e. all the materials secured from the subject's data carrier). Taking into account the issues of the expert's responsibility for the issued opinion, the presented solution may only be used as a supporting tool, however, the prospects of its application seem attractive both from a scientific and practical point of view.

It is important to note that there are methodological limitations of presented study.

There is no universal and unambiguous definition of pornography. Some definitions refer to the purpose of the production, which is to create materials that are supposed to be arousing for the recipient, other underline the role of the actual occurrence of sexual arousal in the recipient [29]. One of the definitions of the pornographic material was given by Warylewski [30]: "Pornographic material is such content, in a material or dematerialized content, that depicts any form of real or imaginary manifestations of human sexual life in a dimension limited to physiological functions". On the other hand, it is difficult to accept this definition as exhaustive, as it ignores the motivation for accessing a given type of material, and the role of the effect of viewing the material is emphasized. Therefore, the definition given by M. Filar can be regarded as a more complete definition, albeit not a simple one. He postulated that a presentation should be classified as pornographic only when it simultaneously and jointly meets the following criteria [31]:

"1) the content of the presentation includes manifestations of human sexuality; 2) the presentation is focused only on technical and biological aspects, disregarding intellectual and personal level of the subject [...]; 3) the presentation depicts sexual organs performing their sexual functions, in particular their direct contact during sexual intercourse, thereby taking the form of an ultimately depersonalized and dehumanized recording of "sexual technology"; 4) objectifying aspects of the presentation clearly demonstrate that the

creator's sole or main intention was to induce sexual arousal in the recipient; 5) an auxiliary criterion may include the aesthetic value of the presentation; the lower the value, the more it may be indicative of the pornographic character of the presentation”.

The issues presented above mean that the classification method applied in Poland may be different from classification methods used in other countries. Another methodological problem is the inability to compare the obtained results to other systems used in the Polish judiciary practice. For this reason, the results of this study can only be compared with other papers.

Conclusions

The neural network was trained in order to classify selected categories of pornographic materials. The results of the presented study seem to be promising for the future research aimed at training neural networks on real child sexual abuse materials. In the future tools based on similar model might facilitate the work of the expert witnesses in child abuse cases.

1. G. M. Hald, A. Štulhofer, What types of pornography do people use and do they cluster? Assessing types and categories of pornography consumption in a large-scale online sample, *The Journal of Sex Research*. 53(7), (2016), 849-859.
2. E. Quayle, The COPINE project, *Irish Probation Journal*. 5 (2008), 65-83.
3. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders* (5th ed.), Washington D.C. 2013.
4. S.T. Holmes, R.M. Holmes, *Sex Crimes: Patterns and Behavior*, Thousand Oaks 2009.
5. ECPAT International, Trends in online child sexual abuse material. <https://www.ecpat.org/wp-content/uploads/2018/07/ECPAT-International-Report-Trends-in-Online-Child-Sexual-Abuse-Material-2018.pdf> (accessed 11 December 2020).
6. J.A. Kloess, J. Woodhams, H. Whittle, T. Grant, C.E. Hamilton-Giachritsis, The challenges of identifying and classifying child sexual abuse material, *Sexual Abuse*. 31(2), (2019), 173-196.
7. C. Cattaneo, S. Ritz-Timme, P. Gabriel, D. Gibelli, E. Giudici, P. Poppa, M. Grandi (2009). The difficult issue of age assessment on pedo-pornographic material. *Forensic science international* 183 (2009), 21-24.
8. W.A. Marshall, J.M. Tanner, Variations in pattern of pubertal changes in girls, *Archives of disease in childhood*, 44(235), (1969), 13-23.
9. A.L. Rosenbloom, Inaccuracy of age assessment from images of postpubescent subjects in cases of alleged child pornography, *International Journal of Legal Medicine*. 127(2), (2013), 467-471.
10. Y. Wang, M. Kosiński, Deep neural networks are more accurate than humans at detecting sexual orientation from facial images, *Journal of personality and social psychology*. 114(2), (2018), 246.
11. X. Jin, Y. Wang, X. Tan, Pornographic Image Recognition via Weighted Multiple Instance Learning. *IEEE transactions on cybernetics*.
12. P. Vitorino, S. Avila, M. Perez, A. Rocha, Leveraging deep neural networks to fight child pornography in the age of social media, *Journal of Visual Communication and Image Representation*. 50 (2018), 303-313.
13. M. Moustafa, M. Applying deep learning to classify pornographic images and videos. *arXiv preprint arXiv:1511.08899* (2015).
14. M. Perez, S. Avila, D. Moreira, D. Moraes, V. Testoni, E. Valle, A. Rocha. Video pornography detection through deep learning techniques and motion information. *Neurocomputing*. 230 (2017), 279-293.
15. Deutsche Welle. German authorities turn to AI to combat child pornography online. Access 24.11.2021 from www.dw.com.
16. T.Y. Yang, Y.H. Huang, Y.Y. Lin, P.C. Hsiu, Y.Y. Chuang, SSR-Net: A Compact Soft Stagewise Regression Network for Age Estimation. *IJCAI*, 5(6), (2018), 7.
17. The Penal Code. Access 20.11.2021 from www.legislationonline.org.
18. Crime statistics. Access 20.11.2021 from www.statystyka.policja.pl.
19. Judgment of the Supreme Court of Nov 23, 2010 (IV KK 173/10). Access 12.11.2021 from www.sn.pl.
20. R. Blanchard, A.D. Lykins, D. Wherrett, M.E. Kuban, J.M. Cantor, T. Blak., P.E. Klassen, Pedophilia, hebephilia, and the DSM-V, *Archives of sexual behavior*. 38(3) (2009), 335-350.
21. G. DeClue, Should hebephilia be a mental disorder? *Archives of sexual behavior*. 38(3), 2009, 317-318.
22. B. Perret, G. Chierchia, J. Cousty, S.J.F. Guimarães, Y. Kenmochi, L. Najman, L. Higrá: Hierarchical graph analysis. *SoftwareX*, 10, (2019).
23. W. Oronowicz-Jaškowiak, A. Siwiak, K. Róg, A. Oronowicz-Jaškowiak, A. Classification of nine types of pornographic materials using the sAI 0.3 model. *Psychiatria Polska*, (2021).
24. J. Howard. Fast.ai software library. Accessed 11.12.2020 from www.fast.ai.
25. N. Ketkar. Introduction to pytorch. Apress, (2017), 95-208

26. W. Oronowicz-Jaśkowiak, E. Bzikowska, K. Jabłońska, A. Kłok, Binary classification of pornographic and non-pornographic materials using the sAI 0.4 model and the modified database, *Advances in Psychiatry and Neurology*. 29(2), (2020), 108-119.
27. T. Kohonen, *Self-organizing Maps*. Heidelberg Springer (1995).
28. L.N. Smith,. A disciplined approach to neural network hyper-parameters: Part 1--learning rate, batch size, momentum, and weight decay. arXiv preprint arXiv:1803.09820, (2018).
29. M. Mozgawa, P. Kozłowska, Prawnokarne aspekty rozpowszechniania pornografii, *Prokuratura i Prawo*. 3 (2002), 23.
30. J. Warylewski, Pornografia w Internecie – wybrane zagadnienia karnoprawne, *Prokuratura i Prawo*. 4 (2002), 53-54.
31. M. Filar, *Penal Code, Commentary* (5th ed., LEX version). Accessed 11.12.2020 from www.lex.pl.

“An Experimental Study on the Development of High-Strength, Self-Compacting, Alkali-Activated Slag Concrete Mixes Under Ambient Curing.”

Shivam Kumar, Pramod Kumar Gupta, Mohammad Ashraf Iqbal

Shivam Kumar is with the Indian Institute of Technology, India (e-mail: skumar18@ce.iitr.ac.in).

Abstract

In the present study, the development of high-strength, self-compacting, alkali-activated slag concrete (HS-SC-AASC) mixes under ambient curing is discussed. These HS-SC-AASC mixes are developed using steel industrial waste such as ground granulated blast furnace slag (a mixture of sodium silicate and sodium hydroxide are used as an alkaline solution to activate the GGBFS) as a binder, blast furnace slag as a fine aggregate and electric arc furnace slag as a coarse aggregate. Since there are large number of controlling parameters which influence the performance and behavior of alkali-activated slag concrete mixes, so we used Taguchi's design of experiments technique to optimize the number of test mixes. Taguchi method uses a special design based on orthogonal arrays to study the entire parameter space with only a small number of experiments.

In the present experimental study, three parameters have been considered as the most controlling factors namely - Total binder content, Water- binder ratio, and Activator modulus (Ms), which influence the properties of GGBS-based AAS mixes, in both their fresh and hardened states. So in this study, there are total twenty-seven mix combinations of the process parameters, each considered at each of the three levels indicated as above. However, as per Taguchi's method, detailed experiments corresponding to only nine of those combinations, taken systematically from the L-9 orthogonal array, have been performed and their results have been used to develop regression equations for any of the performance parameters, which then used to predict that performance parameter for any other combination of the process parameters.

Keywords

Alkali-activated slag concrete, High-strength, Self-compacting, Steel slag sand, Electric Arc Furnace Slag

OBJECTIVES

- Development of High-Strength, Self-Compacting, Alkali-Activated Slag Concrete (HS-SC-AASC) mixes with different constituent parameters. Major parameters which influence the properties of HS-SC-AASC mixes are given below:

- a) Binder content (ground granulated blast-furnace slag and fly ash)
 - b) Water/binder ratio
 - c) % of Na₂O (by weight of binder content)
 - d) Activator modulus ($M_s = \text{SiO}_2/\text{Na}_2\text{O}$)
- To study fresh and hardened properties of HS-SC-AASC mixes under ambient curing
 - To study the behaviour of alkali-activated slag concrete after replacing the natural aggregate with industrial by-products.

METHODOLOGY

In the experimental work following tasks have been performed. After procurement of the materials, the tests for the material properties of blast furnace slag sand and electric arc furnace slag such as specific gravity, sieve analysis, impact test, crushing test and Los Angeles test were performed. Similarly, tests for properties of ground granulated blast furnace slag and cement such as fineness, consistency, specific gravity, soundness, initial and final setting time were carried out.

TAGUCHI'S Design of Experiments:

Since there are large number of controlling parameters which influence the performance and behaviour of alkali-activated slag concrete mixes, it is intended to use Taguchi's design of experiments technique to optimize the number of test mixes. Taguchi's method is one of the most widely used Design of Experiment (DOE) methodologies to investigate the simultaneous effect of several parameters on a process using a minimum number of experiments. Taguchi method uses a special design based on orthogonal arrays to study the entire parameter space with only a small number of experiments.

In the present experimental study, three parameters have been considered as the most controlling factors namely - Total binder content, Water- binder ratio, and Activator modulus (M_s), which influence the properties of GGBS-based AAS mixes, in both their fresh and hardened states. Based on the results of the literature, each of these parameters is considered at three levels as indicated in Table 1.

Table 1: Process parameters and levels – Development of L-9 orthogonal array

Process Parameter	Levels considered		
	Level 1	Level 2	Level 3
Binder content (kg/m ³) - A	600	700	800
Water/binder ratio - B	0.40	0.42	0.44
Activator modulus (M_s) - C	0.8	1	1.2

So in this study, there are total twenty-seven mix combinations of the process parameters, each considered at each of the three levels indicated as above. However, as per Taguchi's method, detailed experiments corresponding to only nine of those combinations, taken systematically from the L-9 orthogonal array, need to be performed and their results are to be used to develop regression equations for any of the performance parameters, which then used to predict that performance parameter for any other combination of the process parameters.

Based on Taguchi's method, thus, there are total nine initial Calibrations, which were developed as base mixes, tests have been conducted on them in their fresh and hardened states to evaluate their performance characteristics, and then regression equations have been developed for their strength characteristics. The accuracy of the predictions of the regression equations was verified by comparing them with the actual results of tests conducted on the test specimens of six more arbitrarily selected representative mixes, referred to here after as verification mixes.

MAIN CONTRIBUTION OF RESEARCH

There is a huge need for sustainable construction materials for buildings, bridges and pavements. This study aims to address the technical issues related to the use of Alkali-activated Slag Concrete mixes in different fields. Fly ash, Blast Furnace Slag (BFS) and Electric Arc Furnace (EAF) slag are waste materials which are generated from the steel industry. The disposal and dumping of these waste products is a primary concern to the industry and also the society. With the increasing growth of the population and the demand for steel products, the amount of waste is increasing rapidly. Slag can be used in concrete as an inert filler material which can be helpful to enhance the strength of the concrete also. It will reduce the negative impact of waste slag on the environment upto some extent also.

Alkali-activated slag has the potential to develop construction materials with an extended lifetime which in turn will reduce energy and natural resource consumption over the life period. Alkali-activated slag concrete (AASC) is receiving attention as an alternative to Portland cement concrete because of its high strength, durability and low environmental impact. This concrete has not received the same attraction in the marketplace till now as has Portland cement concrete. This is due to the fact that there are not enough national and international guidelines available, giving the details of a standardized method of mix design of alkali-activated slag concrete (AASC). This study intends to start bringing this lacking complementary knowledge in the proposed area.

This research work will be useful to find the solution to the following issues:

- Use of industrial waste material i.e. ground granulated blast-furnace slag (GGBS) with some alkali activators as a replacement of ordinary Portland cement in concrete helps to decrease the pollution caused during the cement manufacturing process.
- By using the steel industry waste products in the concrete, we can reduce 60-80 % CO₂ emission into the atmosphere.
- The use of steel industrial waste materials like Blast furnace slag (BFS) and Electric Arc Furnace Slag (EAFS) as a replacement for natural fine and coarse aggregate in concrete

can save natural aggregates and can reduce the natural aggregate depletion up to some extent.

- Disposal of blast furnace slag and electric arc furnace slag from the steel industry which is an environmental issue.

Urban Morphology and Sustainability: Case Study in Lavra, Portugal

Patrícia Diogo, Joana Diogo, Maria Diogo, Manuel Diogo

Abstract— The theoretical and practical nature of the research proposal, therefore, intends to associate sustainability and urban regeneration with fishing settlements and diffuse rural cores, aggregating interdisciplinary and transdisciplinary approaches anchored in a comparative analysis based on the case study, assuming that protecting, conserving, improving and valuing urban soil, rustic soil, the environment and the landscape, despite their regional expression, can make valuable contributions to the promotion of the cultural legacy of smart cities and the dissemination of scientific and technological knowledge with national and international impacts.

Keywords— urbanism, innovation, smart green cities, climate change, sustainable cities.

Vibration Transmission across Junctions of Walls and Floors in an Apartment Building – An Experimental Investigation

Hugo S Libero¹ and Max de Castro Magalhaes ^{*2}

¹Electrical Engineering Department, Universidade Federal de Goiás
Av. Antonio Carlos 6627, 31270-901, Belo Horizonte, Brazil

²Structural Engineering Department, Universidade Federal de Minas Gerais
Av. Antonio Carlos 6627, 31270-901, Belo Horizonte, Brazil

Abstract

The perception of sound radiated from a building floor is greatly influenced by the rooms in which it is immersed and by the position of both listener and source. The main question that remains unanswered is related to the influence of the source position on the sound power radiated by a complex wall-floor system in buildings. This research is concerned with the investigation of vibration transmission across walls and floors in buildings. It is primarily based on the determination of vibration reduction index via experimental tests. Knowledge of this parameter may help in predicting noise and vibration propagation in building components. First, the physical mechanisms involving vibration transmission across structural junctions is described. An experimental set-up is performed to aid this investigation. The experimental tests have showed that the vibration generation in the walls and floors are directed related to their size and boundary conditions. It is also shown that the vibration source position can affect the overall vibration spectrum significantly. Second, the characteristics of the noise spectra inside the rooms due to an impact source (tapping machine) are also presented. Conclusions are drawn for the general trend of vibration and noise spectrum of the structural components and rooms respectively. In summary, the aim of this paper is to investigate the vibro-acoustical behavior of building floors and walls under floor impact excitation. The impact excitation was at distinct positions on the slab. The analysis has highlighted the main physical characteristics of the vibration transmission mechanism.

Keywords: Vibration transmission, Vibration Reduction Index, Impact excitation

1 Introduction

The literature survey has revealed that a significant amount of work has concentrated on analyzing structural response to a dynamic loading using uncoupled structural modes for the building components. In this case, the boundary condition at the interface between walls and floors, which is due to the velocity of the corresponding structure, cannot be replicated. Hence, the aim of this paper is to develop alternative in-situ tests for the measurement of vibration transmission. It is performed here initially to structural coupled components in order to verify the accuracy and applicability of the approach.

Recently, various researchers have concentrated their work on presenting the main advantages of floating floors in terms of their sound isolation effectiveness. The use of floating floors on building construction is well-known among civil engineers, architects and acoustic space designers. They are popular not only for their ability to decrease the transmission of structure-borne sound throughout the building structural components but also for their slender dimension which may be relevant on the calculation of the building total cost price.

Although the physical understanding of floating floor mechanisms is well established, the assessment of the sound

power radiated by the structural floor has not been fully considered in terms of its boundary conditions. For example, it is important to know the relationship between the vibration transmission across wall-floor junctions and the sound pressure inside the adjacent rooms. Recently some researchers have concentrated their investigation on optimizing the dynamic models of floating floor systems in order to improve their effectiveness, i.e., to minimize the transmitted vibrational energy to the structural floor.

The effects of panel boundaries on sound radiation, including a comparison with an infinite panel have been discussed by several researchers [1]-[3]. A simple two-dimensional model has been used for evaluating the sound radiation characteristics of finite panels [3]. The analysis of the radiation, through a baffled plate of finite width and infinite length was rigorously performed. The effects of panel size have been studied in frequency regions below, above and at the critical frequency. In addition, estimates of averaged response over a given frequency range have also been investigated. The literature survey has revealed that a significant amount of work has concentrated on analyzing sound radiation of simply supported panels [5]-[8].

This research was first undertaken as a result of the need to develop an easy and reliable methodology for measuring the floor-wall vibration transmission in order to obtain better comprehension of structure-borne vibration transmission across an apartment slab.

2 Experimental tests

The vibration transmission experiments were performed in a particular unreinforced masonry building. The building is composed of four floors. Each structural floor and load bearing wall has a thickness equal to 10 cm and 15 cm respectively. The tests were made on the 2nd floor of a particular apartment. The external noise influences were well below the vibration level measurements in the walls and floors, i.e., the signal-to-noise ratio was high enough to assure good quality measurements. The experimental set-up and floor characteristics are shown in Fig. 1 and Fig. 2 below. First, a tapping machine and accelerometers were positioned on different positions on the floors and walls. The acceleration measurements were made using ICP accelerometers (50 g range, 100 mV/g general purpose accelerometer with 10-32 top connector and 10-32 mounting hole). Before each measurement, the entire arrangement was checked and calibrated.

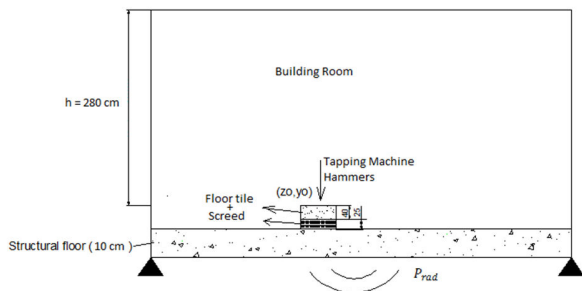


Fig. 1. Set-up of the experimental tests

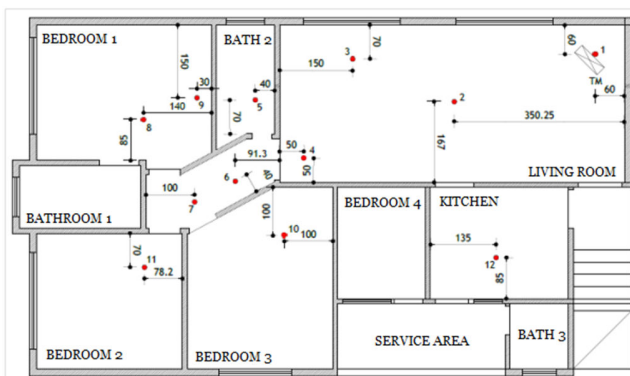
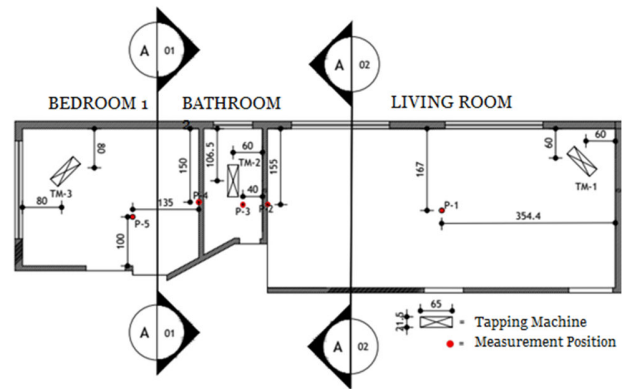
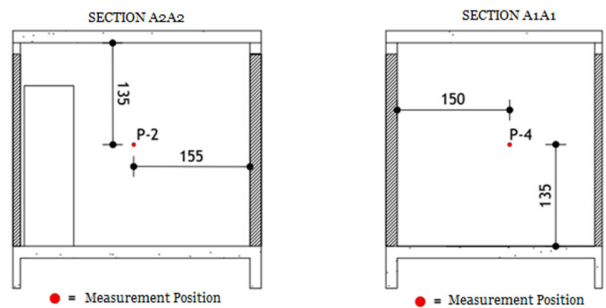


Fig. 2. Accelerometer positions on the apartment floor and tapping machine at position TM-1.



a)



b)

Fig. 3. Accelerometer and tapping machine positions on the apartment floor (P-1, P-3 and P-5) and walls (P-2 and P-4). a) Floor plan; b) Floor plan cuts (A₁ and A₂)

Next, the total loss factor of each floor and wall was measured indirectly using the structural reverberation time. Impulse responses were obtained using the impact testing procedure described as follows. On impacting the 'panel' by an instrumented hammer, the analyzer was triggered and started recording the response signal at the receiving point, where accelerometers were attached and connected to the acquisition equipment (National Instruments data acquisition module type NI-9234). The input signal was filtered by conveniently configuring the channel parameters. The acceleration levels were obtained via Fourier transforms of the measured quantities.

A frequency range of 100–4000 Hz was considered on measuring the acceleration levels due to the tapping machine. For the structural reverberation time, decay curves were measured in the frequency range 100–630 Hz, where the signal/noise ratio was high enough and the results were validated. The vibration source was a plastic headed hammer. It was used to hit the concrete panel at different locations (in order to obtain spatial averaged values) over a period of 6 seconds. The velocities were determined by integrating the accelerations at every frequency line.

3 Structural Reverberation Time

The structural reverberation time T_s was evaluated from the decay curves from a range of 5 dB to 25 dB below the steady-state level. Within the evaluation range a least-squares fit line was computed for the curve. The slope of the straight line gives the decay rate, d , in decibels per second, from which the structural reverberation time was calculated as $T_s = 60/d$. The commercial software named, WinMLS, used the impulse responses for the calculation of the reverberation time.

The damping η , known as total loss factor, can be obtained using the following equation:

$$\eta = \frac{2.2}{f T_s} \quad (1)$$

where T_s is the structural reverberation time in seconds and f is the frequency in Hertz.

The values of damping η are sometimes termed structural damping, to identify that the damping is dependent on both the damping inherent in the material and that which comes from other mechanisms including dissipation losses at the boundary which might be significant. In other words, the total loss factor is equal to the sum of the internal loss factor of the material, the coupling loss factor to the adjacent structures and the radiation loss factor to the surrounding media [1].

An acquisition time of five seconds was adopted. Fig. 3 shows the accelerometer positions on the floors and walls for the reverberation time measurements. At very low frequencies, T_s depends to a large extent on the position of the source and the receiving accelerometer. It is recommended that an ensemble averaging procedure based on a combination of accelerometer positions be adopted for each one-third octave band result.

4 Evaluation of the Vibration Reduction Index K_{ij}

In this section the methodology used for the measurement of vibration reduction index K_{ij} of the cross-junction type is described. The vibration reduction index was obtained using the following expression [4]:

$$K_{ij} = \overline{D_{v,ij}} + 10 \log_{10} \left(\frac{L_{ij}}{\sqrt{a_i a_j}} \right) \quad (2)$$

$$\overline{D_{v,ij}} = \frac{D_{v,ij} - D_{v,jl}}{2} \quad (3)$$

$$a = \frac{2.2 \pi^2 S}{c_o T_s} \sqrt{\frac{f_{ref}}{f}} = \frac{\pi^2 S \eta}{c_o} \sqrt{f_{ref} f} \quad (4)$$

where $\overline{D_{v,ij}}$ is the average vibration level difference between the source element i and the receiving element j (walls, ceiling or floor); L_{ij} is the junction length between the source

and the receiver; a is the equivalent absorption length; S is the area; f_{ref} is the reference frequency which is equal to 1,000 Hz; f is the center frequency; c_o is the sound phase speed in air and η is the total loss factor.

The vibration source (tapping machine) was placed at particular positions in the building 2nd floor. The corresponding distances between the source and the receivers (accelerometers) are presented in Table 1. The average vibration velocity level was then measured at points shown in Fig. 1. The first parameter to be measured was the vibration level in each 'subsystem' (floor and/or wall) which were the source or receiver plate (see Fig. 4 below). After that, the structural reverberation time was also measured.

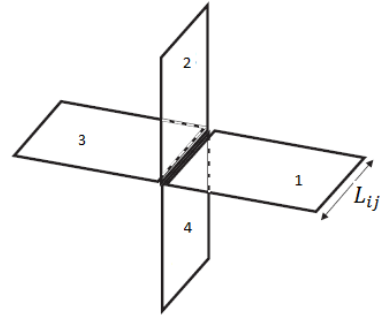
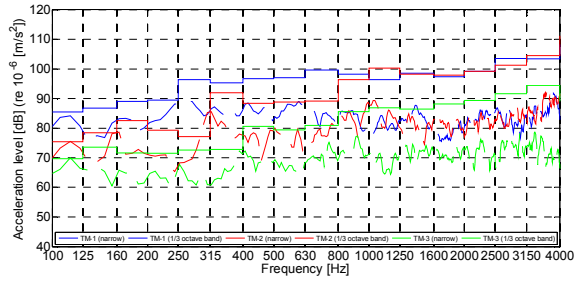


Fig. 4. Cross-junction type considered for the determination of the vibration reduction index K_{ij} between floors and walls. The subscripts i, j represent the source and receiver plate, respectively.

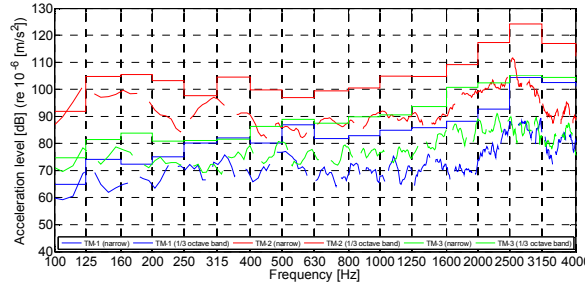
5 Results and discussions

Fig. 5 presents the time and space average acceleration levels of the floors. It is seen the variation of floor acceleration levels measured at different points (see table 1) considering three distinct locations for the tapping machine: living room, bathroom and bedroom l . The values were obtained due to tapping machine generating impact vibrations and the corresponding accelerations being measured at points P_1, P_3 and P_5 (see Fig. 3a). It is seen that the vibration level at point P_1 has the greatest values in the frequency range considered as the tapping machine was on the living room floor (Fig. 5a). Likewise, the highest levels of acceleration at points P_3 and P_5 were for the tapping machine located on the bathroom floor and bedroom '1' respectively (see Fig. 5b and Fig. 5c). It is also observed that the acceleration levels at distinct positions decrease as the distance from the tapping machine increases, as expected.

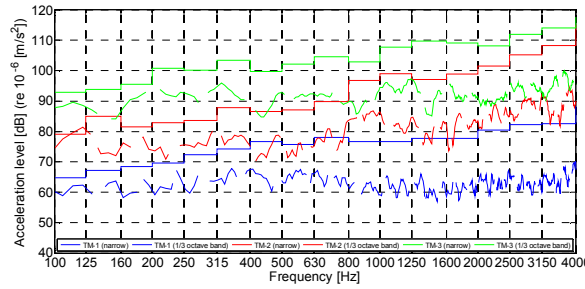
Fig. 6 presents the time average acceleration levels of two walls (points P_2 and P_4). It can be observed that the acceleration level varies according to the relative position between source (tapping machine) and receivers (accelerometers), as expected. It is seen that the highest vibration levels are found as the tapping machine was located on the bathroom floor which is supported on two of its edges by the corresponding walls.



a)

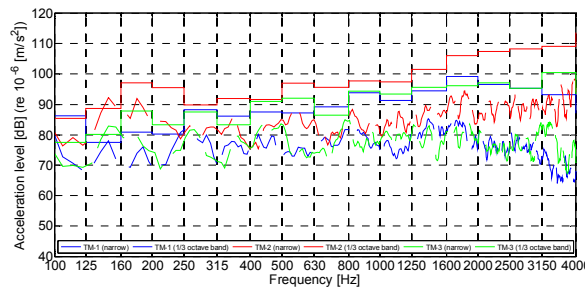


b)

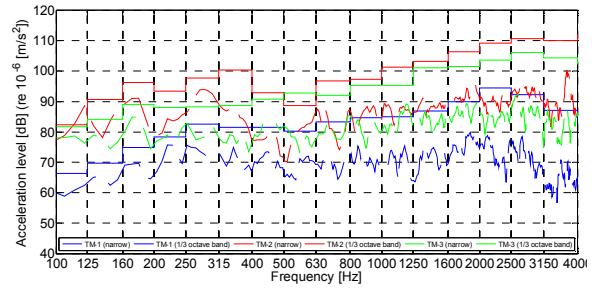


c)

Fig. 5. Variation of floor acceleration level measured at distinct points considering the tapping machine location. a) point P-1 (living room ceiling); b) point P-3 (bathroom ceiling); c) point P-5 (bedroom ceiling).



a)



b)

Fig. 6. Variation of wall acceleration level measured at distinct points considering the tapping machine location. a) accelerometer on point P-2 (living room wall); b) accelerometer on point P-4 (bedroom wall).

Table 1: Distances between the sources (tapping machine at position TM-1, TM-2 and TM-3) and the receivers (accelerometers at positions P₁- P₅)

Distance Source/Receiver	P-1 cm	P-2 cm	P-3 cm	P-4 cm	P-5 cm
TM-1	313	656	706	795	938
TM-2	430	85	52	82	218
TM-3	780	426	358	288	176

In Fig. 7 it is seen that the vibrational level is dependent upon frequency and the distance between the source and receiver, as expected. In this case, the tapping machine is fixed at a particular position on the living room floor (see Fig. 2). There is a direct correlation between the distance between source-receiver and the acceleration level of the floors in most frequency range. Below 500 Hz, the acceleration levels vary as much as 40 dB. In general, structure-borne vibrational modes are predominant at frequencies below the critical frequencies of the floors. In this case, the critical frequency of the floors was approximately 185 Hz.

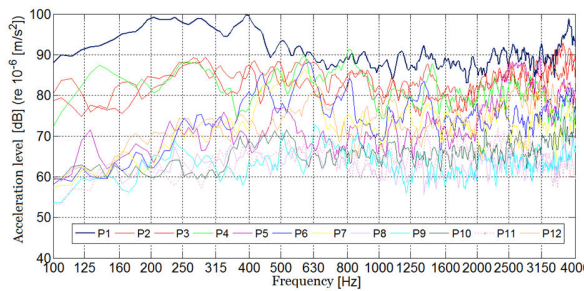


Fig. 7. Variation of floor acceleration level measured at distinct positions located in the apartment. The tapping machine location was fixed on the living room floor.

Table 2: Structural reverberation time of floors (accelerometers at positions P₁, P₃ and P₅) and walls (accelerometers at positions P₂ and P₄).

1/3 octave band (Hz)	T _s (s) P-1	T _s (s) P-2	T _s (s) P-3	T _s (s) P-4	T _s (s) P-5
100	0.53	1.49	0.50	0.46	0.66
125	0.34	0.79	0.41	0.37	0.85
160	0.38	0.38	0.30	0.40	1.28
200	0.33	0.46	0.27	0.27	0.63
250	0.18	0.41	0.15	0.57	0.29
315	0.15	0.28	0.11	0.21	0.15
400	0.21	0.26	0.13	0.16	0.11
500	0.14	0.14	0.10	0.13	0.11
630	0.09	0.14	0.12	0.11	0.10

Table 3 below shows the acceleration levels in 1/3 octave band center frequencies (dB re 10⁻⁶ m/s²) measured at points P₁ – P₅ illustrated in Fig. 3. The level values are presented in the frequency range 100-630 Hz. These values were used in Equation (2) and Equation (3) for the determination of the vibration reduction index which are shown in Fig. 8.

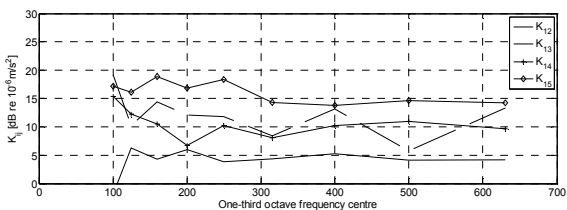


Fig. 8. Variation of the Vibration Reduction Index (K_{ij}) with frequency and accelerometer positions P₁ - P₅. Four different situations were considered: K_{12} (TM1 – P₂), K_{13} (TM1 – P₃), K_{14} (TM1 – P₄) and K_{15} (TM1 – P₅).

Table 3: Acceleration levels in 1/3 octave band center frequencies (dB re 10⁻⁶ m/s²) measured at points P₁ – P₅ (see Fig. 3) as the tapping machine change positions in the apartment rooms (living room, bathroom and bedroom 1).

Accelerator Level [dB re 10 ⁻⁶ m/s ²]/Fr eq. [Hz]	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz
AL (TM-1, P ₁)	85	86	89	90	96	95	97	97	99
AL (TM-2, P ₁)	75	78	83	79	77	92	88	88	89
AL (TM-3, P ₁)	69	73	72	72	73	73	81	79	81
AL (TM-1, P ₂)	86	77	81	80	88	86	88	87	89
AL (TM-2, P ₂)	85	89	97	95	89	92	92	97	96
AL (TM-3, P ₂)	78	80	88	8	88	8	91	92	87
AL (TM-1, P ₃)	65	74	72	75	80	82	80	87	81
AL (TM-2, P ₃)	92	105	106	103	98	105	99	97	99
AL (TM-3, P ₃)	75	81	84	81	81	82	86	89	87
AL (TM-1, P ₄)	66	69	75	78	83	82	82	80	83
AL (TM-2, P ₄)	82	91	96	93	98	100	93	89	96
AL (TM-3, P ₄)	82	84	89	88	88	89	91	93	92
AL (TM-1, P ₅)	65	67	68	70	72	74	77	76	78
AL (TM-2, P ₅)	79	85	82	82	84	88	87	87	90
AL (TM-3, P ₅)	93	94	95	101	100	104	99	102	105
Max	93	105.7	105.5	103.2	100.2	104.7	99.9	102.2	104.5
Min	64.8	67.2	68.4	69.6	72.4	72.8	76.7	75.7	78.0
Avg	78.5	82.4	85.1	84.8	86.4	88.4	88.7	89.4	90.3
Var	84.9	96.1	114.1	101.9	80.7	93.9	49.3	52.8	59.3

$$\text{Stdn} \left| \begin{array}{c} 9. \\ 2 \end{array} \right| \left| \begin{array}{c} 9.8 \\ 7 \end{array} \right| \left| \begin{array}{c} 10. \\ 1 \end{array} \right| \left| \begin{array}{c} 10. \\ 0 \end{array} \right| \left| \begin{array}{c} 9. \\ 9.7 \end{array} \right| \left| \begin{array}{c} 7. \\ 0 \end{array} \right| \left| \begin{array}{c} 7.3 \\ 7.7 \end{array} \right|$$

Fig. 8 shows the variation of K_{ij} with frequency. As expected, K_{15} and K_{12} shows the top and bottom values in the whole frequency range. The difference between them reaches 15 dB in the frequency range. On the other hand, K_{13} and K_{14} present a difference of less than 5 dB between each other.

6 Conclusions

The study presented herein is an alternative for understanding the structure-borne transmission across junctions in dwellings. Flanking transmission via flanked building floors and walls have been investigated using the concept of the parameter named vibration reduction index. This concept is a reliable approach which provides a rapid and practical measurement of the total sound power transmitted into structural panels. The method of measuring vibration acceleration levels, outlined in this study, is a cost-effective technique that can be used in place of traditional techniques which considers the structure sound radiation. In addition, experimental tests can be made in a noisier environment where background noise levels (measured in one octave band) can be tolerated. The acoustic-based technique may be alternatively applied to mechanical vibration techniques. The influence of vibration level exposure on the physiological and psychological behavior of humans inside residential buildings is already under investigation as part of future work.

Acknowledgments

The author gratefully acknowledge the financial support provided by the Federal University of Minas Gerais (UFMG) and Cnpq (National Council for Scientific and Technological Development).

References

- [1] F. Fahy, *Sound and Structural Vibrations*. Academic Press, London, 1985.
- [2] F. G. Leppington, E. G. Broadbent and K. H. Heron, The Acoustic Radiation Efficiency of Rectangular Panel. *Proceedings of the Royal Society of London. Series A, Math. and Physical Sciences*, 1982, 382, 245-271.
- [3] M. D. C. Magalhaes and N. S. Ferguson, The development of a Component Mode Synthesis (CMS) model for three dimensional fluid-structure interaction, *J. Acoust. Soc. Am.*, 2005, 118, 3679-3691.
- [4] C. Hopkins, C. Crispim, J. Poblet-Puig and C. Guigou-Carter, Regression curves for vibration transmission across junctions of heavyweight walls and floors based on finite element methods and wave theory, *Applied Acoustics*, 2016, 113, 7-21.
- [5] Rabold A.; Buschshmid, M.; Duster, A.; Muller, G.; Rank, E. Modelling the excitation force of a standard tapping machine on lightweight floor structures. *Building Acoustics*, 2010, vol 17, num 3, p. 175-197.
- [6] Shi, W. Johansson, C., Sundback, U., An investigation of the characteristics of impact sound sources for impact sound insulation measurement. *Applied Acoustics*, 1997, v.51, 85-108.
- [7] Shin, K., Park S., Kim, K. Sound prediction based on footstep-induced vibrations in concrete building using a convolutional neural network, *Applied Acoustics*, 2022, v. 198, p. 1-8.
- [8] Schiavi, A., Astolfi, A., The prediction of the vibration reduction index K_{ij} for brick and concrete rigid junctions. *Applied Acoustics* 2010, 71, 523-530.

Measuring the Likeability of Robots among Seniors: A Field Research

Balaji Viswanathan

University of Maryland, Baltimore County

Baltimore, USA

balaji@mitrarobot.com

Tim Oates

University of Maryland, Baltimore County

Baltimore, USA

oates@cs.umbc.edu

Abstract—A number of pilot projects have commenced across the world to use robots for senior care. We aim to measure likeability of these robots among seniors and help robot designers focus on the features that matter. We built a robot likability score with over 30 parameters and used this to interview 50 seniors in various locations in the United States. This paper presents the results of this field research.

Index Terms—assistive robotics, aging, human robot interaction

An Assessment of Rice Yield Improvement among Smallholder Rice Farmers in Asunafo North Municipality of Ghana

I. Diaka, M. Kenichi

Abstract— Ghana's rice production has increased mainly because of increased cultivated areas. On this point, scholars who promoted crop production increase for food security have overlooked the fact that its per-acre yield has not increased. Also, Ghana's domestic rice production has not contributed much to domestic rice consumption especially in major cities where consumers tend to rely on imported rice from Asia. Considering these points, the paper seeks to understand why smallholder rice farmers have not been able to increase per acre rice yield. It also examines smallholder rice farmers' rice yield improvement needs, and the relationship that exist between rice farmers' socioeconomic factors and their yield levels by rice varieties. The study adopted a simple random sampling technique to select 154 rice farmers for a questionnaire survey between October and November 2020. The data was analyzed by performing a correlation analysis, an independent t-test, and Kendall's coefficient of concordance. The results showed that 58.4% of the respondents cultivated popular high-yield varieties like AGRA and Jasmine. The rest used local varieties. Regarding respondents' yield differentials, AGRA and Jasmine had an average yield of 2.6 mt/ha, which is higher than that of local varieties (1.6mt/ha). The study found untimely availability of improved seed varieties and high cost of inputs some of the major reasons affecting yield in the area. For respondents' yield improvement needs, Kendall's coefficient of concordance showed that access to improved varieties, irrigation infrastructure, and row planting were respondents' major technological needs. As to their non-technological needs, the respondents needed timely information about rice production, access to credit support options, and extension services. The correlation analysis revealed that farm size and off-farm income exhibited a positive and negative association towards respondents' yield level, respectively. This paper then discusses recommendations for providing with improved rice production technologies to farmers.

Keywords— Ghana, Rice, Smallholder farmers, Yield improvement.

I Diaka is with the Environmental Science Department, University of Tsukuba, Japan (e-mail: s2230315@s.tsukuba.jp.ac).

M Kenichi is with the Faculty of Life and Environmental Sciences, University of Tsukuba, Japan (matsui.Kenichi.gt@u.tsukuba.ac.jp)

Assessing Smallholder Rice and Vegetable Farmers' Constraints and Needs to Adopt Small-scale Irrigation in South Tongu District, Ghana

M. K. Tamekloe, M. Kenichi

Abstract—Irrigation access is one of the essential rural development investment options that can significantly improve smallholder farmers' agriculture productivity. Investment in irrigation infrastructural development to supply adequate water could improve food security, growth in income for farmers, poverty alleviation, improve business and livelihood. This paper assesses smallholder farmers' constraints and needs to adopt small-scale irrigation for crops production in South Tongu District of Ghana. The data collection involved database search, questionnaire survey, interview, and field work. The structured questionnaire survey was administered from September to November 2020 among 120 respondents in six purposively sampled irrigation communities in the District. The questions focused on small-scale irrigation development constraints and needs. As a result, we found that the respondents relied mainly on rainfall for agriculture production. They did not have adequate irrigation access. Even though the District is blessed with open arable lands and rich water sources for rice and vegetable production on a massive scale, water sources like the Lower Volta River, Tordzi River, and Avu Lagoon were not close enough to the respondents. The respondents faced inadequate credit support (100%), unreliable rainfall (76%), insufficient water supply (54%), and unreliable water delivery challenges on their farms (53%). Physical constraints for the respondents to adopt irrigation included flood (77%), drought (93%), inadequate irrigation technology (59%), and insufficient technical know-how (65%). Farmers were interested in investing in irrigation infrastructural development to enhance productivity on their farms only if they own the farmlands. External support from donors on irrigation systems did not allow smallholder farmers to control irrigation facilities.

Keywords—Constraints, food security, needs, smallholder farmers, small-scale irrigation.

M. K. Tamekloe is with the Graduate School of Science and Technology, University of Tsukuba, Japan (e-mail: mickyay@yahoo.com).

M. Kenichi is with the Faculty of Life and Environmental Sciences, University of Tsukuba, Japan (e-mail: matsui.kenichi.gt@u.tsukuba.ac.jp).

The impact of illegal firearms Possession, Limited Security Staff and Porosity of Border on Human Security in Ipokia Local Government Area, Ogun State

Ogunmefun Folorunsho Muyideen
Criminology and Security Department
Chrisland University, Abeokuta
Ogun State Nigeria

folorunshoogunmefun@gmail.com/fogunmefun@chrislanduniversity.edu.ng
+2348085025357/+2347057156688

Alujo Tolulope Evelyn
Psychology Department
Chrisland University
Oyeyemitolulope55@gmail.com
+2347064500035

Abstract

One of the trending menaces faced in the world today is centered on porosity of borders and proliferations of illegal weapons among the State members without the State Authorizations. Proliferation of weapons along porous borders remains a germane and unsolvable question among developed and developing nations due to crisis degenerated from the menace (loss of lives, properties, traumatization, civil unrest and retrogressive economic development). Mixed method was adopted while survey method was used for communities' selection (Oke-Odan, Ajilete, Illaise, Lanlate) at Ipokia Local Government as sample frame. Multi-stage sampling was employed to breakdown the site to wards, to streets and different house numbers before randomizing administration of the questionnaires using face to face method while Purposive sampling was used for collecting verbal information through In-depth interviews method. The population size for the site is 150.398 while 399 was the sample size derived from the use of Yamane sample size formula.. After retrieval of structured questionnaires, 346 were found useful while 10 per cent (399) of the quantitative instruments was summed to 30 participants that were interviewed using in-depth interviews technique. The result of the first hypothesis shows composite relationship between the variables tested (Independents and Dependent). The result indicated that the porosity of border, illegal possession of guns and limited security staff jointly predispose insecurity among the residents of the residents of the selected study site. The result of

the second hypothesis deciphered that Illegal gun possession (Independent) variable predict business outcome among the residents of the study site because sporadic gun shoot will regress the business activities in the study area. The result of the third result indicated that Independent (porosity of borders) variable predict social bonding network because high level of insecurity will destroy the level of trust in the communication among the residents of the study area. The last questions give comprehensive meaning to one of the recommendations derived using content systematic analysis which explains that out of 30 participants interviewed 18 submit individual involvement in monitoring communities will solved the problem, 7 out of 30 opines that governmental agents are to be trained for effective combat 3 participants out 30 submits that the fight is for both government and the citizens while 2 participants out of 30 claimed that there must be an agreement between Nigerian and neighbouring countries on border security., International donors must totally control sales of weapons to unauthorized personality. Criminal cases must be treated with deterrence measure and target harden procedure through decoying and blending, stakeout and sting tactics.

Keywords- ,Human-Security, Illegal-Weapons, Porous-Borders, Development.

1.1. Background of the Study

In every human society globally, the law of social contract explain how there must be strong relationship and partnership between the Government and the citizens in achieving adequate security to lives and properties of the people in any society. According to [7] in Rome in the 3rd securing the citizens and ensuring peace is done by the unpaid Magistrates (Judges) who are considered as professional law enforcers elected by the citizens to represent their interest. These unpaid judges are protected by the Lictors who are to enforce and carried out the decisions of the judges. More so, in 6th century in Rome, ensuring security is the sole responsibility of the Emperor Augustus who took some guards from the military and turns them to Praetorian Guards in charge of protecting the palace and Praefectus Urbi in charge of the city protection while Vigils are fire fighters in Rome. It is mandatory that every relationship that brings about safety must embark on transparent and accountable steps towards protecting the lives and property of people living within its boundaries. Globally, the porosity of borders or boundaries between countries aid the growth and distribution of illegal firearms which leads to other social vices such as terrorism, herdsmen attacks, smuggling, human ritualism, fraudulent activities and the proliferation of firearms among others According to [18], it is very difficult to estimate the scope and value of illegal firearms trafficking into, within and from the European Union [16] He further laments that, the study of illegal firearms distribution in European States lack reliable and scientific estimation of the overall size of illicit firearm worldwide. The situation shows that there is need to rigorously inquire into factors that lead to possession of illegal firearms by the member of the public globally which may increase the level of insecurity in any nation worldwide

In the world at large today, several other types of criminal activities carried out by suspects or convicted criminals were also linked with the use of illegal Guns or machines [5], [4], [8]. It is generally believed that the fundamental essence of security is the reason societies made efforts to policing their neighborhoods in order to ensure safety of societal members from criminal victimization, oppression, and marginalization among others which was observed in the

traditional Roman Empire where security works is the sole collective roles of the King and the citizens to ensure safety in terms of lives and properties.

In Africa, most studies ignore proper inquiry into various ways ammunitions ended up in the hands of the community members without legal authorization of the State. This is the reason for setting up this inquiry so as to get deeper knowledge on the meaning of insecurity and various causes of human insecurity in the study selected area in Ogun State. According to [12] the word security connote and shed better understanding to the study of peace, orderliness and harmony among mankind in any society Likewise,[17], describe safety society as the society that experienced absence of crisis or threats to human dignity, all of which facilitate development and progress of any human society. The above assertion shows that security has to do with the process connected with assuaging any kind of threat to people and their precious values.

In Nigeria, there are lacks or gaps of proper records on the scope and estimation of illegal firearms used by the suspects or convicts in Nigeria to carry out criminal activities especially those that operate without authorized use of guns. This research is set to unravel various menace associated with insecurity resulting from illegal firearms distribution among the apprehended suspects or convicted criminals in the country. This will help in the area of policy formulations on the protection of illegal firearms in Nigeria.. Thus, the illegal gun used is a serious problem in contemporary Nigeria. The Nigeria Police and Customs who are the primary agent in the fight against crime are ineffective due to the rate at which people of Ipokia Local Government constantly reports the menace of sporadic use of guns which mostly affect their psychological and economic activities on a daily basis. These have created problem of under proliferation of illegal firearms among the people in Ogun State. Thus, illegal possession of firearms by civilians in Nigeria has increases level of insecurity and crimes committed on daily basis without detection and prosecution. It on this ground the following research questions and hypotheses were formulated to guides the outcome of the research inquiry

1. What are the factors (Limited number of security personnel, porous border and illegal possession of guns) predispose insecurity among the residents of Ipokia Local Government Area, Ogun State?
2. To what extent has the possession of illegal firearms affect Business transaction in the community?
3. How has the Porosity of Border affect the social bonding system or network of the residents of Ipokia Local Government?
4. What are the other strategies that are in place to control the distribution of illegal firearms in Idi-Iroko Community?

Literature Review and Theoretical Framework

Broken Windows Theory----This study is anchored on broken window theory and structural strain theory. While broken window theory was used to explain the place of failure of the State and community members of the study site (Idi-Iroko Community) to repair the occurrence of use of illegal guns and porosity of border land in their community by reporting such cases to the authority in charge According Keiling and Wilson, Broken windows theory focuses on the

control and prevention of crime from within the community as against from outside the community. It explains how effective and efficient of community members developed their community policing structures so as to control crimes compared to over relying on formal policing structure that is made up of 'strangers'. The theory holds that only the community members can safeguard themselves from crimes. This is because they live in the community and can work and watch at all times. They also know who those potential criminals are and how best they can be contained. Scholars are of diverse orientations concerning factors that are responsible for lack of repair of the menace of illegal firearms and porosity of borders on the security challenges faced by members of people in Africa and Nigeria in general. For Bashir (2014), one of the major factors that increases insecurity is anchored on the porosity of the borders that gives rise to the rate of uncontrollable weapons in west African continent. Likewise, Gofwan, Ishayat & Ado (2019) opines that the proliferation of small arms and light weapons is often one of the major security obstacles currently facing Nigeria and indeed the world in general. The core principle of community membership involvement in policing structures is the constant maintenance of law and order in the various communities by members.. This is in line with the core notion of broken window theory, which asserts that the constant presence of police structures makes a community less conducive for crime and criminals.

Structural Functionalism----Structural strain theory was developed by Talcott Parsons (1957). According to him, in every society, people experience strain whenever there is a disjuncture between the culturally accepted goals and the institutionalized (conventional) means of achieving these goals. According to Parsons, the principle of achieving positive societal development is anchored on the quality value consensus relationship that exists among various parts that formed the whole. Once the whole (society) experiences perfect relationship in their mode of working hands in hands, it will foster progressive development then it will foster development. This theory explains that once all the various set of people in various institutions such as family, economy, health, politics, education decided to work hand in hand it will bring development For Nte (2011), lack of joint contributions among various institutions gave birth to fast growing menace of weapon proliferation in the world along various porous borders. He further explains then when the menace are not totally combatted it will degenerate to other social vices such as terrorism, violent conflict, Armed robbery, kidnapping gangsterism and cultism. Therefore there is a need for collective value consensus that must exists among the people before solutions can be achieved in any society that will promote human and institutional development.

Materials and Method

This research work was conducted in Ipokia Local Government Area of Ogun State. The Local government comprises of some communities such as Oke odan, Ilarse, Ita-Egba, Ajilete, among others. (National Population Census, 2006, Omoniyi, 2014) The Local Government shared boundaries with Benin Republic which makes smuggling of contra bound goods and use of illegal guns or weapons to carry out illegal functions more pronounce. Mixed methods were adopted for the study. For the quantitative methods structured questionnaires were designed and served to the residents while Qualitative method was adopted for collection of verbal information from the respondents in their various communities. According to National Population Census (2006), the residents of Ipokia Local Government were estimated to 150,389. For this study Taro Yemane sample size formula was adopted to determine the sample size which was estimated to 399 but after the retrieval of the structured questionnaires 347 were found useful for the

quantitative analysis while 10 percent of the quantitative data (347) retrieved was used for the collection of verbal information from the residents using in-depth interview method and the aids of the unstructured questionnaire. All ethical standards were strictly followed such as letting the residents to know the purpose of the research work and introducing the resource person as a researcher to residents. More so, all information supplied will be treated with utmost confidentiality before gaining access to carry out the study. Anova method was adopted for the interpretations of the quantitative result while content systematic method was adopted for the transcribing of the collected verbal information from respondents in their various communities at Ipokia Local Government Area, Ogun State.

Results

The first research hypothesis inquires on factors (Limited number of Security Personnel, Porous border and illegal possession of guns) that predispose insecurity at Idi-Iroko Community Area. The result of the model summary, Anova and coefficients tables are presented below

Table 1a- This table presents the model summary of the indicators of insecurity

Model	R	R-Square	Adjusted R-Square	Standardized Errors of the Estimate
1	.973	.947	.947	1.85989

Indicators (Constant) Possession of Illegal guns, Limited Security Staff and Porous Border
 Table 1a---- The table below show the Regression Summary and estimate of the joint and relative contribution of Possession of Illegal Guns, Limited Security Staff and Porous Border on the rate of insecurity experiences at Ipokia Local Government Area in Ogun State

Table 1b- This table below is centered on the Regression Analysis of the Variables Tested

Model	Sum of Square	df	Mean of Square	F	Sig
Regression	21219.000	3	7073.00	2044.697	.000
Residual	1186.503	343	3.459		
Total	22405.504	346			

a. **Predictors** (Possession of Illegal guns, porosity of Borders and Limited Security Staff)

b. Insecurity

The parameter estimate of the relative contributions of Porosity of Border, Illegal possession of Guns and Limited Security Staff on insecurity shows that there is significant relative contribution on the insecurity experienced in the study location

Table 1c- This table is centered on the cross tabulation of the independent and dependent variables adopted for the study

Model	Unstandardized Coefficient		Standardized Coefficient	t	Sig
	B	Standardized Error	BETA		
Constant	-5.416	,659	-	-8.222	.000
Porosity of Border	1.110	.018	.935	62.027	.000
Illegal Guns Possession	.094	.024	.066	4.010	.000
Limited Security Staff	,006	.028	.003	216	.825

Dependent Variable; Insecurity

The composite contribution of the Independent variables to predict insecurity as indicated in table 1 reveals that the variable jointly accounted for 5 per cent of the total variance in the prediction of insecurity (R=0.973; R-Square=0.947; Adjusted R Square =0.947; F.3.343=2044.697. The Porosity of the Border (B=1.110; t= 62.027; P<0.05). The result of illegal possession of Guns (B=0.094; t=4.010; P<0.05 AND Limited Security Staff were estimated to B=0.006; t=0.216; P>0.05). The outcome of the result deciphers that the joint contribution of the Independent variables (Porosity of Border, Illegal Guns Possession and Limited Security Staff relatively predict insecurity (Dependent) is significant at 0.05 level of significant

The Second hypothesis intended to know the extent to which possession of illegal firearms affect Business transaction in the community. The following result were generated from the hypothesis tested through the use of Regression one way analysis.

Table 2a- This table presents the model summary of the independent variable adopted

Model	R	R-Square	Adjusted R-Square	Standardized Errors of the Estimate
1	343	118	115	5.79475

Indicators (Constant) Possession of Illegal guns

Table 2b---- The table below show the Regression Summary and estimate of the relative contribution of Possession of Illegal Guns on business transactions at Ipokia Local Government Area in Ogun State

Model	Sum of Square	Df	Mean of Square	F	Sig
Regression	1547.406	1	1547.406	46.082	.000
Residual	11584.78413132.190	345	33.579		

Total		346			
-------	--	-----	--	--	--

a. Predictors (Possession of Illegal guns,

b. Business Security

The parameter estimate of the relative contributions of Illegal possession of Guns on business outcome shows that there is relative significant of the independent variable on the dependent variables in the study location.

Table 2c- This table is centered on the cross tabulation of the independent and dependent variables adopted for the study

Model	Unstandardized Coefficient		Standardized Coefficient	t	Sig
	B	Standardized Error	BETA		
Constant	21.372	1.79	-	11.935	.000
Illegal Guns Possession	.312	.046	.343	6.788	.000

Dependent Variable; Business Outcome

The relative contribution of the Independent variable to predict business security as indicated in table above reveals that the independent variable (Illegal gun possession) among the residents of the study area will predict level of business Outcome in the study area. The prediction of business insecurity (R=0.343; R-Square=0.118; Adjusted R Square =0.115; F.=46.082. The result of illegal possession of Guns (B=0.312; t=6.788; P<0.05). The outcome of the result deciphers that the contribution of the Independent variables (Illegal Guns Possession predict rate of business security in the study area (Dependent) is significant at 0.05 level of significant

The third hypothesis intended to know how porosity of Border affects the trust in interaction among the community members in the study area. The outcome o the regression analysis indicated that.

Table 3a- This table presents the model summary of the independent variable adopted

Model	R	R-Square	Adjusted R-Square	Standardized Errors of the Estimate
1	.466	.217	.215	6.45920

Indicator (Constant) Porosity of Border

Table 3b---- The table below show the Regression Summary and estimate of the relative contribution of Possession of Illegal Guns on the rate of insecurity experiences at Ipokia Local Government Area in Ogun State

Model	Sum of Square	Df	Mean of Square	F	Sig
Regression	2850.214	1	2850.214	95.636	.000
Residual	10281.7760	345	29.803		

Total	13132.190	346			
-------	-----------	-----	--	--	--

c. Predictors (Possession of Illegal guns,

d. Business Security

The parameter estimate of the relative contributions of Illegal possession of Guns on insecurity shows that there is significant relative contribution on the insecurity experienced in the study location.

Table 3c- This table is centered on the cross tabulation of the independent and dependent variables adopted for the study

Model	Unstandardized Coefficient		Standardized Coefficient	t	Sig
	B	Standardized Error	BETA		
Constant	19.218	1.474	-	13.040	.000
Illegal Guns Possession	.520	.053	.466	9.779	.000

Dependent Variable; Social Bonding System/Network

The relative contribution of the Independent variable to predict business security as indicated in table above reveals that the independent variable (Illegal gun possession) among the residents of the study area will predict level of business insecurity in the study area. The prediction of business insecurity (R=0.343; R-Square=0.118; Adjusted R Square =0.115; F.=46.082. The result of illegal possession of Guns (B=0.312; t=6.788; P<0.05). The outcome of the result deciphers that the contribution of the Independent variables (Illegal Guns Possession predict rate of business security in the study area (Dependent) is significant at 0.05 level of significant

The forth question is set to gather verbal information on various strategies that are in place to control the distribution of illegal firearms proliferation and control of porosity of the Nigerian borders. In the interviews conducted among 30 participants at various wards, streets and houses at Ipokia Local Government Area in Ogun State. The following submission were derived.

I strongly believed that if Nigerian security wants to work they will do especially if they want to arrest criminals along the border line they will do it but another problem I see is that the ammunitions in the name of the Custody needs to be change so that they can have strong fight with the people that carry contra bound goods or smuggle bad goods into Nigeria. To me the problem is not just the security but the government needs to put good measure on ground to help the customs in achieving their tasks of security

IDI/Man/Yoruba/Musilm/39yrs/Ajilete Community/ 20January,2022

Another submission gathered on the questions explains that

The Nigerian Government to me did not have any good plans concerning how to ensure positive security in the Border areas of Nigeria. The situation is very worst to the extent that even contraband goods are regularly coming constantly to our communities. The security did not even know extent numbers of the porous border records in Nigeria, therefore how will they have effective methods for controlling the rate at which people trade guns or carry contraband goods into Nigeria. They need to come or designed another method that will be adopted because the old methods seem not working at all for security of lives and properties

IDI/Woman/Hausa/Fulani/Muslim/32yrs/Oke-Odan Community/ 23,January,2022

In another community, the submission of one of the community elders on the questions explains that

Are there any forms of security put in place along border line?. Check it yourself then what we be your answer. To be everybody in our communities along Nigeria-Benin Republic border areas must be willing to help themselves by creating local vigilantes that will help in bringing security and safety closer to his or her communities without that we will all suffer for it. Just look at Boko Haram and banditry attacks on a regular basis and what the questions what has Nigerian Leaders done to eradicate the internal problem talk less of border problem. We should be ready to do justice to our lives

IDI/Man/Yoruba/Christian29yrs/Illaise Community/ 26, January,2022

The summary of the in-depth interviews conducted on various strategies put in place to ensure fight against porosity of border for illegal business activities and proliferation of illegal weapons shows that there is total failing concept that emanated from the Nigerian government and its state security apparatus I fight against corruption and criminal activities along border line and control of unauthorized use of weapons. Out of the 30 participants interviewed 17 of the participants interviewed explained that they are not expecting any positive things from the Nigerian Government in term of border security. They further explains that they will need to strengthen informal security to help fight those who planned to destroy their communities because of their individual interest 8 out of the 30 of them said the problem cannot be solved alone by the citizens that they needs the government to established quality relationship between the residents of the borderline communities so as to fight and achieve struggle against civil unrest and psychological trauma faced by large number of the residents of the border land in Nigeria while 5 out of 30 participants submit that Electronic monitoring toll gates must be planted along the border lands throughout Nigeria to checkmated the rate of inflow of unauthorized weapons and porosity of the

Nigerian border to ensure safety of lives and properties among the communities members at Ipokia Local Government Area of Ogun State

Conclusion and Discussion Finding

The discussion of the research work was centered on the discussion of finding from the socio-demographic characteristics of the 346 participants in the research inquiry. The result of the socio-demographics was given as follows. The result on the gender position of the participants shows that 224(64.7%) of the respondents that participated in the research inquiry were male while 122(35.3%) of the other counterpart in the research inquiry were female participants as at the time the research was conducted. The questions asked on the religion affiliation of the participants shows that 198(57.2%) of the participants were practicing Christianity, 105(30.3%) of them were practicing Islam Religion, 40(11.6%) of them claimed to be practicing traditional religion while 3(9%) of them states that they practice other religion such as Buddhism or Hinduism religion respectively. The result gathered on age distribution of the participants shows that 116(33.5%) of the respondents that participate in the research were within the age bracket of 41 to 45 years, 68(19.7%) of them were within 26 to 30 years, 50(14.5%) of them were within 31 to 35 years, 42(12.1%) of them were within 21 to 25 years, 26(7.5%) were equally recorded under the age bracket of 16 to 20 years and 46 to 50 years respectively, 16(4.6%) of the participants were under the age bracket of 36 to 40 years, 2(.6%) of the participants were recorded under less than 15 years while nothing was recorded under 51 and above age bracket. The result gathered on the ethnic background question shows that 252(72.8%) of the participants were Yoruba speaking people, 46(13.3%) of them were Igbos, 22(6.4%) of the participants were Hausa/Fulani while 26(7.5%) of the participants were recorded as foreigner who came from Togo, Benin Republic and Chad but reside along the border land area. The marriage records of the participants were also recorded and it shows that 217(62.6%) of the participants were married as at the time the research was conducted, 48(13.9%) of them claimed to be either widowed or widower, 43(12.3%) of them said they are married but they are separated from their various partners before the research was conducted 38(11.0%) of them were singled in the study area while 4(1.2%) of them said they are divorced before the research was carried out in their various communities in the local Government of Ipokia. The result of the educational data of the participants were stated as follows, 107(30.9%) of them claimed to have no form of formal education, 87(25.2%) of them said they had secondary school education, 62(17.9%) of them claimed to have primary school education, 42(12.2%) of them tertiary educational system 32(9.2%) had no formal education at all while 16(4.6%) of them claimed they are Agbero meaning bus solicitors during the research exercise. The result of the names of communities in the Ipokia Local Government and the administration of the structured questionnaires are explained as follows, 92(26.6%) of the participants interviewed were from Oke-Odan community, 89(25.7%) of the participants were from Ajilete community, 87(25.2%) of them were from lanlate community while 78(22.5%) of them were from ilaise community at the end of the retrieval and analysis of the research questionnaires. . . .

The research inquiry was concluded based on the findings of the set research work. Thus, there are five research works structured and equally followed to give comprehensive meaning to the outcome of the inquiry. The first inquiry is a set hypothesis that intends to find out in the quantitative inquiry various factors such as Limited number of security personnel, porous border and illegal possession of guns) predispose insecurity among the residents of Ipokia Local. The

quantitative finding shows that there are significant relationships between various indicators tested such as porosity of borders, limited number of security staff and access to illegal weapons in the study site. But the result of the qualitative data collected show different orientation concerning what is obtainable in the question asked. The finding of the qualitative data shows that political factor and greed is one of the factors that propelled people to get involved in illegal firearms possession and transacting business across border.. More so, some opines that most people that deal in illegal business are the people using illegal guns to fight against the Nigerian security agents along border lines respectively.

The result gathered from the second hypothesis that intends to know how illegal possession of firearms affects Business transaction in the community. The result of the quantitative analysis shows that there are significant relationships between the variable tested. The result indicated that the rate of illegal possession of guns or weapons among the Nigerians or smugglers affect the business activities of the people in the nearby communities. This is because the moment sporadic shooting start between the Nigeria Custom and the smugglers, it will definitely affect the main business activities of the people that are not dealing on illegal businesses. Even those residing close to the border areas are commonly affected because mostly the situation may leads to civil unrest, psychological trauma and economic instability.

The conclusion of the third hypothesis was traced to Porosity of Border affect the social bonding system or network of the residents of Ipokia Local Government. The final result indicated that one of the major factors affecting and encouraging the growth of lack of trust within the communities in Ipokia local government area of Ogun State is anchored on the porosity of the border which allows in flow of various kinds of contraband goods into Nigeria. The quantitative result shows that there is significant relationship between porosity of the border and breakdown in social network among various communities in the study site which increases the level of insecurity experienced on a regular basis in the study site. But the qualitative outcome also supported the result gathered from the quantitative analysis which shows that large number of the participants interviewed in their various communities were of the view that porosity of the border between Nigeria-Benin Republic was the major reasons for the prevalence of human insecurity in their various communities due to the failure of the Nigeria security agents and the entire community members in fighting against insecurity.

The last research question intends to know various strategies put in place to control the distribution of illegal firearms and porous border control along Idi-Iroko Community. The qualitative data collected verbatim from the participants' shows that there are lot of submission on the qualitative question .Out of the 30 participants 18 of them submit that there is nothing new about what the government put in place to fight against illegal weapons proliferation and porosity of the border in Nigeria because it was still the same old Custom measure which seems not really working in this period, 12 out Of 30 interviewed were of the view that the community members should be more involved because the borderland is porous therefore the community member needs to stand so that the smugglers will not spoil the land for them. 5 out Of 30 claimed that the only way to do something new is to incorporate the local community members into security forces because they really understand some places as routes for the illegal transactions

Recommendations

There recommendations were derived from the research conducted in the local government where the research was carried out. This recommendation is more of practical and theoretical approaches. On this ground the following recommendations were made.

- 1) The Nigeria Government should work on the border land because there are lot of dangerous business transaction going on around the border that Nigeria. This can be achieved when Nigeria Customs can be train and retrain periodically
- 2) The use of modern technology appliances and machines should be deployed along border line such as constant and consistent introduction of drone technology to support the old security measure in the border. More so, the use of Closed Circuit television should be adopted to checkmates the occurrence of the criminal activities before they grow out of space
- 3) The security personnel should also adopt some security tactics in order to carry out effective security work such as adopting measures such as decoy and blending in the closer communities around the border line. More so adopt stakeout tactics to by not putting on security outfits but still have access to heavy guns to carry out security operation. Finally, the sting method should also be adopted by planning to open shops where guns will be sells as second weapons in the market so that they could track the records of those that are selling and those that are coming to buy from the shops
- 4) The community members along border land should purge themselves out of the preconceived notions that it only the Customs, Nigeria Police among others that are charged with security responsibility. This ideology should be replace because security works is for all rather than subjecting it to the security forces alone
- 5) Youth programmes needs to be encourage and developed because the youths are considered as the bedrock, prime mover and cornerstone for developmental activities in all nations because of their distinct characteristics. Therefore, the youths needs to be encouraged to be part of the security agents that will safe guards their various communities
- 6) Government should also provide employment opportunities for the youths in the communities studied because most of the youths in the communities are equally engaging in the delinquent activities bu indulging in smuggling and making means out of the illegal activities. lot of youth seminar, discussion, debate and public lecturer needs to be produced and reproduced over time to awake the morale consciousness of the youths because large number of them don't even see the illegal transaction such as involving in contraband goods into the country as wrong activities

References

- [1] Afolayan A.D (2012), Trans-Border Movement and Trading; A Case Study of a Borderland in Southwestern Nigeria. Institut Francais de-recherche-on-Afrique
- [2] Bashir M(2014), Small Arms and Light Weapons priliferationsand its implications for West Africa Regional Security. International Journal of Humanities and Social Sciences. Vol 4 (8)
- [3] Center for Strategy and Evaluation Services (2014), Study of support on impact Assessment on options for combatting illicit firearms trafficking in the European Union. Final Reports. Brussels. European Commission p 16

- [4] CEPOL Meeting 14 (2019), Firearms linked to Organised Crime and Terrorism; implementations of the EU Firearms Directives. Lisbon.23-27 September 2019
- [5] Crip L (2019), Illegal weapons, gangs and violent extremist in Denmark. Europe. Flemish Peace Institute pp 123-168
- [6] Daily Trust (2016), Nigeria Corruption Thrives. Nigeria Border
- [7] Dempsey, J.S &Forst L.S (2008) An Introduction to Policing. USA. Thomson Learning Academic Resource Center
- [8] Duquet N & Coris K (2018), Firearms acquisitions by Terrorists in Europe; Research findings and Policy Recommendations of Project SAFTE. Brussels. Flemish Peace Institute,
- [9] Europol (2010), Oc-Scan threat notice integrated (EU) Approach against illegal trafficking in Heavy Firearms. 5, January, 2010
- [10] Europol (2016), European Union Terrorism Situation and trend Reports 2016. Den Haag Europol p 37
- [11] Ering S.O (2011), Trans-border Crime and its Socio-economic Impact on Development Economies. *Journal of Sociology and Social Anthropology* 2(2) pp73-80
- [12] Florguin N & King B(2018), From Legal to Lethal converted Firearms in Europe. Geneva. Small Firearms Survey p 9
- [13] Gofwan, J.D Ishaya J & Ado D.M (2019), Small Arms and Light Weapons proliferation and Insecurity in Nigeria. *Nexus and Implications for National Stability. Journal of Humanities and Social Sciences.*
- [14] National Population Census (2006), Population Distribution by Sex, State, Local Government and Senatorial District. Nigeria (NPC, 2006)
- [15] Omoniyi T (2014), The Sociolinguistics of borderland; Two Nation, One Community. Trentor. Africa Word Press
- [16] Pokoo J.M (2014), Restricting the Spread of Small Arms and Light Weapons. Cambridge University Press,
- [17] United Nation Office of Drugs and Crime (UNODC, 2015), UNODC Study on Firearms 2015; A Study on the Transnational nature of and routes and modus operandi used in trafficking in Firearms. Vienna. UNODC p 2
- [18] United Nations on Office of Drugs and Crime (UNODC, 2020) Global Studies in Firearms Trafficking in 2020. Vienna. UNODC. p15
- [19] Small Arms Surveys (2011), The Shadow of War. New York University Press.

Understanding Disney Gender Roles and Stereotypes Through a Generational Lens

V. Williams, O. Martinez, II, S. Aguilar, C. Barrientos, V. Cerrillo, L. Constancio, M. Enriquez Chavez, H. Espinoza, A. Faz, A. Gonzalez, L. Gonzalez, E. Martinez, K. Maldonado, A. Moyeda, M. Padilla, B. Perez, M. Rodriguez, G. Romero, G. Sanchez, D. Vazquez

Abstract— Gender roles and stereotypes are more relevant in today's robust changing society where the younger generations seem to value equality over gender biasness. This biasness revolves around stereotypes that women should cook, clean, and be 'girly', whereas men should love sports, take charge, and be the household bread-earner (main income earner in the household). Though largely regarded as a biasness towards females, a biasness of males is as prevalent though not as highly noticed. Though there are a plethora of places as to where the knowledge of these gender bias stems from, one of the main culprits is media.

Corporate giant The Walt Disney Company has a history of stereotyping both male and female roles in children's media. Through the creation of the original Disney Princes and Princesses, Disney brought to the forefront gender roles that seem to be the basis of today's fight for equity in gender roles and a reduced prevalence of stereotypes in both males and females. From the original Cinderella (1950) and Snow White and the Seven Dwarfs (1937), to the mid-era Disney representations of leads like Mulan (1998) and Aladdin (1992), to the more current Disney films like Shang-Chi and the Legend of the Ten Rings (2021) and Maleficent (2014), Disney has set a tone for how males and females are represented in media. Though not always on par with the expectations of the masses, a noticeable shift in gender bias and stereotyping is occurring.

Most research on gender bias and stereotypes in Disney films revolves around the Disney princesses, but few research indicates how these representations affect the audience of different generations. Student researchers at Southwest Texas Junior College developed a questionnaire consisting of 17 overall questions separated into 2 groups. The first group of questions were directed towards a respondent's favorite Disney film and character as a child, whereas the second group of questions were directed towards gender roles and stereotypes. Observations and an interview were also conducted in an effort to gather interpretative data to analyze the connection between Disney gender roles and stereotypes and how they affect both males and females from different generations.

Keywords— Disney, equality, gender roles, stereotypes, The Walt Disney Company.

Authors are with Southwest Texas Junior College, Uvalde, TX 78801 USA (phone: 830-758-4146; phone: 830-758-5079; e-mail: vcastro@swtjc.edu, ommartinezii@swtjc.edu).

A Narrative of Nationalism in Mainstream Media: the US, China, and COVID-19

Rachel Williams, graduate student at International Christian University (racheldiane26@gmail.com)

Shiqi Yang, graduate student at International Christian University (montoprian@gmail.com)

Abstract

Our research explores the influence nationalism has had on media coverage of the COVID-19 pandemic as it relates to China in the United States through an inclusive qualitative analysis of two US news networks, Fox News and CNN. In total, the transcripts of sixteen videos uploaded on YouTube, each with more than 100,000 views, were gathered for data processing. Co-occurrence networks generated by KH Coder illuminate the themes and narratives underpinning the reports from Fox News and CNN. The results of in-depth content analysis with keywords suggest that the pandemic has been framed in an ethnopopulist nationalist manner, although to varying degrees between networks. Specifically, the authors found that Fox News is more likely to report hypotheses or statements as a fact; on the contrary, CNN is more likely to quote data and statements from official institutions. Future research into how nationalist narratives have developed in China and in other US news coverage with a more systematic and quantitative method can be conducted to expand on these findings.

I. Introduction

The COVID-19 pandemic and its upheaval have seen the rise of concerning political trends, particularly in the realm of nationalism [13]. The United States and China have entered a “narrative battle,” assigning blame to the other country for the pandemic’s spread [8]. As the media is one of the main vehicles for the dissemination of nationalism [2], this research seeks to examine how media messaging in the United States on China and the pandemic has developed in 2021 and fits into existing frameworks of nationalism through word frequency and co-occurrence analysis of a sample of news coverage from two major US networks, Fox News and CNN.

II. Literature Review

The concept of pervasive ambiguity, coined by Sandra Ball-Rokeach in 1973, describes the way people deal with situations that have yet to be defined socially. In such situations, people often work to resolve this ambiguity by attempting to define the situation at hand [1]. Tai & Sun (2007) explore the ways which media dependency, a theory developed by Ball-Rokeach and Melvin DeFleur in 1976, operates in crisis situations in which media information is limited [12]. To do this, they examine the 2003 SARS pandemic in China, finding that media-audience relationships can shift and change during a crisis situation as people seek to resolve the ambiguity they are facing by looking to the media for a definition of the situation. However, because of the uncertainty of pervasively ambiguous situations, the definitions of the situation provided by the media can be driven by a number of factors other than strict, factual information. Not only do people often draw on narratives in the social environment to make sense of things that happen around them, but the need to define situations such as the COVID-19 pandemic leaves room for politically-motivated definitions to arise and be propagated by both individuals and the media. Notably, the media is one of the primary ways nationalism is spread and reproduced within society, meaning that the ambiguity of the COVID-19 pandemic creates space for nationalistic explanations of the pandemic to arise [2].

This is arguably what has been observed with the pandemic so far. Particularly, in China and the United States, the pandemic has presented opportunities to vilify the other country in line with a long-standing mistrust of each other, and both governments have taken advantage of this [8]. Experts predicted that COVID-19 would lead to a rise in nationalism around the world, not solely in those two countries [13], but the US and China are important to examine because the countries have been embroiled in a “narrative battle” about the origin of, responsibility for, and response to the pandemic, attributing blame to each other [8].

That withstanding, the way nationalism operates is very different in the two countries. Jenne has made the argument that there are two distinct types of nationalism seen in the responses to the COVID-19 pandemic: “liberal nationalist” and “ethnopolitist” [9]. These two types of nationalism place an imagined community against foreign threats. “Liberal nationalism” does not exclude approaches that involve international cooperation and scientific methods for battling the pandemic, but it prioritizes the nation above other groups. This imagined community of the nation is more broadly defined in liberal nationalism than ethnopolitism; ethnopolitism both asserts that there is an ethnically-defined “true” nation within the boundaries of the nation-state and that elites are trying to compromise the nation from the inside. The true nation, as the word ethnopolitism suggests, is defined along ethnic, racial, or religious lines. Ethnopolitist anger can be directed against members of the nation who are not considered to be “elite” but might be construed as receiving privileges from the elites as part of the attack on the true nation. Both modes of the thought construct the virus as a foreign enemy that the nation must defend against. The main difference lies in where the lines between nation and enemy are drawn: outside the nation’s territory or inside.

Jenne’s work classifies the United States as ethnopolitist in the age of Donald Trump [9]. Historically, nationalism in the United States has arguably been defined civically, meaning the nation is characterized by shared values such as liberty and individual rights [2]; however, these authors would argue that, considering the way racial politics has influenced the development of the country, nationalism may have been defined overtly through civic participation, but there has long been a pattern of defining the nation in racial terms that exclude, among other groups, people of East-Asian descent [10]. Whatever the case, ethnopolitist nationalism is not the same as ethnic nationalism, which defines the nation through a shared history and culture [2], because ethnopolitist nationalism argues not only that there is a group that constitutes the “true nation” but that societal elites are betraying this group by elevating other groups. This leads to a mistrust of both other groups and members of the true nation’s own group [9].

The US is not the only country experiencing a rise in populist nationalism. Anti-Asian xenophobia has been growing in several countries in the Western world since the beginning of the COVID-19 pandemic [13]. During times of crisis, groups associated with the crisis are likely to have blame for the situation attributed to them [11]. For example, the United States has a long history of anti-Chinese sentiment linked to economic anxieties. In the late 1800s, immigration from China was perceived to challenge the job stability of low-wage workers during an economic downturn. Additionally, xenophobic rhetoric of the time asserted that Chinese people were unable to assimilate to American culture and life [15]. More recently, Donald Trump used rhetoric that evoked fears of rising Chinese power throughout his campaign for the US presidency. The perceived economic power of China bolstered Trump’s narrative that the “true nation” was being exploited by unfair trade deals, stroking xenophobic sentiments. Hinojosa Ojeda & Telles note that Trump’s popularity and, likely, the popularity of his ideals, was higher in parts of the US that were less directly impacted by trade with China [7]. Instead, they suggest that adherence to xenophobic ideals might be the product of media exposure, religious identity, racial anxieties, or other factors. If ethnopolitist nationalism is rising in the US, this indeed makes sense. In this mode of thought, Chinese people fall outside the constructed idea of the “true nation” and therefore cannot be trusted. This also aligns with the United States’s historical characterization of China as a malicious actor on the world stage [8]. Jaworsky & Qiaoan (2021) also argue that China took on the role of the victim while interacting with America and that America perceived China as a dangerous competitor while Trump simultaneously highlighted “the good relationship between the US and China” [8].

Word co-occurrence analysis of the news coverage in this article’s dataset suggests that the narrative battle has continued into the post-Trump era of US politics, articulating a narrative of ethnopolitist nationalism.

III. Research Questions

1. How is enthopopulist nationalism articulated in Fox News and CNN's China-related coverage of COVID-19?
2. What is the difference between the narratives presented by the two networks?

IV. Methodology

IV.1 Data Collection

In order to examine how coverage of the COVID-19 pandemic has evolved, qualitative content analysis was conducted. The authors collected the transcripts of 16 videos produced by FOX and CNN on YouTube. As FOX and CNN are the most influential mainstream media institutions in the US with 985 million and 1,420 million followers respectively. Each selected video was uploaded by the news network during the year 2021 and had been viewed more than 100,000 times. Where possible, transcripts of the news coverage was pulled from either the Fox News website or the website Transcripts CNN. This was done by searching for transcripts of news coverage that aligned with the date the relevant YouTube video had been posted and then listening to the video in order to see which parts of the transcript were representative of it. When this was not possible, the videos were run through a transcription generator and edited by the authors. Crucially, not all content in the videos was relevant to the topic, though each video chosen was selected for advertising COVID-19 and China in its title. Therefore, in order to process the data more effectively, only portions of the videos that were pertinent to the topic were entered into the dataset. The final dataset contained 28,020 words.

IV.2 Data Processing

The transcripts were processed by KH Coder, which is a content analysis software that assists in counting the frequency and revealing the co-occurrence between words [6]. The inclusive content analysis method was conducted to better understand the datasets' structure [14]. Before processing data, the author set a list of stop words several times before pre-processing to remove the meaningless words in datasets (for example, a/ an/ right/ wrong are words which usually cannot identify themes in the data). The KH Coder's processing method can lead to words that need to be to be analyzed together being separated; however, the software includes measures, such as the "mandatory picked words" function, to counter this. The author created word frequency charts for both networks. The co-occurrence network on KH Coder was used to demonstrate the cluster and theme existing on datasets. In the co-occurrence network, words with strong connections are highlighted with the same color and associated with the full line. Conversely, words with weak associations are connected with the dotted line. The different colors contribute to the identification of the disclosure themes on Fox News and CNN. To better understand the similarity and differences between Fox News and CNN, the "word-headings" variable was employed in the co-occurrence network analysis. The keywords that overlapped in Fox News and CNN's coverage are highlighted in grass green on the diagram (Figure 5).

V. Results and Discussion

Word co-occurrence analysis of the dataset reveals eleven clusters of keywords from Fox News and seven from CNN. It shows that included news coverage was primarily concerned with discussing the potential origins of the COVID-19 pandemic and the role the Chinese government may have played in suppressing that information. Both CNN and Fox News featured coverage that seriously contended with the possibility of COVID-19 having escaped from a virology lab in Wuhan, reflected through the frequency of keywords "Wuhan/ Lab/ Leak/ Chinese" seen in Figure 3 (Fox News) and "Wuhan/ Lab/ Origin/ China" in Figure 4 (CNN). More specifically, in the case of Fox News, this was treated with more certainty, but

anchors at CNN similarly expressed a desire to uncover the origins of the pandemic, presenting the subject as unsettled. This is also reflected in Figure 5; “opinion” and “theory” are among the most-used words in CNN’s coverage, while “fact” was used frequently at Fox News. CNN was also less likely to directly state or imply that the Chinese government would have been at fault for a leak. In Figure 1, the word co-occurrence graph for Fox News, “Chinese” and “government” are in the same cluster as words related to the lab-leak theory, such as “lab,” “Wuhan,” and “research.” CNN also made many references to the virology lab in Wuhan, but the words “Chinese” and “government,” which also were among the most frequently-used words, were found in a different cluster, associated with each other but not strongly associated with words related to theories of the pandemic’s origins (see Figure 4). This difference is also demonstrated by the networks’ respective word frequency charts. For example, on Figure 2, the word frequency chart for CNN, the top ten words are related to facts, such as the outbreak of COVID-19 beginning in China; on the other hand, the top ten keywords on Fox News indicate that the network’s coverage is more focused on politics, making mention of political figures and stressing that the virus leaked from a Chinese lab (“China” and “Lab” appear most frequently).

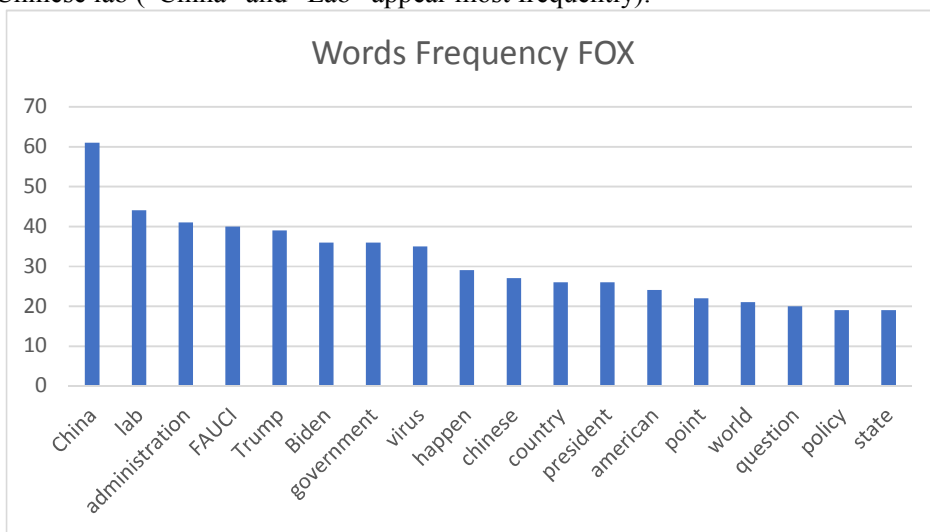


Figure 1: Top 20 Keywords Frequency of Fox News

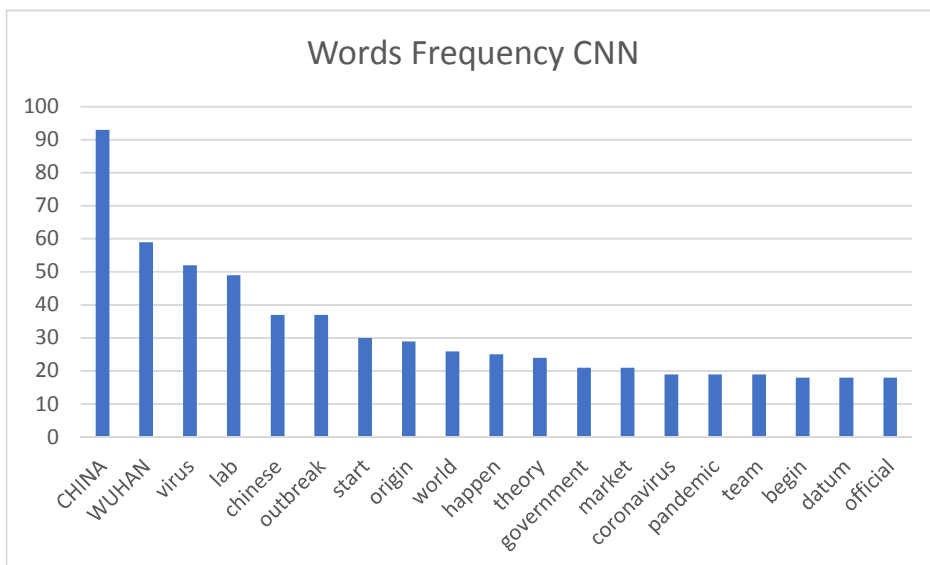


Figure 2: Top 20 Keywords Frequency of CNN

As CNN's Michael Smerconish acknowledges, COVID-19's origins became a partisan issue in the United States. Therefore, people who were not politically aligned with Donald Trump might have been inclined to dispute the lab leak theory (the idea that the virus that causes COVID-19 escaped from a virology lab in Wuhan as opposed to being transmitted from animals to humans) because Trump endorsed it [4]. While CNN's coverage was not hostile or even opposed to the lab leak theory, the position of CNN in the US political landscape and the network's critical stance towards Donald Trump could help explain these differences. Fox News, conversely, is generally aligned with Trump's politics; it is therefore unsurprising to see coverage on the network leaned heavily into ethnopopulist nationalist ideas, such as those suggesting that elites are betraying the "true nation." This is evidenced by the frequent references to political figures such as Dr. Anthony Fauci (Figure 1 & 3), the top infectious disease expert in the US, and presidents Biden and Trump.

In a particularly popular video showing coverage from the popular Fox News program "Tucker Carlson Tonight," the eponymous Carlson references CNN's interview with Robert Redfield, director of the Centers for Disease Control and Prevention (CDC) at the time of COVID-19's initial outbreak. Redfield stated in the interview that he believed that the novel coronavirus likely escaped from the virology lab in Wuhan, though he did not allege that this was at all deliberate. He explained that scientists working with respiratory viruses are at risk of catching said viruses and spreading them to other people and that he saw such a circumstance as more likely than zoonotic transmission [3]. Carlson played a short clip of Redfield's interview on his show, prefacing it with "And then they intimidated anyone who tried to tell the truth." Interestingly, the clip included in Carlson's program has Redfield saying that he is of the opinion that virus escaped from a lab; he says that other scientists disagree, and that it is alright because the answer will eventually be figured out. An interview Redfield did with Vanity Fair is later quoted in which he mentions having received death threats. However, Redfield does not suggest that his opinion is the truth. To Carlson's credit, CNN's John Berman and Sanjay Gupta acknowledge that the opinion of the former director of the CDC is not something to be taken lightly, but Gupta takes care to mention multiple theories of the virus's origin, including one that suggests US Military involvement. The CNN anchors ultimately do not assert an explanation as to the origins of the pandemic from Dr. Redfield's comments [3].

However, Carlson goes on to say that BuzzFeed had "*Thousands of e-mails showing that Tony Fauci knew from the beginning that COVID may have been manufactured in China in dangerous experiments he helped pay for.*" This suggests a direct link between the interests of powerful parties in the US and a misleading of the American public as to the origins and causes of the pandemic. The video's title on YouTube reads, "Tucker: why did they lie to us for so long." Carlson mocks the idea that the virus could have originated in a wet market and goes on to allege that Peter Dazak, a virologist who along with other scientists published a letter early in the pandemic saying that the virus originated from a wet market, was covering up his own culpability in the leaking of the virus from the Wuhan lab. Carlson says,

"These are Americans working to hide the truth of the origin of COVID-19 from a country that's been destroyed by COVID-19. You can't prevent outbreaks unless you know where they came from, and yet Federal bureaucrats prevented us from learning where this one came from [5]."

While this is one example of the coverage included in the datasets, it quite plainly shows how ethnopopulist nationalism is influencing the perception of the COVID-19 pandemic in the United States. CNN also entertained the idea that the American public was being misled or betrayed in relation to the pandemic, but this notion was not given a representative face in the same manner; though the network did interview Dr. Fauci when many of his emails were leaked to the public, his name was not used nearly as frequently on CNN as it was on Fox News.

These findings suggest that both networks, despite their differences in political affiliation, engaged in the narrative battle through ethnopopulist nationalist messaging, only differing in the certainty with which such ideas were presented.

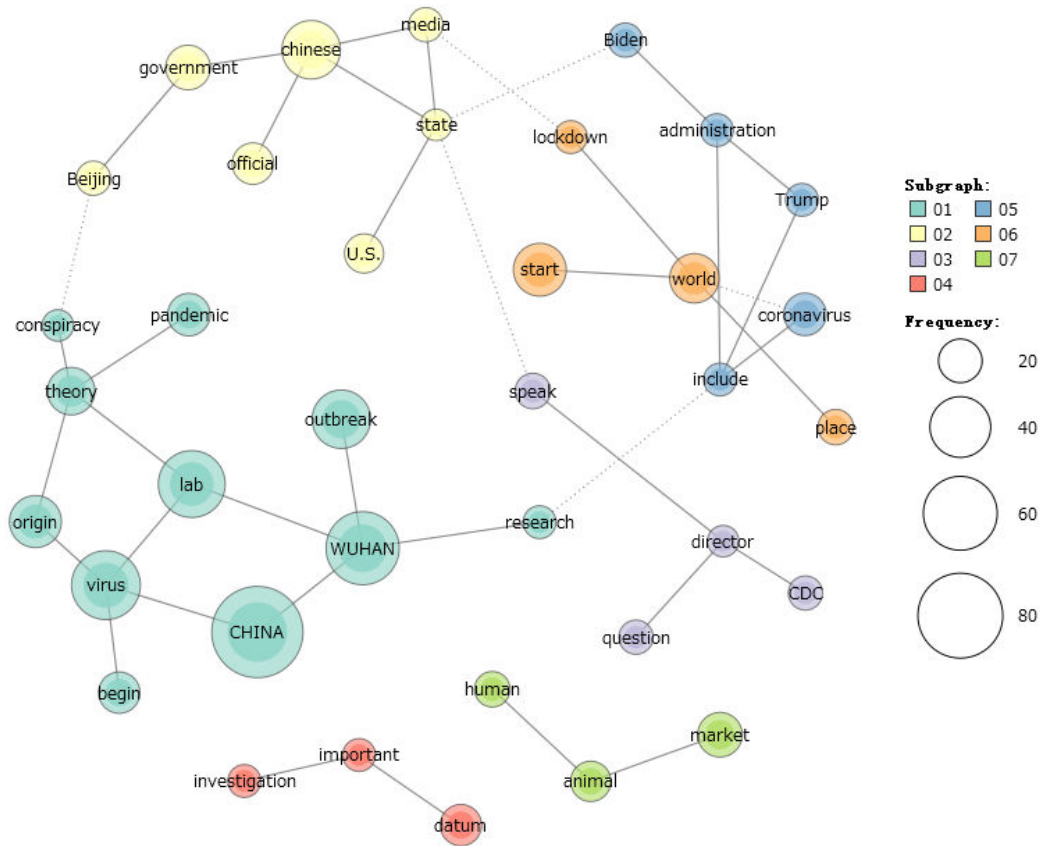


Figure 4: Co-occurrence Network Graph for CNN

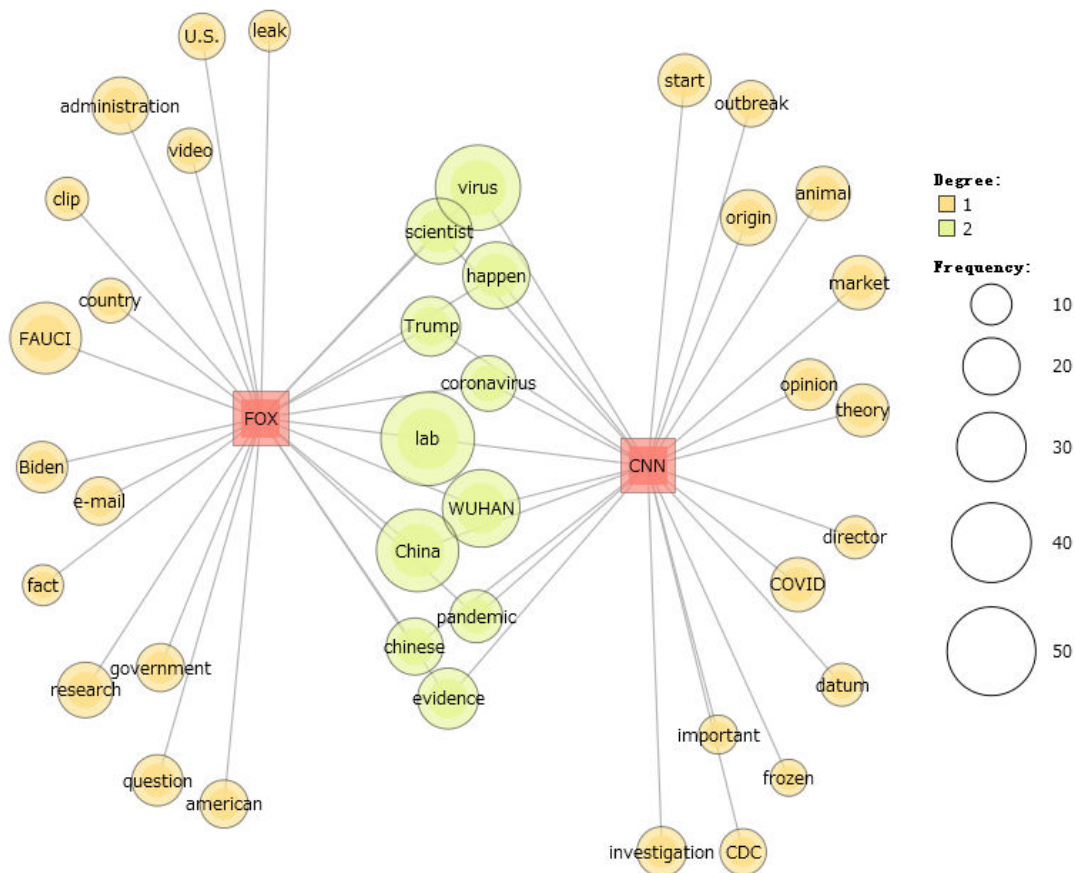


Figure 5: Co-occurrence Network comparison for Fox and CNN

VI. Limitations

This study only examines two US media networks. While CNN and Fox News are very popular within the United States, their coverage of the pandemic might not be representative of the way most journalists have framed the crisis; additionally, by choosing videos of popular coverage, the authors might have only been able to find that ethnopopulist nationalist messaging is popular with viewers. This study also is limited in that it does not explore all potentially relevant coverage on the pandemic from each network, and while it does explore the continuation of the narrative battle between the US and China, it only looks at media coverage inside the US. Continued research into how the narrative battle has developed in China is needed in order to provide a fuller picture of the ways nationalism is influencing this conflict.

References

- [1] Ball-Rokeach, S. J. (1973). From pervasive ambiguity to a definition of the situation. *Sociometry*, 36(3), 378. <https://doi.org/10.2307/2786339>
- [2] Chung, A. Y., Jo, H., Lee, J., & Yang, F. (2021). COVID-19 and the Political Framing of China, Nationalism, and Borders in the U.S. and South Korean News Media. *Sociological Perspectives*, 64(5), 747–764. <https://doi.org/10.1177/07311214211005484>
- [3] CNN. (2021e, March 26). *Ex-CDC boss believes Covid-19 virus came from China lab*. YouTube. Retrieved August 30, 2022, from https://www.youtube.com/watch?v=f0_RhfT21bw

- [4] CNN. (2021g, May 29). *CNN's Michael Smerconish calls out the politics of Covid-19 origin theories*. YouTube. Retrieved August 30, 2022, from <https://www.youtube.com/watch?v=QobQambBGIE>
- [5] Fox News. (2021f, June 4). *Tucker: Why did they lie to us for so long*. YouTube. Retrieved August 30, 2022, from <https://www.youtube.com/watch?v=32V-e7saq60>
- [6] HIGUCHI, K. (2017a, August 3). A.5.10 [Hierarchical Cluster Analysis] of words. In *KH Coder 3 Reference Manual* (p. 50). <https://kncoder.net/en/>
- [7] Hinojosa Ojeda, R., & Telles, E. (2021). Trump paradox: How immigration and trade affected white voting and attitudes. *Socius: Sociological Research for a Dynamic World*, 7, 237802312110019. <https://doi.org/10.1177/23780231211001970>
- [8] Jaworsky, B. N., & Runya, Q. (2021). The politics of blaming: The narrative battle between China and the US over COVID-19. *Journal of Chinese Political Science*, 26(2), 295-315. <https://doi.org/10.1007/s11366-020-09690-8>
- [9] Jenne, E. (2022). Varieties of Nationalism in the Age of Covid-19. *Nationalities Papers*, 50(1), 26-44. doi:10.1017/nps.2021.104
- [10] Merida, T. (2020). A Japanese Anomaly: Theodore Roosevelt and Japan's Racial Identity at the Turn of the Twentieth Century. *The Asia-Pacific Journal: Japan Focus*, 18(20). <https://apjif.org/2020/20/Merida.html>
- [11] Nguyen, T.C., Croucher, S.M., Diers-Lawson, A., & Maydell, E. (2021). Who's to blame for the spread of COVID-19 in New Zealand? Applying attribution theory to understand public stigma. *Communication Research and Practice*, 7, 379 - 396.
- [12] Tai, Z., & Sun, T. (2007). Media dependencies in a changing media environment: The case of the 2003 SARS epidemic in China. *New Media & Society*, 9(6), 987–1009. <https://doi.org/10.1177/1461444807082691>
- [13] Woods, E. T., Schertzer, R., Greenfeld, L., Hughes, C., & Miller-Idriss, C. (2020). Covid-19, Nationalism, and the politics of crisis: A scholarly exchange. *Nations and Nationalism*, 26(4), 807–825. <https://doi.org/10.1111/nana.12644>
- [14] Yang, Y., & Chen, X. (2020, September 16). Globalism or Nationalism? The Paradox of Chinese Official Discourse in the Context of the COVID-19 Outbreak. *Journal of Chinese Political Science*, 26(1), 89–113. <https://doi.org/10.1007/s11366-020-09697-1>
- [15] Young, J. G. (2017). Making America 1920 again? nativism and US immigration, past and present. *Journal on Migration and Human Security*, 5(1) <https://www.proquest.com/scholarly-journals/making-america-1920-again-nativism-us-immigration/docview/1931263153/se-2?accountid=10105>

Controlled Digital Lending, Equitable Access to Knowledge and Future Library Services

Xuan Pang, Alvin L. Lee, Peggy Glatthaar

Abstract— Libraries across the world have been an innovation engine of creativity and opportunity in many decades. The on-going global epidemiology outbreak and health crisis experience illuminates potential reforms, rethinking beyond traditional library operations and services. Controlled Digital Lending (CDL) is one of the emerging technologies libraries used to deliver information digitally in support of online learning and teaching and make educational materials more affordable and more accessible. CDL became a popular term in the United States of America (USA) as a result of a white paper authored by Kyle K. Courtney (Harvard University) and David Hansen (Duke University). The paper gave the legal groundwork to explore CDL: Fair Use, First Sale Doctrine, and Supreme Court rulings. Library professionals implemented this new technology to fulfill their users' needs. Three libraries in the state of Florida (University of Florida, Florida Gulf Coast University, and Florida A&M University) started a conversation about how to develop strategies to make CDL work possible at each institution. This paper shares the stories of piloting and initiating a CDL program to ensure students have reliable, affordable access to course materials they need to be successful. Additionally, this paper offers an overview of the emerging trends of Controlled Digital Lending in the USA and demonstrates the development of the CDL platforms, policies, and implementation plans. The paper further discusses challenges and lessons learned and how each institution plans to sustain the program into future library services. The fundamental mission of the library is providing users unrestricted access to library resources regardless of their physical location, disability, health status, or other circumstances. The professional due diligence of librarians, as information professionals, is to make educational resources more affordable and accessible. CDL opens a new frontier of library services as a mechanism for library practice to enhance user's experience of using libraries' services. Libraries should consider exploring this tool to distribute library resources in an effective and equitable way. This new methodology has potential benefits to libraries and end users.

Keywords— controlled digital lending, emerging technologies, equitable access, collaborations.

Natural Learning Model: Disruption in Education Paradigm

Pramod Maithil

Abstract— At elementary school level, quality education can be achieved if the agency of children is given space in their education. We need to believe in children, accordingly change the education design and methods. We require developing activities, materials, processes so that the diversity among children becomes an asset and can add value in the learning environment. Let the children learn according to their interest and at their pace and grow in an environment of trust, responsibility and freedom.

I have been exploring possibilities in this for the last 11 years. My Insight from all these exploration and experience is a method, I named Natural Learning Model. I propose this alternative perspective for education in which each child has her way of doing things and learns at her pace and interest.

Keywords— natural leaning, pedagogy, education practitioner, experience, teacher, tinkering.

Successful Public-Private Partnership through the Impact of Environmental Education - A Case Study on Transforming Community Conflict into Harmony in the Dongpian Community

Men An Pan¹, Ho Hsiung Huang², Jui Chuan Lin¹, Tsui Hsun Wu^{1,*}, Hsing Yuan Yen¹

¹ Pingtung County Government, Taiwan

² Dongpian Gemstone Village Co., Ltd.

Abstract—Pingtung County, located in the southernmost region of Taiwan, has the largest number of pig farms in the country. In the past, livestock operators in Dongpian Village discharged their wastewater into the nearby waterbodies, causing water pollution in the local rivers and polluting the air with the stench of the pig excrement. These resulted in many complaints from the local residents. In response to the long time fighting back of the community against the livestock farms due to the conflict, the County Government's Environmental Protection Bureau (PTEPB) examined potential wayouts in addition to heavy fines to the perpetrators. Through helping the livestock farms to upgrade their pollution prevention equipment, promoting the reuse of biogas residue and slurry from the pig excrement, and environmental education, the conflict was successfully resolved. The properly treated wastewater from the livestock farms has been freely provided to the neighboring farmlands via pipelines and tankers. Thus, extensive cultivation of bananas, papaya, red dragon fruit, Inca nut, and cocoa has resulted in 34% resource utilization of biogas residue as a fertilizer. This has encouraged farmers to reduce chemical fertilizers and used microbial materials like photosynthetic bacteria after banning herbicides while lowering the cost of wastewater treatment in livestock farms and alleviating environmental pollution simultaneously. That is, the livestock farms fully demonstrate the determination to fulfill their corporate social responsibility (CSR).

Due to the success, Eight farms jointly established a social enterprise - "Dongpian Gemstone Village Co., Ltd." to promote organic farming through a "shared farm". The company appropriates 5% of its total revenue back to the community through caregiving services for the elderly and a fund for young local farmers. The community adopted the Satoyama Initiative in accordance with the Conference of the CBD COP10. Through the positive impact of environmental education, the community seeks to realize the coexistence between society and nature while maintaining and developing socio-economic activities (including agriculture) with respect for nature, and building a harmonic relationship between humans and nature. By way of sustainable management of resources and ensuring biodiversity, the community is transforming into a socio-ecological production landscape. Apart from nature conservation and

watercourse ecology, preserving local culture is also a key focus of the environmental education. To mitigate the impact of global warming and climate change, the community and the government have worked together to develop a disaster prevention and relief system, strive to establish a low-carbon emitting homeland, and become a model for resilient communities. By the power of environmental education, this community has turned its residents' hearts and minds into concrete action, fulfilled social responsibility, and moved towards realizing the UN SDGs. Even though it is not the only community to integrate government agencies, research institutions, and NGOs for environmental education, it is a prime example of a low-carbon sustainable community that achieves more than 9 SDGs, including responsible consumption and production, climate change action, and diverse partnerships. The community is also leveraging environmental education to become a net-zero carbon community targeted by COP26.

Keywords—environmental education, biogas residue, biogas slurry, CSR, SDGs, climate change, net zero carbon emissions

* Corresponding author: phone: 886-8-7351921; fax: 886-8-7351909; e-mail: wucx@mail.ptepb.gov.tw.

The Integration and Practice of Indigenous Knowledge System and Sustainable Environmental Education Concept

Shih-Tsung Chen

Pingtung county Evergreen Lily Elementary School /Princial

Yenchin Hsiao

Pingtung county *Timur* Elementary School/ Teacher

Abstract

Evergreen Lily is a newly-built school after Morakot typhoon took place. The school is located in Majia farm which is surrounded by mountains. The fund in construction of school is solely sponsored by Chang Yung-Fa Foundation. There are 483 permanent houses near the school belonging to three tribes, Dashe, Majia and Haocha. Due to the most ancient heritages of Paiwan and Rukai in these three tribes, the school is full of cultural atmosphere. In modern and traditional perspectives, Evergreen Lily strives to establish and develop a long-lasting educational model to meet the expectation of the tribes, parents and the public.

This study is a case study of how to develop indigenous education in newly established schools after the Morakot Hurricane disaster to meet the concept of environmental education. The systematic curriculum construction of education and cultural integration and the systematic practice of curriculum practice will be discussed, and the concept and practice of tribal education curriculum and sustainable environmental education will be understood.

This study found that this school integrates the spirit of natural philosophy, democratic education, ethnic and experimental education, and constructs a knowledge system that includes three levels of spiritual culture, institutional culture and material culture, as well as six dimensions of life philosophy, natural ecology, organizational system, tribal literature and history, song and dance, and technical and artistic methods. Adhering to the concept of harmonious education and sustainable common good, the development of school-based tribal academic courses accounts for about one-third of the total number of teaching sessions, and there are different cultural themes in grades one to six, and there are clear teaching modules to effectively enhance students' potential inspiration. The complete curriculum implementation model can be described as a model for the development of indigenous schools to sustainable environmental education.

Keywords: environmental education, indigenous education, sustainable development, school-based curriculum

Promoting Teaching and Learning Structures Based on Innovation and Entrepreneurship in Valahia University of Targoviste

Gabriela Teodorescu, Ioana Daniela Dulama

Abstract— In an ever-changing society, the education system needs to constantly evolve to meet market demands. During its 30 years of existence, Valahia University of Targoviste (VUT) tried to offer its students a series of teaching-learning schemes that would prepare them for a remarkable career. In VUT, the achievement of performance through innovation can be analyzed by reference to several key indicators (i.e., university climate, university resources and innovative methods applied to classes), but it is possible to differentiate between activities in classic format: participate to courses; interactive seminars and tutorials; laboratories, workshops, project-based learning; entrepreneurial activities, through simulated enterprises; mentoring activities. Thus, VUT has implemented over time a series of schemes and projects based on innovation and entrepreneurship, and in this paper some of them will be briefly presented. All these schemes were implemented by facilitating an effective dialog with students and the opportunity to listen to their views at all levels of the University and in all fields of study, as well as, by developing a partnership with students setting out priority areas. VUT demonstrates innovation and entrepreneurial capacity through its new activities for higher education, by which will attract more partnerships and projects dedicated to students.

Keywords—Romania, project-based learning, entrepreneurial activities, simulated enterprises.

Acknowledgements—This work was supported by project CNFIS-FDI-2022-0016 entitled “Institutional development and increasing of competitiveness through international cooperation”, in the frame of Future Entrepreneur Center (VUT).

G. T. is with the Valahia University of Targoviste, Faculty of Environmental Engineering and Food Science, 130004 Targoviste, Romania (e-mail: gabriela.teodorescu@valahia.ro).

I.D.D. is with the Valahia University of Targoviste, Institute of Multidisciplinary Research for Science and Technology, 130004 Targoviste, Romania (e-mail: Dulama.ioana@icstm.ro).

Linguistic Politeness in Higher Education Teaching Chinese as an Additional Language

Leei Wong

Abstract—Changes in globalized contexts precipitate changing perceptions concerning linguistic politeness practices. Within these changing contexts, misunderstanding or stereotyping of politeness norms may lead to negative consequences such as hostility or even communication breakdown. With China's rising influence, the country is offering a vast potential market for global economic development and diplomatic relations and opportunities for intercultural interaction, and many outside China are subsequently learning Chinese. These trends bring both opportunities and pitfalls for intercultural communication, including within the important field of politeness awareness. One internationally recognized benchmark for the study and classification of languages – the updated 2018 CEFR (Common European Framework of Reference for Language) Companion Volume New Descriptors (CEFR/CV) – classifies politeness as a B1 (or intermediate) level descriptor on the scale of Politeness Conventions. This provides some indication of the relevance of politeness awareness within new globalized contexts for fostering better intercultural communication. This study specifically examines Bald on record politeness strategies presented in current beginner TCAL textbooks used in Australian tertiary education through content-analysis. The investigation in this study involves the purposive sampling of commercial textbooks published in America and China followed by interpretive content analysis. The philosophical position of this study is therefore located within an interpretivist ontology, with a subjectivist epistemological perspective. It sets out with the aim to illuminate the characteristics of Chinese Bald on record strategies that are deemed significant in the present-world context through Chinese textbook writers and curriculum designers. The data reveals significant findings concerning politeness strategies in beginner stage curriculum, and also opens the way for further research on politeness strategies in intermediate and advanced level textbooks for additional language learners. This study will be useful for language teachers, and language teachers-in-training, by generating awareness and providing insights and advice into the teaching and learning of Bald on record politeness strategies. Authors of textbooks may also benefit from the findings of this study, as awareness is raised of the need to include reference to understanding politeness in language, and how this might be approached.

Keywords—linguistic politeness, higher education, Chinese language, additional language.

Preparation of Papers - A Review of Critical Thinking Formative Assessment Framework: Coping with Teachers Resistance to Critical Pedagogy

CH. Wang, CB. Lee*

Abstract—The practice of critical pedagogy is challenged by resistance from teachers. This study presents a discussion on teachers resistance to the critical pedagogy and previous practical frameworks for assessing critical thinking in formative assessment in the classroom through a critical review of the related literature. The authors found out that the main issue of teachers resistance is not whether teachers should possess theoretical knowledge of critical thinking, but how they apply that knowledge in their classroom teaching. In addition, critical thinking in formative assessment may provide teachers with a comprehensive understanding of critical pedagogical planning, implementing and reflecting. Therefore, this paper intends to discuss a practical step-by-step framework for critical thinking formative assessment to address this resistance. Such discussion is based on a thorough examination of the related theories and frameworks. This review paper will benefit teachers in understanding and reducing their resistance to critical pedagogy as well as in implementing critical pedagogy.

Keywords—critical thinking; critical pedagogy; critical thinking formative assessment framework; teachers resistance;

CH. Wang is with the Western Sydney University, Sydney and with Jilin Business and Technology College (phone:+610412512823; e-mail:90955143@westernsydney.edu.au)

CB. Lee (Corresponding Author) is with the Western Sydney University (phone:+612 47360719 email:chwee.lee@westernsydney.edu.au)

Rethinking Higher Education Unit Design: Embedding Universal Design for Learning in Online Studies

Traci-Ann Garrad, University of New England, Australia
Huw Nolan, University of New England, Australia

Introduction

Universities are increasingly attracting candidates from varied cultural and linguistic backgrounds, age ranges and socioeconomic backgrounds, inclusive of students with disability (Burgstahler, 2015; McCall et al., 2020). In response to the needs of non-traditional students or diverse learners, universities globally have increased their online course offerings, transforming the face of higher education (Stone, 2019). Despite the continued evolution of post-secondary education from traditional paper-based teaching methodologies to the use of flexible digital technologies, high online learning student attrition rates persist (Coussement et al., 2020). Several reasons have been posited for this phenomenon, including poor course design, low levels of facilitation of learning, and students' ineffective engagement (Eliasquevici et al., 2017; Hammond & Shoemaker, 2014; Pinchbeck & Heaney, 2017). Nevertheless, proactive frameworks can support the engagement, access, and facilitation of students' learning in an online environment, ensuring equity and inclusivity (Florian & Linklater, 2010).

Online Learning in Higher Education Environments

The term online learning is synonymous with e-Learning, web-based learning, internet learning, and computer-assisted learning, to name just a few. All these terms have a commonality: online learning is characterised as a flexible mode of learning that involves the use of information and communication digital technologies and electronic media for educational purposes (Rodrigues et al., 2019). Developments in digital technologies have allowed for greater degrees of flexibility in information representation, expression and engagement. However, it is crucial to appreciate that access to educational materials through digital technologies does not guarantee learning barriers are automatically overcome. Simply transforming traditional materials into electronic or digital resources does not directly address diversity; instead, it simply transfers the barriers associated with traditional print materials to the online learning environment (McGhie-Richmond & Howrey, 2014).

Online learning environments are most successful when intentional instructional design decisions are made to maximise access to learning for students in a way that has not been possible in previous decades due to advances in digital technology (Hiltz & Goldman, 2004). For instance, digital technologies have allowed for greater control and manipulation of written text factors such as font size, colour, and contrast settings. The ability to embed hyperlinks, additional multimedia components and screencasts have helped support learners in their comprehension and ability to reach learning objectives. The creation of documents and textbooks accessible as text-to-speech enables ease of access and availability of such resources and diminishes the need for transcript services. These advances have helped enhance the learning opportunities of distance students in a fully online environment as they enable lecturers to provide multiple modes or representations of the course materials and provide students multiple pathways and flexibility to engage in their learning.

Universal Design for Learning (UDL) is one such framework for supporting the planning and implementation of such efficacious approaches. UDL in education evolved from the principles of Universal Design in architecture, which became popular towards the latter end of the 1990s by promoting readily accessible buildings for individuals of all abilities (Rose & Meyer, 2002). As Universal Design in architecture works to remove or lower access barriers to physical spaces, UDL works to remove or lower barriers to access curriculum content and increase participation in learning to meet students' varying learning needs. In education from early childhood through to higher education studies (Ashman, 2010; Fovet, 2020; Hayward et al., 2020; Lowrey et al., 2017). The UDL instructional framework is a proactive approach to support the facilitation of today's diverse learners, including, but is not limited to attributes such as age, ethnicity, socioeconomic status, ability, and gender (Edyburn, 2010; Meyer et al., 2014)

Developed and updated by the Center for Applied Special Technology (CAST, 2018), the UDL framework encompasses three core dimensions: limiting or reducing barriers to learning, multiple means of engagement, multiple means of representation, and multiple means of action expression. Multiple Means of Engagement address the "why" of learning, recognising that learners differ significantly in how they are motivated or can be engaged in the learning process. This includes intrinsic and extrinsic motivational factors such as individual neurological capacities, cultural expectations, interests and background knowledge, and the degree to which they engage in or avoid social constructivist learning environments. Multiple Means of Representation focuses on the "what" of learning, the ability to access information in formats that appeal or are relevant to them. Sometimes these approaches might be dictated by specific needs, such as students with sight impairment. Students might also demonstrate a preference for learning, such as students who learn through visual means rather than reading a text. The provision of multiple forms of representation reinforces within and between concepts and increases the likelihood that one or more representations will be accessible for the learner. Multiple Means of Action and Expression addresses the "how" of learning, which requires flexibility or choice in how learners can apply the newly acquired information and demonstrate their learning. For instance, students who may struggle to construct formal written texts due to language barriers may be capable of an oral examination on content, providing them with the ability to express their learning. It is important to note, that while the aims of the UDL framework may infer success in these areas, one must not assume it to be so. Research into UDL is ongoing and its application to different contexts and demographic groups is a growing area of study.

Previous research has examined the impact of different aspects of UDL implementation across educational contexts. For example, examining UDL efficacy across formal educational levels from the pre-school years through to high school in inclusive education environments (Lieber et al., 2008; Rappolt-Schlichtmann et al., 2013). Research has focused on the positive social and academic outcomes of students with a range of disability in inclusive education environments (Marino, 2009; Marino et al., 2014; Rappolt-Schlichtmann et al., 2013). Examination of the impact of UDL within specific curriculum contexts such as literacy and numeracy for learners from diverse backgrounds (Kennedy et al., 2014; Kortering et al., 2008). The recorded benefits to date for UDL in higher education have shown it is a sustainable and efficacious framework for supporting students' engagement and outcomes with disabilities, Indigenous students, and those who are the first-in-family (Fovet, 2020). However, there is a paucity of research in the area of online learning in higher education environments in Australia (Cumming & Rose, 2021), and as such, exploration of a broader application of UDL for the

engagement of students in the online higher education context is still required to confidently promote uptake of this approach.

To explore the potential impact of UDL in an online, higher education context, intentionally planned strategies and resources were embedded in the course delivery features of an existing academic module on inclusive education. Within the module, the three core dimensions of UDL (Multiple Means of Engagement, Multiple Means of Representation and Multiple Means of Expression) aimed to minimise barriers to accessibility of learning to increase student engagement and lower student attrition rates within the unit.

Method

Following approval from the Human Research Ethics Committee [# HE21-003], student cohorts for the academic module were separated into pre-UDL and post-UDL depending on the year in which the module was studied. The study used a pre-test–post-test quasi-experimental design to examine differences between the pre-UDL, and post-UDL student cohorts. Cleaned Learning Management System (LMS) and Business Intelligence data on student satisfaction, student engagement and retention were analysed.

Participants

The learning analytics data from 107 undergraduate, initial teacher education students enrolled in a 4-year Bachelor of Education program at a regional Australian university were examined. Data was not examined until the unit was completed and all grades were submitted. Student user names were replaced with anonymous identifiers.

Module Design

Post-UDL unit design elements included pre-recorded lecture materials (i.e., teacher-made videos) created to teach key course concepts. All pre-recorded lectures included oral narration accompanied by a Prezi presentation, graphic elements (e.g. images, diagrams), and videos that further illustrated the concepts covered. Pre-recorded lectures were made available through an embedded link to YouTube to provide students with the opportunity to access English closed captioning services. Lecture videos were also compressed through a readily available web program to minimise the recordings' file size. File sizes were reduced to ensure students in low internet bandwidth areas could access the recordings, or students could download the recordings easily to watch and review “offline” where required.

The pre-recorded lectures could be viewed in full, in part, and repeatedly for review, clarification, supporting the comprehension of the core concepts, and study aid for topic quizzes and the written assessment pieces. Also, downloadable lecture resources were made available to students. These included lecture transcripts (in both Word and Adobe PDF formats), an audio-only recording of the lecture, and a copy of the Prezi presentation slides. Providing text documents meant that students could self-customise the content by manipulating the font size, font type, layout or any other aspect that enhances accessibility for the individual. Multiple text formats also enable the use of text to speech software for greater accessibility to the unit materials. These design elements worked to address the core UDL dimension of Multiple Means of Representation (the way in which students are offered information and resources). All students had access to the required software for each design element.

In addressing the core dimension of Multiple Means of Engagement (a students' affective connection to and with the content of instruction), flexibility was addressed through access to the LMS from any device, at any time, from any place. The flexibility of engagement was extended using online quizzes as a mechanism for self-pacing of study (hurdle quizzes). Students could log in at any time to complete the topic module quizzes. To unlock the next topic in the learning sequence, students needed to achieve a passing grade set at seven out of 10. Students could take the quiz as many times as required to meet the passing grade. This allowed post-UDL students to work through the unit at a pace that suited them, without waiting for the release of content. By contrast, the pre-UDL cohort had new materials made available on a weekly schedule.

The core dimension of Multiple Means of Representation was addressed in several ways. Students were provided with the choice of the focus and context of their assignment. This included choosing one out of four psychological theories that impact learners to explore in the first assignment. Students could also contextualise their reflections based on the context of their future or prospective teaching environment; early childhood, primary, middle or high school. Choice was provided in the second assignment of the unit where students could select any one of 27 defined efficacious intervention practices (see (Wong et al., 2015) that could be employed to meet diverse learners' needs in classroom environments. In addition, students could choose to submit a formal written essay, a PowerPoint Presentation or a recorded oral presentation.

Table 1

Pre and Post-UDL Unit Design Elements

Pre-UDL	Post-UDL
Pre-recorded lecture of oral material	Pre-recorded lecture including supplementary materials such as subject videos and visuals Lecture slides Lecture transcript (MS Word & Adobe PDF) Closed captioning Video compression Audio only version of the lecture
Weekly release of unit materials	Self-paced learning Hurdle quizzes at topic completion
Two written assessments on a single pre-defined topic	One written assessment with a choice of four foci One assessment with a choice of 27 foci Choice of educational education context Choice of presentation format and style

Data Collection Procedure

Moodle, a Learning Management System (LMS) platform, was used to support the organisation and delivery of an online learning space hosting the unit materials (Moodle.org). This LMS platform enabled the storing and administration of the digital instructional resources and track and monitor individual student's interactions with the instructional resources. The log files produced in Moodle were used to examine student engagement with the course's digital components and included the frequency of access and student actions on the course site (e.g.,

resource and information views, lecture views, and downloads). Learning analytics are commonly used to discern patterns in the collected data from an LMS to explore the number of time students spend online, amongst other considerations (You, 2016).

Measures

Students engaged with various access and content learning features that specifically address the modelling of the three core UDL dimensions; Multiple Means of Representation, Multiple Means of Engagement and Multiple Means of Expression. Student engagement was operationalised as the number of times students logged in and interacted with the specified unit's digital content. This included accessing resources, completing quizzes, viewing lecture materials and participating in online discussion forums (Henrie et al., 2015). This was determined through the LMS log file that records student behaviours allowing for the examination and measurement of the regularity of engagement with the online learning environment.

At the end of each teaching period students are encouraged to complete a unit evaluation form online. A number of factors were analysed that aligned with the unit design elements addressing UDL. These included the provision of resources, levels of intellectual stimulation, the efficacy of the unit in supporting students to achieve the learning outcomes and overall satisfaction levels. Ratings are collected against specific statements on a five-point Likert-scale ranging from 1 (strongly disagree) to a maximum of 5 (strongly agree).

Student attrition is the difference between the number of students who commence a unit of study and those who complete the study unit. Student attrition is calculated as the ratio of commencing and completing students.

Data Analysis

A one-sample t-test comparing login rates over the trimester between the pre-UDL engagement and post-UDL design individual student engagement was undertaken to examine the impact, if any existed, between the UDL unit design and student engagement rates. This approach was deemed the most appropriate given that the university's LMS data cleaning process restricted data collection of historical individual student engagement calculations.

Unit evaluation scores were compared pre- and post-UDL. Overall engagement rates were available for the unit's previous year, and individual student engagement rates remained accessible for the current year. Descriptive data are reported for the overall percentage of student attrition.

Results

Engagement

A one-sample t-test was used to compare the engagement rates post-UDL unit design of a cohort of 104 undergraduate teacher education students ($M=701.45$, $SD=14.80$) against the pre-UDL ($n=102$) average of 2973.90. The post-UDL unit design students interacted with the unit resources 2272.0, 95% CI [2301,2243] more times than the pre-UDL unit design cohort. The difference was found to be significant, $t(103)=-153.60$, $p<.001$. $d=3.02$,

Unit Evaluation Outcomes

Overall, there was a notable increase in the mean unit satisfaction factor scores collected as part of the unit evaluation. The mean satisfaction score for pre-UDL was 3.91/5.00 compared to 4.91/5.00 in the post-UDL cohort (Table 2). Students were asked to evaluate the unit and lecturer with a set of predetermined questions. Lecturers have no input to the question selection.

Table 2

Comparison of Student Evaluation Scores between Pre- and Post-Universal Design for Learning (UDL) Student Cohorts (1.00=highly unsatisfied-5.00=highly satisfied)

	Pre-UDL	Post-UDL
The learning outcomes of this unit were made clear to me	4.09	4.88
The unit enabled me to achieve the learning outcomes	4.00	4.75
The unit was intellectually stimulating	3.91	4.88
I found the resources provided for the unit (eg online, print) to be helpful	3.64	5.00
The overall amount of work required of me for this unit was appropriate	3.70	4.88
The lecturer made effective use of teaching aids and media where appropriate	3.73	4.88
Overall, the lecturer was highly effective in facilitating my learning	4.18	5.00
Overall, I was satisfied with the quality of this unit	3.73	4.88

Student Attrition Rates

Student attrition rates more than halved between the pre-UDL and post-UDL cohorts (15.73% and 7.09% respectively).

Discussion

The implementation of UDL as the unit design framework in an inclusive education unit resulted in a significant increase in student engagement rates, unit satisfaction factor ratings and a noticeable decrease in student attrition when compared to the pre-UDL cohort. As such, this is an encouraging framework for implementation to improve students' engagement in learning and retention rates of students in higher education online learning environments. The difference in engagement rates was significant given that pre-UDL students logged into and interacted with the unit resources a total of 29,739 times compared with the post-UDL total of 72,951. It is insufficient to draw too heavily on LMS data alone. Not all clicks translate to meaningful engagement. Similarly, the ability to draw on multiple modes of engagement might reduce the number of clicks. For instance, students might download materials once for the trimester so they can study offline at their own pace. Future studies will benefit from interviews specific to their experiences studying a unit with embedded UDL principles.

In the post-UDL unit design, student engagement was increased by using multiple means of representation of the unit materials. Informal feedback from students throughout the teaching period indicated that the ability to download audio recordings resulted in greater student accessibility of the lectures during drive time, including to and from their usual place of employment. Students were also able to download the lecture transcripts, which they commented helped them to take notes and follow the recorded lecture materials, highlighting key points and concepts more easily than taking handwritten notes. These outcomes speak to a more meaningful translation and accessibility of learning materials through digital technology (McGhie-Richmond & Howrey, 2014). This was further reflected in the unit satisfaction

evaluation ratings with an increase from 3.64 to a maximum rating of 5.00 concerning the unit resources made available to the students. In addition, students rated the effective use of teaching aids and media by the lecturer at 4.88 compared with the pre-UDL rating of 3.73.

Multiple Means of Engagement were represented through the accessibility of the LMS at any time, housing the unit resources and the summative topic quizzes. The students highly valued the ability to self-pace. As previously discussed, the demographics of 21st Century online higher education students has shifted significantly (Stone, 2019). At this university, a large proportion of the student cohort balances work, family, and study, including part-time enrolment. Having the ability to self-pace through units of work means students can better accommodate the workload of the unit at a time and place that suits individuals' schedules and competing responsibilities. Rather than having to wait for a weekly schedule of accessible topic materials, the hurdle quizzes allowed students to complete the topic in their time. The hurdle quizzes did not contribute to the unit's overall grades; instead, they ensured students had engaged with the lecture materials and readings before commencing to the next topic in the learning sequence. Students needed to gain a passing grade of seven out of 10 to unlock the unit's next topic. Informal feedback was highly positive. Students enjoyed the flexibility offered by self-pacing and also having the opportunity to check their understanding of the content as they progressed. Some students reported taking the hurdle quiz at the beginning of the topic and then at the end of the topic to compare their progress and understanding. There was also a considerable increase in the unit satisfaction rating by students reflecting their engagement as recorded in the intellectual stimulation (3.91 to 4.88) and the overall satisfaction ratings for the unit (3.73 to 4.88).

Measuring the impact of Multiple Means of Expression was problematic. Informal feedback indicated that students enjoyed a level of flexibility in being provided with a choice of topics to address in the unit's written assessment components. However, there was no direct unit evaluation factors to compare. Correspondence and face-to-face discussion elicited informal comments around the ability to choose a focus topic supporting greater relevance with students' proposed teaching contexts and interests. Students felt that the approach supported greater motivation throughout the assessment writing process and such strategies were likely to have contributed to the high overall satisfaction rating from the unit (4.88). To address this aspect in future studies, a short survey could be embedded in the LMS to collect ratings on the aspects addressing flexibility to better explore the impact of Multiple Means of Expression.

Student attrition decreased by 8.64% from 15.73% pre-UDL to 7.09% post-UDL. According to the Tertiary Education Quality Standards Agency (2020) the Australian national attrition average stands at 15.18% in higher education. The unit attrition rate of 7.09% is therefore substantially lower than the national rate. Given the comparison in unit satisfaction ratings between the pre- and post-UDL unit design intervention, it is plausible that the enhancements that impacted on increased student engagement, also decreased student attrition rates. Students rated the ability of the lecturer to effectively facilitate learning as 5.00, compared with the 4.18 in the pre-UDL design unit offering. The correlative relationship between attrition and UDL remains insufficient to claim causation. However, given it was the same lecturer teaching during the two unit offering timeframes, this would support the impact of UDL in supporting greater student engagement, higher levels of overall unit satisfaction ratings and the lower attrition rates. Further research is needed to improve our understanding of student attrition and how UDL may influence it.

It was not practicable to create a true experimental scenario, and so the statistical viability of the conclusions are not without their limitations and must be interpreted with caution. However,

as a preliminary study into the impacts of UDL on an online, higher education cohort, there is sufficient evidence to warrant optimistic speculation for the success of UDL while stressing the importance of future study in this area. Future Studies will benefit from purposeful interviews and surveys specifically embedded into the project.

Conclusion

Overall, after the use of UDL, this study saw a statistically significant increase in student engagement rates, increased unit satisfaction ratings and lower levels of student attrition compared to the pre-UDL teaching period. However, given the limitations of the study, it would be highly beneficial to replicate this research project through embedding the same UDL design principles into a unit outside of the School of Education to measure the impact, if any, of such an approach across different disciplines. Replication of the unit design would allow for comparison of outcomes between the three aspects of students' engagement rates, student satisfaction ratings and student attrition rates. This study supports the increasing importance of UDL across multiple contexts and highlights the importance of further investigation into UDL in the higher education context.

Reference List

- Ashman, A. (2010). Modelling inclusive practices in postgraduate higher education courses. *International Journal of Inclusive Education*, 14(7), 667-680. <https://doi.org/10.1080/13603111003778429>
- Burgstahler, S. (2015). *Universal design in higher education: From principles to practice* (Second edition.). Harvard Education Press.
- CAST. (2018). *The UDL guidelines*. <http://udlguidelines.cast.org/>
- Coussement, K., Phan, M., De Caigny, A., Benoit, D. F., & Raes, A. (2020). Predicting student dropout in subscription-based online learning environments: The beneficial impact of the logit leaf model. *Decision Support Systems*, 135, 113325. <https://doi.org/10.1016/j.dss.2020.113325>
- Cumming, T.M., & Rose, M.C. (2021), Exploring universal design for learning as an accessibility tool in higher education: a review of the current literature, *Australian Educational Researcher*. <http://dx.doi.org/10.1007/s13384-021-00471-7>
- Edyburn, D. L. (2010). Would you recognize universal design for learning if you saw it? Ten propositions for new directions for the second decade of UDL. *Learning Disability Quarterly*, 33(1), 33-41. <https://doi.org/10.1177/073194871003300103>
- Eliasquevici, M. K., da Rocha Seruffo, M. C., & Resque, S. N. F. (2017). Persistence in distance education: A study case using Bayesian network to understand retention. *International Journal of Distance Education Technologies (IJDET)*, 15(4), 61-78. <https://doi.org/10.4018/IJDET.2017100104>
- Florian, L., & Linklater, H. (2010). Preparing teachers for inclusive education: Using inclusive pedagogy to enhance teaching and learning for all. *Cambridge Journal of Education*, 40(4), 369-386. <https://doi.org/10.1080/0305764X.2010.526588>
- Fovet, F. (2020). Universal design for learning as a tool for inclusion in the higher education classroom: Tips for the next decade of implementation. *Education Journal*, 9(6), 163-172. <https://doi.org/10.11648/j.edu.20200906.13>
- Hammond, D. E., & Shoemaker, C. (2014). Are there differences in academic and social integration of college of agriculture master's students in campus based, online and mixed programs? *NACTA Journal*, 58(3), 180. <https://www.jstor.org/stable/nactajournal.58.3.180>

- Hayward, D. V., Mousavi, A., Carbonaro, M., Montgomery, A. P., & Dunn, W. (2020). Exploring preservice teachers engagement with live models of universal design for learning and blended learning course delivery. *Journal of Special Education Technology*, 35, Advance online publication. <https://doi.org/10.1177/0162643420973216>
- Henrie, C. R., Halverson, L. R., & Graham, C. R. (2015). Measuring student engagement in technology-mediated learning: A review. *Computers & Education*, 90(1), 36-53. <https://doi.org/10.1016/j.compedu.2015.09.005>
- Hiltz, S. R., & Goldman, R. (2004). *Learning together online: Research on asynchronous learning networks*. Routledge.
- Kennedy, M. J., Thomas, C. N., Meyer, J. P., Alves, K. D., & Lloyd, J. W. (2014). Using evidence-based multimedia to improve vocabulary performance of adolescents with LD: A UDL approach. *Learning Disability Quarterly*, 37(2), 71-86. <https://doi.org/10.1177/0731948713507262>
- Kortering, L. J., McClannon, T. W., & Braziel, P. M. (2008). Universal design for learning: A look at what algebra and biology students with and without high incidence conditions are saying. *Remedial and Special Education*, 29(6), 352-363. <https://doi.org/10.1177/0741932507314020>
- Lieber, J., Horn, E., Palmer, S., & Fleming, K. (2008). Access to the general education curriculum for preschoolers with disabilities: Children's school success. *Exceptionality*, 16(1), 18-32. <https://doi.org/10.1080/09362830701796776>
- Lowrey, K. A., Hollingshead, A., Howery, K., & Bishop, J. B. (2017). More than one way: Stories of UDL and inclusive classrooms. *Research and Practice for Persons with Severe Disabilities*, 42(4), 225-242. <https://doi.org/10.1080/09362830902805848>
- Marino, M. T. (2009). Understanding how adolescents with reading difficulties utilize technology-based tools. *Exceptionality*, 17(2), 88-102. <https://doi.org/10.1080/09362830902805848>
- Marino, M. T., Gotch, C. M., Israel, M., Vasquez III, E., Basham, J. D., & Becht, K. (2014). UDL in the middle school science classroom: Can video games and alternative text heighten engagement and learning for students with learning disabilities? *Learning Disability Quarterly*, 37(2), 87-99. <https://doi.org/10.1177/0731948713503963>
- McCall, D., Western, D., & Petrakis, M. (2020). Opportunities for change: What factors influence non-traditional students to enrol in higher education? *Australian Journal of Adult Learning*, 60(1), 89-112. <https://ajal.net.au/>
- McGhie-Richmond, D., & Howrey, K. (2014). Program planning and student diversity . In J. Andrews & J. Lupart (Eds.), *Understanding and addressing student diversity in Canadian schools* (pp. 248-292). Nelson Education Ltd./Cengage Learning.
- Meyer, A., Rose, D. H., & Gordon, D. T. (2014). *Universal design for learning: Theory and practice*. CAST Professional Publishing.
- Pinchbeck, J., & Heaney, C. (2017). Case report: The impact of a resubmission intervention on level 1 distance learning students. *Open Learning: The Journal of Open, Distance and e-Learning*, 32(3), 236-242. <https://doi.org/10.1080/02680513.2017.1348290>
- Rappolt-Schlichtmann, G., Daley, S. G., Lim, S., Lapinski, S., Robinson, K. H., & Johnson, M. (2013). Universal design for learning and elementary school science: Exploring the efficacy, use, and perceptions of a web-based science notebook. *Journal of Educational Psychology*, 105(4), 1210. <https://doi.org/10.1037/a0033217>
- Rodrigues, H., Almeida, F., Figueiredo, V., & Lopes, S. L. (2019). Tracking e-learning through published papers: A systematic review. *Computers & Education*, 136, 87-98. <https://doi.org/https://doi.org/10.1016/j.compedu.2019.03.007>

- Rose, D. H., & Meyer, A. (2002). *Teaching every student in the digital age: Universal design for learning*. Association for Supervision and Curriculum Development.
- Stone, C. (2019). Online learning in Australian higher education: Opportunities, challenges and transformations. *Student Success*, 10(2), 1-11. <https://doi.org/10.5204/ssj.v10i2.1299>
- Tertiary Education Quality Standards Agency. (2020). *Good practice note: Improving retention and completion of students in Australian higher education*. <https://www.teqsa.gov.au/sites/default/files/good-practice-note-improving-retention-completion-students-v2-0.pdf?v=1581913481>
- Wong, C., Odom, S. L., Hume, K. A., Cox, A. W., Fettig, A., Kucharczyk, S., Brock, M. E., Plavnick, J. B., Fleury, V. P., & Schultz, T. R. (2015). Evidence-based practices for children, youth, and young adults with Autism Spectrum Disorder: A comprehensive review. *Journal of Autism and Developmental Disorders*, 45(7), 1951-1966. <https://doi.org/10.1007/s10803-014-2351-z>
- You, J. W. (2016). Identifying significant indicators using LMS data to predict course achievement in online learning. *The Internet and Higher Education*, 29, 23-30. <https://doi.org/10.1016/j.iheduc.2015.11.003>

Measuring Moral Rhetoric: A Quantitative Text Analysis of Candidates' Electoral Campaign Speeches in France

Clara Alexandra Husson
(University of Mannheim)

Nicola Palma
(University of Bologna)

Abstract

How do political actors use moral rhetoric during an election campaign? To what extent does their moral rhetoric differ on the basis of ideology and over time? Political actors strategically use moral rhetoric to elicit voters' reactions. Moral foundations are a basis for instantaneous intuitions that reach individuals and influence their behavior without rational thought and reasoning. When political actors use moral rhetoric, individuals feel an unconscious approval or disapproval with their statement. Therefore, we argue that moral rhetoric is a very powerful rhetorical tool used by political actors in their discourse.

Measures of moral rhetoric are mainly based on the Moral Foundations Theory (MFT) from the psychology literature (Graham et al., 2009) that distinguish five moral foundations: care/harm, fairness/cheating, loyalty/betrayal, authority/subversion, and sanctity/degradation. Scholars agree that morality differs across cultures but that all moral foundations are universally shared in different degrees across cultures. By means of applying a translated novel version of the Moral Foundations Dictionary (MFD) in French-speaking contexts, we study whether the pairing of morality-politics holds in a multi-party system.

On one hand, drawing insight from political communication and moral psychology, we argue that candidates use moral rhetoric in their discourse because these moral stances are intrinsically linked to their ideology. Previous findings suggest that variations in individual moral orientations also reflect variations in the individual political ideology. In particular, it has been shown that in the US, liberals tend to value the moral domains of care and fairness, while conservatives' morality uniformly draws on the five different units of the individual moral intuition (Graham et al., 2009). First, we hypothesize that these findings hold for liberal and conservative candidates in a

multi-party system. Second, extending the analysis beyond the US bi-partisanship and focusing on a wider political spectrum, the analysis carried out in this study allows us to draw conclusions on the moral content of far-right and far-left political actors' rhetoric. On the other hand, we examine whether the incentives that political actors have in using moral rhetoric change strategically depending on the political circumstances. In particular, this strategy allows us to study under which conditions candidates for a presidential election in France use moral rhetoric as a discursive political communication strategy during their campaign. Using quantitative text analysis tools, we analyze speeches of the major candidates during the 2007, 2012, and 2017 French presidential election campaign. Findings confirm, first, that differences in use of moral rhetoric between liberals and conservatives hold in a multi-party system such as France. Second, investigating beyond the US bi-partisanship, findings suggest that both far-left and far-right candidates have a significantly higher use of moral rhetoric than mainstream political parties. Last, results show that outsider candidates to an election use significantly more moral rhetoric in their discourse. A possible explanation to this phenomenon could be that morality is a strategic tool that allows them to reach out to the voting constituency without having a clear, specific, and well assessed ideological thread.

1. Graham, J., Haidt, J., & Nosek, B.A. (2009). Liberals and Conservative Rely on Different Sets of Moral Foundations. *Journal of Personality and Social Psychology*, 96(5), 1029–46.

Subjective Temporal Resources: On the Relationship Between Time Perspective and Chronic Time Pressure to Burnout

Diamant Irene, Dar Tamar

Abstract— Burnout, conceptualized within the framework of stress research, is to a large extent a result of a threat on resources of time or a feeling of time shortage. In reaction to numerous tasks, deadlines, high output, management of different duties encompassing work-home conflicts, many individuals experience 'time pressure'. Time pressure is characterized as the perception of a lack of available time in relation to the amount of workload. It can be a result of local objective constraints, but it can also be a chronic attribute in coping with life. As such, time pressure is associated in the literature with general stress experience and can therefore be a direct, contributory burnout factor. The present study examines the relation of chronic time pressure – feeling of time shortage and of being rushed, with another central aspect in subjective temporal experience - time perspective. Time perspective is a stable personal disposition, capturing the extent to which people subjectively remember the past, live the present and/or anticipate the future. Based on Hobfoll's Conservation of Resources Theory, it was hypothesized that individuals with chronic time pressure would experience a permanent threat on their time resources resulting in relatively increased burnout. In addition, it was hypothesized that different time perspective profiles, based on Zimbardo's typology of five dimensions – Past Positive, Past Negative, Present Hedonistic, Present Fatalistic, and Future, would be related to different magnitudes of chronic time pressure and of burnout. We expected that individuals with 'Past Negative' or 'Present Fatalist' time perspectives would experience more burnout, with chronic time pressure being a moderator variable. Conversely, individuals with a 'Present Hedonistic' - with little concern with the future consequences of actions, would experience less chronic time pressure and less burnout. Another temporal experience angle examined in this study is the difference between the actual distribution of time (as in a typical day) versus desired distribution of time (such as would have been distributed optimally during a day). It was hypothesized that there would be a positive correlation between the gap between these time distributions and chronic time pressure and burnout. Data was collected through an online self-reporting survey distributed on social networks, with 240 participants (aged 21-65) recruited through convenience and snowball sampling methods from various organizational sectors. The results of the present study support the hypotheses and constitute a basis for future debate regarding the elements of burnout in the modern work environment, with an emphasis on subjective temporal experience. Our findings point to the importance of chronic and stable temporal experiences, as time pressure and time perspective, in occupational experience. The findings are also discussed with a view to the development of practical methods of burnout prevention.

Keywords— conservation of resources, burnout, time pressure, time perspective.

The Impact of Employee Assistance Program on New Hire Well Being and Turnover

Steffira Anjani, Agnes Dessyana, Luciyana Lesmana

Abstract—Employee well-being has been a major factor for employee to deliver optimal performance in the workplace. During the COVID-19 pandemic, there has been a major concern for organizations to develop Employee Assistance Program as an approach to maintain employees' well-being. However, there is little published evidence assessing the effectiveness of Employee Assistance Program for the employee's well-being. The purpose of this paper is to advance theory and practice by understanding how the Employee Assistance Program (EAP) impacts to new hire well-being and turnover especially in private organization.

This paper provides an intervention framework used to new employees. The intervention program (onboarding and support group) is carried out to improve new hire well-being and to make them stay at the organization. The intervention is delivered to 36 new hire employees that was recruited from January 2021 to still on going 2022. The result of level 1 evaluation shows that new hire employees give good rating to the intervention program. Next, the result of level 2 evaluation shows that the intervention has significance difference of new hire well-being before and after the intervention program ($Z = -2,11$, $p < 0,05$) and increase the percentage of recruitment quality index (RQI = 10%).

Keywords—Employee Assistance Program, well-being, turnover, intervention program.

An Analysis and Some Ways of Treatment for The Deeply Disadvantaged Rural Areas in Post-Socialist Economies. Case Study: Argeş County, Romania

G. Secăreanu, I. Ianoş, I. Sîrodoev, C. Merciu, A. Giugăl

Abstract—The paper addresses the social-economic problems in the rural areas of the Eastern European administration where the economies are post-socialist. The fall of communism has led to the spread of a free economy, in which the state no longer dictates the economic policy, and the results for this meant that several small economies could not handle these transformations. Thus, the rural environment has eroded the most under these circumstances; there were consistent social and economic consequences which led to the widening of the gaps between the performing areas and the deeply disadvantaged ones. The result of such transformations was mainly a mass migration of the young population within the country, due to the poor living conditions.

The present paper aims to determine and treat the deeply disadvantaged rural areas. These were determined with the help of four broad categories of indicators, namely: an economic one, a social one, an educational one and infrastructure.

The next step was to identify how to develop these areas, and the proposed development was mainly based on local resources so that the implementation costs could be as low as possible. Following the determination of the deeply disadvantaged rural areas, one can observe, throughout the analysis a compact arrangement for these areas, specifically in the southern part of the county, in the plain area, but also in the north of the county, in the vicinity of the Municipality of Campulung Muscel, as a result of the industrial decline of the city.

The research considers the approach and implementation of applied models that support the long-term development of deeply disadvantaged communes. These include: the model of the multiscale association, the model of cluster leadership and a model for an integration of the environment in the policies of smart development, all applied at the level of the rural settlements.

Keywords—deeply disadvantaged rural areas, developing economy, post-socialist space, rural development.

Post Covid-19 Landscape of Global Pharmaceutical Industry

Abu Zafor Sadek

Abstract— Pharmaceuticals were one of the least impacted business sectors during the corona pandemic as they are the center point of Covid-19 fight. Emergency use authorization, unproven indication of some commonly used drugs, self-medication, research and production capacity of an individual country, capacity of producing vaccine by many countries, Active Pharmaceutical Ingredients (APIs) related uncertainty, information gap among manufacturer, practitioners and user, export restriction, duration of lock-down, lack of harmony in transportation, disruption in the regulatory approval process, sudden increased demand of hospital items and protective equipment, panic buying, difficulties in in-person product promotion, e-prescription, geo-politics and associated issues added a new dimension to this industry. Although the industry maintains a reasonable growth throughout Covid-19 days; however, it has been characterized by both long- and short-term effects. Short-term effects have already been visible to so many countries, especially those who are import-dependent and have limited research capacity. On the other hand, it will take a few more time to see the long-term effects. Nevertheless, supply chain disruption, changes in strategic planning, new communication model, squeezing of job opportunity, rapid digitalization are the major short-term effects, whereas long-term effects include a shift towards self-sufficiency, growth pattern changes of certain products, special attention towards clinical studies, automation in operations, the increased arena of ethical issues etc. Therefore, this qualitative and exploratory study identifies the post-covid-19 landscape of the global pharmaceutical industry.

Keywords— covid-19, pharmaceutical, business, landscape.

An Easy Approach For Fabrication of Macroporous Apatite-Based Bone Cement Used as Potential Trabecular Bone Substitute.

Vimal Kumar Dewangan^{1,2}, T. S. Sampath Kumar¹, Mukesh Doble^{2,3}, Viju Daniel Varghese⁴

¹Department of Metallurgical and Materials Engineering, Indian Institute of Technology Madras, Chennai - 600036, India

²Department of Biotechnology, Indian Institute of Technology Madras, Chennai - 600036, India

³Saveetha Dental College & Hospitals, Saveetha Institute of Medical and Technical Sciences, Chennai - 600077, India

⁴Department of Orthopaedics, Christian Medical College Hospital, Vellore – 632004, India

Abstract:

The apatite-based, i.e., calcium-deficient hydroxyapatite (CDHAp) bone cement is well-known potential bone graft/substitute in orthopaedics due to its similar chemical composition with natural bone minerals. Therefore, an easy approach was attempted to fabricate the apatite-based (CDHAp) bone cement with improved injectability, bioresorbability, and macroporosity. In this study, the desired bone cement was developed by mixing the solid phase (consisting of wet chemically synthesized nanocrystalline hydroxyapatite and commercially available (synthetic) tricalcium phosphate) and the liquid phase (consisting of cement binding accelerator with few biopolymers in a dilute acidic solution) along with a liquid porogen as polysorbate or a solid porogen as mannitol (for comparison) in an optimized liquid-to-powder ratio. The fabricated cement sets within clinically preferred setting time (≤ 20 minutes) are better injectable ($>70\%$) and also stable at $\sim 7.3-7.4$ (physiological pH). The CDHAp phased bone cement was resulted by immersing the fabricated after-set cement in phosphate buffer solution and other similar artificial body fluids and incubated at physiological conditions for seven days, confirmed through the X-ray diffraction and fourier transform-infrared spectroscopy analyses. The so-formed synthetic apatite-based bone cement holds the acceptable compressive strength (within the range of trabecular bone) with average interconnected pores size falls in a macropores range ($\sim 50-200\mu\text{m}$) inside the cement, verified by scanning electron microscopy (SEM), mercury intrusion porosimetry and micro-CT analysis techniques. Also, it is biodegradable (degrades $\sim 19-22\%$ within 10-12 weeks) when incubated in artificial body fluids under physiological conditions. The biocompatibility study of the bone cement, when incubated with MG63 cells, shows a significant increase in the cell viability after 3rd day of incubation compared with the control, and the cells were well-attached and spread completely on the surface of the bone cement, confirmed through SEM and fluorescence microscopy analyses. With this all, we can conclude that the developed synthetic macroporous apatite-based bone cement may have the potential to become promising material used as a trabecular bone substitute.

Keywords: calcium deficient hydroxyapatite, synthetic apatite-based bone cement, injectability, macroporosity, trabecular bone substitute

Recurrent Torsades de Pointes post Direct Current Cardioversion for Atrial Fibrillation with Rapid Ventricular Response

Taikchan Lildar, MD¹, Ayesha Samad, MS4², Suraj Sookhu, MD³

¹Department of Internal Medicine, Flushing Hospital Medical Center, Flushing, NY 11355

Abstract—Atrial fibrillation with rapid ventricular response (AF-RVR) results in the loss of atrial kick and shortened ventricular filling time, which often leads to decompensated heart failure. Pharmacologic rhythm control is the treatment of choice and patients frequently benefit from restoration of sinus rhythm. When pharmacologic treatment is unsuccessful or a patient declines hemodynamically, direct cardioversion is the treatment of choice. Torsades de pointes or “twisting of the points” in French, is a rare, but under-appreciated risk of cardioversion therapy. Torsades de pointes account for fewer than 5% of the estimated 300,000 sudden cardiac deaths annually in the United States.

A 61-year-old female with no significant past medical history presented to the ED with worsening dyspnea. An electrocardiogram (ECG) showed AF-RVR and chest X-ray was significant for bilateral pulmonary vascular congestion. Full dose anticoagulation and diuresis were initiated with moderate improvement in symptoms. Transthoracic echocardiogram revealed biventricular systolic dysfunction with a left ventricular ejection fraction of 30%. After consultation with an electrophysiologist, the consensus was to proceed with restoration of sinus rhythm which would likely improve the patient’s heart failure symptoms and possibly the ejection fraction. Transesophageal echocardiogram was negative for left atrial appendage thrombus, the patient was treated with a loading dose of amiodarone and underwent successful direct current cardioversion with 200 Joules. The patient was placed on telemetry monitoring for 24-hours and was noted to have frequent premature ventricular contractions (PVCs) with subsequent degeneration to torsades de pointes. The patient was found unresponsive and pulseless, cardiopulmonary resuscitation was initiated with cardioversion and return of spontaneous circulation (ROSC) was achieved after four minutes to normal sinus rhythm. Post-cardiac arrest ECG showed sinus bradycardia with calculated QTc of 592msec. The patient continued to have frequent PVCs and required two additional cardioversions to achieve ROSC with intravenous magnesium, and lidocaine. An automatic implantable cardioverter-defibrillator (AICD) was subsequently implanted for secondary prevention of sudden cardiac death. The backup pacing rate of the AICD was set higher than usual in an attempt to prevent PVC-induced torsades de pointes. The patient did not have any further ventricular arrhythmias after implantation of the AICD.

Overdrive pacing is a method utilized to treat PVC-induced torsades de pointes by preventing a patient’s susceptibility to R on T-wave induced ventricular arrhythmias. Pacing at a rate of 90 beats per minute succeeded in controlling the arrhythmia without the need for traumatic cardiac defibrillation. In our patient, conversion of AF-RVR to NSR resulted in a slower heart rate and an increased probability of PVC occurring on the T-wave and ensuing ventricular arrhythmia. This case highlights direct current cardioversion for AF-RVR resulting in persistent ventricular arrhythmia requiring ICD placement with overdrive pacing to prevent recurrence.

References

- Mantri, N., Lu, M., Zaroff, J. G., Risch, N., Hoffmann, T., Oni-Orisan, A., ... & Iribarren, C. (2022). Torsade de pointes: A nested case-control study in an integrated healthcare delivery system. *Annals of Noninvasive Electrocardiology*, e12888.
- Charlton, N. P., Lawrence, D. T., Brady, W. J., Kirk, M. A., & Holstege, C. P. (2010). Termination of drug-induced torsades de pointes with overdrive pacing. *The American journal of emergency medicine*, 28(1), 95-102.

Analysis of Autoantibodies to the S-100 Protein, NMDA, and Dopamine Receptors in Children with Type 1 Diabetes Mellitus

Yuri V. Bykov, V. A. Baturin

Abstract—

Aim of the study: The aim of the study was to perform a comparative analysis of the levels of autoantibodies (AAB) to the S-100 protein as well as to the dopamine and NMDA receptors in children with type 1 diabetes mellitus (DM) in therapeutic remission.

Materials and methods: Blood serum obtained from 42 children ages 4 to 17 years (20 boys and 22 girls) was analyzed. Twenty-one of these children had a diagnosis of type 1 DM and were in therapeutic remission (study group). The mean duration of disease in children with type 1 DM was 9.6 ± 0.36 years. Children without DM were included in a group of "apparently healthy children" (21 children, comparison group). AAB to the S-100 protein, the dopamine, and NMDA receptors were measured by ELISA. The normal range of IgG AAB was specified as up to $10 \mu\text{g/mL}$. In order to compare the central parameters of the groups, the following parametric and non-parametric methods were used: Student's t-test or Mann-Whitney U test. The level of significance for inter-group comparisons was set at $p < 0.05$.

Results: The mean levels of AAB to the S-100B protein were significantly higher ($p = 0.0045$) in children with DM ($16.84 \pm 1.54 \mu\text{g/mL}$) when compared with "apparently healthy children" ($2.09 \pm 0.05 \mu\text{g/mL}$). The detected elevated levels of AAB to NMDA receptors may indicate that in children with type 1 DM, there is a change in the activity of the glutamatergic system, which in its turn suggests the presence of excitotoxicity. The mean levels of AAB to dopamine receptors were higher ($p = 0.0082$) in patients comprising the study group than in the children of the comparison group ($40.47 \pm 2.31 \mu\text{g/mL}$ and $3.91 \pm 0.09 \mu\text{g/mL}$). The detected elevated levels of AAB to dopamine receptors suggest an altered activity of the dopaminergic system in children with DM. This can also be viewed as indirect evidence of altered activity of the brain's glutamatergic system. The mean levels of AAB to NMDA receptors were higher in patients with type 1 DM compared with the "apparently healthy children," at $13.16 \pm 2.07 \mu\text{g/mL}$ and $1.304 \pm 0.05 \mu\text{g/mL}$, respectively ($p = 0.0021$). The elevated mean levels of AAB to the S-100B protein may indicate damage to brain tissue in children with type 1 DM. A difference was also detected between the mean values of the measured AABs, and this difference depended on the duration of the disease: mean AAB values were significantly higher in patients whose disease had lasted more than five years.

Conclusions: The elevated mean levels of AAB to the S-100B protein may indicate damage to brain tissue in the setting of excitotoxicity in children with type 1 DM. The discovered elevation of the levels of AAB to NMDA and dopamine receptors may indicate the activation of the glutamatergic and dopaminergic systems. The observed abnormalities indicate the presence of central nervous system damage in children with type 1 DM, with a tendency towards the elevation of the levels of the studied AABs with disease progression.

Keywords—autoantibodies, brain damage, children, diabetes mellitus.

Yuri Bykov is with the Stavropol State Medical University, Russia (e-mail: yubykov@gmail.com).

Duplicated Common Bile Duct; A Recipe for Injury

David Armany, Matthew Allaway, Preet Gosal, Senarath Edirimanne

Abstract— A potentially devastating complication of routine laparoscopic cholecystectomy include iatrogenic bile duct injuries which represent a stable incidence rate of 0.3% over the past 3 decades. Whilst related to several relative risks such as surgeon experience, and patient factors (older age, male sex), misinterpretation of biliary tree anatomy remains the most common cause, accounting for 80% of iatrogenic Common Bile Duct injuries. Whilst extremely rare, a duplicate common bile duct anomaly remains a potential variation to encounter during biliary surgery, with 30 recognised cases in the worldwide literature, of which type Vb accounting for 4. We report the case of a rare type Vb variation encountered during intra-operative laparoscopic cholecystectomy and confirmed on cholangiogram. To our knowledge, this is the first documented Type Vb case encountered in an Australian population. Given these anomalies are asymptomatic and can perpetuate iatrogenic common bile duct injuries, awareness of all subtypes is crucial. Irrevocably, preoperative Magnetic Resonance Cholangiopancreatography can help recognise these anomalies before the operating theatre, however their widespread adoption is limited by expensive and availability.

Keywords— Duplicated common bile duct, type Vb, cholecystitis, MRCP, cholangiogram, iatrogenic CBD

D. A. Author is with the Department of Surgery, Nepean Hospital, Kingswood NSW 2747 (phone: 0472 730 381; e-mail: davidarmany72@gmail.com).

M. A. Author, is with the Department of Surgery, Nepean Hospital, Kingswood NSW 2747 (phone: 0438 683 995; e-mail: matthewallaway@live.com).

P. G. Author is with the Department of Surgery, Nepean Hospital, Kingswood NSW 2747 (phone: 0406 431 995; e-mail: preet.gosal@outlook.com).

S. E. Author, is with the Department of Surgery, Nepean Hospital, Kingswood NSW 2747 (phone: 0488 218 031; e-mail: dredirimanne@gmail.com).

Maple Syrup Urine Disease with Central Diabetes Incipidus: Case Report

Rini Andriani*, Damayanti R. Sjarif*, Antonius H. Pudjiadi, Cut Nurul Hafifah, Sudung O. Pardede

Abstract—Maple syrup urine disease (MSUD) is a rare genetic disease of metabolic disorder inherited as an autosomal recessive trait, caused by branched-chain alpha-keto acid dehydrogenase (BCKD) deficiency, which biochemically characterized by elevated concentration of the branched-chain amino acids (BCAAs): leucine, isoleucine, and valine. Diabetes Insipidus (DI) is a disease manifested clinically with polyuria and polydipsia. In MSUD, cerebral edema often occurs which can cause DI, although until now there has been no report. A case with both MSUD and Central DI (CDI) to the author's best knowledge has not been reported previously. In this study, we presented a patient with both MSUD and diagnosis of CDI in hospital with limited laboratory facilities. The diagnosis of CDI in this patient includes a physical examination, monitoring urine output, blood gas analysis, urinalysis, water deprivation test, and serum electrolytes on a regular basis. Treatment in this patient using continuous intravenous infusion of Argipressin, in which the patient's urine production can be suppressed, but adverse effects appeared immediately after administration. Oral desmopressin was immediately given to the patient after the drug was available, with the patient's condition stable after 2x24 hour monitoring. The patient was discharged on a strict medication schedule.

Keywords— Maple syrup urine disease, Central diabetes insipidus, limited laboratory facilities, Argipressin, Desmopressin.

I. INTRODUCTION

Maple syrup urine disease (MSUD) is an inborn error of metabolism, biochemically characterized by elevated concentration of the branched-chain amino acids (BCAAs): leucine, isoleucine, and valine. The disorder is caused by a severe deficiency in the activity of the branched-chain α -keto acid dehydrogenase complex (BCKDH). MSUD is an autosomal recessive disorder with a worldwide incidence of approximately 1:185000. Maple syrup urine disease (MSUD) is

categorized as classic, intermediate, intermittent, and thiamine-responsive with classic MSUD has the most severe clinical manifestations. Early and nonspecific signs of metabolic intoxication (e.g., irritability, hypersomnolence, anorexia) are accompanied by the presence of branched-chain alpha-keto acids, acetoacetate, and beta-hydroxybutyrate in the urine with worsening encephalopathy manifesting as lethargy, apnea, opisthotonos, and reflexive "fencing" or "cycling" movement as the sweet smell of Maple syrup becomes evident in the urine until its intoxication culminates in critical cerebral edema, coma, and central respiratory failure. Treatment of MSUD consists of dietary leucine restriction, BCAA-free medical foods, judicious supplementation with isoleucine and valine, which is aimed at reducing the accumulation of toxic metabolites, while at the same time maintaining normal physical development and nutritional status, and preventing catabolism, with frequent clinical and biochemical monitoring.[1]-[3]

Diabetes Insipidus (DI) is a disease manifested clinically with polyuria and polydipsia and can result from either vasopressin deficiency (central DI) or vasopressin insensitivity at the level of the kidney (nephrogenic DI [NDI]). Both central DI and NDI can arise from inherited defects of congenital or neonatal onset or can be secondary to a variety of causes. In central DI, neonates and young infants are often best treated solely with fluid therapy, given their requirement for large volumes nutritive fluid which the use of vasopressin analogs in patients with obligate high fluid intake is difficult given the risk of life-threatening hyponatremia, while in older children is best accomplished with the use of diluted parenteral and lyophilized long-acting vasopressin analog DDAVP (desmopressin).[4]

A case with both MSUD and central DI has not been hitherto reported. Here, we present a patient with both MSUD and central DI, and the diagnosis of central DI in hospitals with limited laboratory facilities by general pediatricians who are clinically guided by consultant pediatricians via telemedicine.

*Rini Andriani is with Department of Child Health, Tanjung pura University, Pontianak, West Kalimantan, Indonesia 78124 and Doctoral Program, Indonesia University, Salemba Raya Street, Jakarta Capital Special Region, Indonesia 10430 (corresponding author: Mobile Phone: +62 87819131166, email:rini@medical.untan.ac.id)

*Damayanti R.Sjarif is with Division of Nutrition and Metabolic Disease, Department of Child Health, National Central General Hospital Dr. Cipto Mangunkusumo, Jakarta, Jakarta Capital Special Region, Indonesia 10430

*The first two authors are equally contributed to overall patient's management and in writing this manuscript.

Antonius H.Pudjiadi is with Division of Children's Emergency and Intensive Care, Department of Child Health, National Central General Hospital Dr. Cipto Mangunkusumo, Jakarta, Jakarta Capital Special Region, Indonesia 10430 (e-mail: ahpudjiadi@gmail.com)

Cut Nurul Hafifah is with Division of Nutrition and Metabolic Disease, Department of Child Health, National Central General Hospital Dr. Cipto Mangunkusumo, Jakarta, Jakarta Capital Special Region, Indonesia 10430 (e-mail: cutnurulhafifah@yahoo.com).

Sudung O.Pardede is with Division of Nephrology, Department of Child Health, National Central General Hospital Dr. Cipto Mangunkusumo, Jakarta, Jakarta Capital Special Region, Indonesia 10430 (e-mail: suopard@yahoo.com)

II. CASE REPORT

We report a 1 year 6 month-old male boy diagnosed with MSUD at the age of 7 months old who was brought to hospital in West Borneo, Indonesia in May 2022, with chief complaints of loud breathing, shortness of breath, diarrhea accompanied by convulsions. The patient also had edema on both palms and soles with sores in the anal and genital areas (diaper rash). Patients admitted with a working diagnosis laryngotracheobronchitis (LTB), aspiration pneumonia, diarrhea with moderate dehydration.

From past medical history, the patient has been diagnosed (late diagnosis) with MSUD since the age of 7 months with symptoms that arise in the form of poor feeding started 5 days of life, irritability and frequent seizures manifested as breath holding spells with cyanosis but resolved spontaneously and showed a marked elevation of BCAA concentration (leucine, isoleucine, and valine) confirming MSUD. The leucine + isoleucine concentration was 2388.79 $\mu\text{mol/L}$ (29.0-266.0) and valine concentration was 519.46 $\mu\text{mol/L}$ (70.0-348.0).

Since then, patient had frequent episodes of hospitalization, hence this admission in intensive care unit on 18 months old. The physical examination revealed that the patient was moderately ill with a respiratory rate of 45-55 breaths/minute, a body temperature of 37.9°C, and a pulse of 130-145 bpm. Lung examination revealed bilateral crackles and wheezing. Other physical examinations include sunken eyes, slow return of turgor, increased bowel sounds, with edema of both palms and soles. On examination of the genital region, there is erythema and sores in the anal, genital, and perianal areas. His initial chest X-ray showed infiltrates in the lower midfield in both lungs, revealed pneumonia. Complete blood count (CBC) showed anemia (haemoglobin 8.3 g/dL), with normal white cell count and normal platelet count. Urinalysis showed a normal pH, with specific gravity < 1.005, and microscopically visible 1-2 squamous epithelium. Blood gas analysis (BGA) showed normal pH 7.40, with compensated acidosis metabolic. Blood culture was not done since this examination is not available.

	On Admission
Haemoglobin (g/dL)	8.3
Hematocrit (%)	25.5
White blood cell count ($10^3 \times \mu\text{L}$)	10.76
Red blood cell count ($10^6 \times \mu\text{L}$)	3.39
Platelet count ($10^3 \times \mu\text{L}$)	922

On admission, patient was put on nothing per mouth (NPO) for 24 hours, and was given oxygen support, frequent nebulization with adrenaline as LTB management, beta 2 agonis nebulization combination with ipratropium bromide and steroid nebulization to increase airflow and to decreased the work of breathing. The patient was treated with antibiotic Ceftriaxone, and Phenobarbital injection to control the seizure. Patient was also rehydrated with intravenous fluid drops (IVFD) that contain dextrose 10% with glucose infusion rate (GIR) 6.8 while on NPO with target blood glucose between 80-100 mg/dL.

Feeding restarted after 24 hours NPO with BCAD formula,

with continuous drip for 1 hour for each feeding to avoid vomiting. Other management include packed red cell (PRC) transfusion for anemia with respiratory distress, maintain positive fluid balance since patient still had diarrhea, and monitoring of electrolyte balance and blood glucose. The patient was also given supplements of valine and isoleucine at a dose of 60 mg/kg/day. Urine production still normal, around 1.5-2.8 ml/kg/hour, with negative keton and specific gravity around 1.005-1.020 during monitoring every day.

On the 4th hospital day (HD), the patient experienced shortness of breath with a respiratory rate of 55 x/min, a pulse rate of 170 bpm, and temperature of 37.3°C. Diarrhea had stopped, but fine wet crackles were still found in both lung fields of the patient, where edema was increasing in all four extremities of the patient. The results of the BGA showed respiratory alkalosis with hypoxemia, metabolic acidosis and hypoalbuminemia. Injection steroid was stopped, but we added furosemide injection. Patient was given supplemental oxygen via non rebreathing mask (NRM). Repeat BGA after 12 hours showed improvement but CBC showed thrombocytopenia and anemia. Antibiotics were shifted to Meropenem and Amikacin. Serial albumin examination was carried out showing a decrease in albumin levels so that albumin transfusion was given alternate with PRC transfusion started on 7th HD until 10th HD. Patient had positive fluid balance because urine production decrease to 0.8-1.2 ml/kg/day despite furosemide injection at 1 mkdose 2 times a day. IVFD are given as much as 10 mL/kg/day with milk as much as 120 mL/kg/day.

On 11th HD (3 June), patient had pulmonary edema after 3rd doses of albumin infusion. Patient then put on NPO since there was increase work of breathing, vomiting episodes and ascites despite furosemide injection and albumin transfusion. IVFD are given as much as 100 mL/kg/day. Blood gas analysis done showed metabolic alkalosis with respiratory acidosis, hyponatremia, hypochloremia and hypoalbuminemia. Urine production around 0.8-1 ml/kg/hour.

Table 2. Blood Gas Analysis

	On Admission	13 th HD 5 June	14 th HD 6 June (pre intubation)	14 th HD 6 June (post intubation)	28 th HD 20 June
pH	7.41	7.41	7.33	7.36	7.50
pCO ₂ (mmHg)	64.6	64.6	76.4	66.7	27.3
pO ₂ (mmHg)	125	125	44	202	158
Hct (%)	27	27	26	35	32
cNA ⁺ (mmol/L)	125	125	126	121	133
cK ⁺ (mmol/L)	1.08	1.08	3.72	4.98	4.00
cCa ²⁺ (mmol/L)	81	81	1.16	1.11	1.25
cCl ⁻ (mmol/L)	41.2	41.2	79	83	96
CtHb (g/dL)	8.8	8.8	8.5	11.3	10.3
cHCO ₃ ⁻ (P) (mmol/L)	41.2	41.2	40.8	37.6	21.4
cBase (B) (mmol/L)	14.4	14.4	12.8	10	-0.9
sO ₂ (%)	98.8	98.8	79	99.7	99.6

The main problem here is thought to be alkalosis metabolic due to frequent vomiting resulting in hypochloremia and frequent furosemide administration (Table 1, result BGA on 13th HD). This metabolic condition resulting in compensation of breathing in the form of respiratory acidosis, which is exacerbated by the respiratory condition of patients who have not recovered from laryngeal edema due to laryngotracheobronchitis with acute pulmonary edema. The patient was still treated with NRM 8 LPM oxygen while waiting for parental approval for intubation and mechanical ventilation.

On 13th HD (5 June), the ABG results were repeated after about 12 hours showed worsening with the threat of respiratory failure so that the patient was intubated and mechanically ventilated for 4 days. Results of complete blood count showed severe anemia, thrombocytopenia, so the antibiotic Meropenem was changed to piperacillin tazobactam while Amikacin was

continued. Patient was again put on NPO and given parenteral nutrition. On 17th HD (9 Juni), the patient was weaning from ventilator and extubated. Ventilatory support changed to NIV with a mask. Urine production increase to 1.7-2.3 ml/kg/hr hence furosemide injection was stopped. Patient had negative fluid balance, edema and ascites resolved.

On 19th HD (11 June), shortness of breath, stridor and retractions have reduced. But the problems that exist on 19th HD were arrhythmias, bradycardia, hyperglycemia and polyuria (urine output: 726 mL/day (4.5 ml/kg/hour)). The management carried out were trophic feeding 10 ml/kg/day thru nasogastric tube, lowering GIR to lower blood glucose, dehydration correction with fluids are given at a rate of ±5 ml/kg/hour for urine replacement, monitoring urine production, and administration of Dobutamine as an inotropic. Fast correction of potassium level is performed immediately, due to the onset of symptoms of sinus bradyarrhythmias due to hypokalemia (serum potassium level 3 mmol/L).

Table 3. Urine examination

Urine Examination Results	19 th HD	20 th HD	21 th HD	22 th * HD	23 th HD	24 th HD	25 th HD
Colour	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
specific gravity	1.015	1.015	1.010	<1.005	1.015	<1.005	<1.005
pH	7.5	7.5	8.0	7.5	8.0	7.5	7.0

*(Before Vassopressin)

Table 4. Serum electrolyte examination

Electrolyte	19 th HD	21 th Morning HD	21 th Evening HD	22 th HD	24 th HD	28 th HD
Na ⁺ (mmol/L)	133	136	140	138	122	132
K ⁺ (mmol/L)	3.00	3.80	4.20	3.78	3.40	5.6
Ca ²⁺ (mmol/L)	1.17	1.29	1.28	0.82	0.21	1.06
Cl ⁻ (mmol/L)	91	94	97	94	92	96

On 20th HD (12 June), patient still on NIV support with mask, had fever (37.6 °C), and ongoing potassium correction. Blood glucose maintained at normal level by decreasing GIR from IVF, but polyuria persisted with urine production 5.9-7.5 mL/kg/hour per shift (4 hours monitoring). Fluid replacement was done to prevent dehydration due to polyuria.

In this condition, it can be thought that cause of polyuria is not caused by osmotic diuresis because patient's blood sugar level is well controlled. Another possibility of polyuria can be caused by giving too much fluid, but this can also be ruled out because the fluid balance is always negative. Another possible cause of polyuria is polyuria phase of acute renal failure, but in this patient's renal function is always normal under monitoring,

so polyuria in this patient is thought to be caused by diabetes insipidus. Examination of urine electrolytes in this case 24-hour urine sodium and 24-hour urine osmolality is needed to be able to distinguish whether the diuresis that occurs is water diuresis or osmotic diuresis. It is important to be able to distinguish whether there is a polyuria phase from acute renal failure or diabetes insipidus. However, the examination of urine sodium and urine osmolality cannot be carried out in regional hospitals, urine must be sent to Jakarta (capital of Indonesia) and the results of the examination are obtained as soon as 4 days after receiving the specimen. The critical condition of the patient with excessive urine production, very negative fluid balance with dehydration, requires an immediate diagnosis and appropriate management.

Table 4. Fluid balance and urine output monitoring

Day of Admission	Urine Output in 24 hours, mL	Urine Volume, mL/kg per hour	Total Balance
3 th HD	894.3 (mixed with diarrhea)		+253.3
4 th HD	130	0.80	-213.8
5 th HD	222	1.38	+200.9
6 th HD	515	3.20	+210.3
7 th HD	200	1.24	+96.9
8 th HD	150	0.93	-113.1
9 th HD	510	3.17	+92.2
10 th HD	220	1.36	-197.5
11 th HD	445	2.7	-125
12 th HD	533	3.3	-290
13 th HD	179	1.1	-37
14 th HD	249	1.54	-154
15 th HD	369	2.3	-419
16 th HD	832	5.2	-470

17 th HD	511	3.2	-408
18 th HD	280	1.7	-149
19 th HD	726	4.5	-316
20 th HD	802	5	-311
21 th HD	920	5.8	-259
22 th HD	916	5.7	-548
23 th HD	707	4.4	-213
24 th HD	964	6	-358
25 th HD	910	5.6	-363
26 th HD	832	5.1	-285
27 th HD	688	4.3	+85
28 th HD	604	3.8	+116

On 21th HD (13 June), based on clinical experience, serum sodium was checked within 10 hours of monitoring. While the change of urine production every hour, with clear fluid replacement. Serum sodium examination was repeated after 10 hours and the result was that serum sodium was increasing even though the patient was given clear water as a replacement fluid. This indicates that the urine come out contain more water than sodium, so the diagnosis of this patient is more likely to lead to Diabetes Insipidus. (Table 3).

Next step, a water deprivation test was carried out with close monitoring. The patient is only given fluids in the amount of insensible water loss (IWL). In this test, it is seen whether with minimal fluid administration, urine decreases or remains a lot. In this patient, when the deprivation test was carried out, the hourly urine production reached 8-10 ml/kg/hour so the test was only carried out for 2 hours for fear of severe dehydration in this patient. Based on the result of this test, diagnosis of Central Diabetes Insipidus established. Furthermore, it is planned to give Desmopressin therapy to this patient. However, the problem that occurs is the unavailability of Desmopressin in the city where the patient is being treated. Desmopressin was sought and ordered from Jakarta but it took about 3 days to arrive in the city where the patient was being treated.

On 22th HD, polyuria is getting worse (920 mL/day), with fluid replacement cannot be on target, dehydration, hypernatremia, and irregular bradyrhythmia. The patient's condition is getting worse. In this difficult condition, argipressin injection was started with IV drip because Desmopressin still not available. Strict urine output monitoring was done every hour, and patient's vital signs, especially blood pressure and heart rate.

On 22th HD (14 June), patient was given argipressin 20 units/mL, start with a drip of 0.0005 units/kg/hour accompanied by hourly monitoring of urine production. Dose increased gradually until targeted diuresis reached at 15-20 mL/hour (2-3mL/kg/hour), with argipressin drip at 0.004 unit/hour.

On 24th HD (16 June), after 3 days of argipressin drip administration, adverse effects began to occur such as tachycardia up to 150-160 beats/minute, and episodes of hypertension with hyponatremia that worsened despite maximal sodium correction. The problem faced was the immediate production of a lot of urine when the argipressin drip was stopped even if it was only for 30 minutes.

On 25th HD (17 June), Desmopressin tablets are available.

The patient is planned to be given oral desmopressin. Furthermore, monitoring is carried out when switching drugs from injection to oral. With regard to the duration of action of oral desmopressin with an onset of approximately 1-2 hours after ingestion, desmopressin is administered at a dose of 0.05 mg per hour while monitoring diuresis hourly. In this patient, the dose of 0.05 mg did not produce a response that could be seen with urine production which was still high, so the dose was increased to 0.1 mg. Next, the argipressin drip was stopped after oral desmopressin started to work. Hourly urine monitoring is still carried out to determine how long the effects of desmopressin in this patient's body. This is done to determine the frequency of drug administration. On monitoring, the patient's urine production began to return a lot after about 8 hours of the drug being given, so the drug desmopressin was given every 8 hours in this patient. Close monitoring of urine production is carried out to find the appropriate desmopressin dose, drug administration interval and target diuresis. Correction of dehydration and sodium is done when desmopressin is started. This dosage adjustment takes about 3 days.

On 25th HD (17 June), Desmopressin tablets are available. The patient is planned to be given oral desmopressin. Furthermore, monitoring is carried out when switching drugs from injection to oral. With regard to the duration of action of oral desmopressin with an onset of approximately 1-2 hours after ingestion, desmopressin is administered at a dose of 0.05 mg per hour while monitoring diuresis hourly. In this patient, the dose of 0.05 mg did not produce a response that could be seen with urine production which was still high, so the dose was increased to 0.1 mg. Next, the argipressin drip was stopped after oral desmopressin started to work. Hourly urine monitoring is still carried out to determine how long the effects of desmopressin in this patient's body. This is done to determine the frequency of drug administration. On monitoring, the patient's urine production began to return a lot after about 8 hours of the drug being given, so the drug desmopressin was given every 8 hours in this patient. Close monitoring of urine production is carried out to find the appropriate desmopressin dose, drug administration interval and target diuresis. Correction of dehydration and sodium is done when desmopressin is started. This dosage adjustment takes about 3 days.

III. DISCUSSION

Our patient came in shortness of breath accompanied by convulsions, with diagnosed with MSUD on 7 months old. During the day of hospitalization, the patient developed edema in all four extremities accompanied by polyuria. Polyuria is defined as inappropriately high urine output relative to effective arterial blood volume and serum sodium. Polyuria defined clinically as urine production of more than 2 L/m²/24 hours. Polyuria in children was defined as more than 150mL/kg per day in neonates, 100-110mL/kg per day in children up to 2 years of age, and 40 to 50mL/kg per day in older children. [5]-[7] Our patient, weighing about 6.7 kg, had urine output range of 130-500 mL/day from 1st HD-19th HD. However, it can be seen on the 19th HD, the patient's developed polyuria with urine output reached 726 mL/day.

A distinction must be made between water diuresis, osmotic diuresis or a mixture of the two. In this case, a 24-hour urine osmolality examination is needed to be able to distinguish these two things. At the time of initial polyuria, osmotic diuresis is suspected due to episodes of hyperglycemia that occur in patients with severe infectious conditions. [5], [7]

Once polyuria has been confirmed, the following laboratory tests should be collected: serum sodium, potassium, glucose, calcium, and blood urea nitrogen, ureum creatinine, urine sodium, urine specific gravity and osmolality. Urine volume greater than 4 mL/kg per hour, serum osmolality greater than 300 mOsm/kg with a urine osmolality less than 300 mOsm/kg confirms a diagnosis of DI. Meanwhile, to differentiate between Central DI and Nephrogenic DI, re-confirm urine specific gravity which < 1010 for Central DI and < 1005 for Nephrogenic DI. [6], [8]

In this patient, urine osmolality and urine sodium could not be done directly due to limited laboratory facilities so that strict clinical monitoring was carried out to get an immediate diagnosis. Due to the suspicion of Diabetes Insipidus as the cause of polyuria seen from the urine output (pH>7, Urine Specific Gravity <1.005), a serum sodium test was attempted at intervals of about 10 hours. In this patient, there was an increase in serum sodium from 136 mg/dL to 140, although at the same time, the patient was given water instead of excessive urine production, to prevent hypernatremia so that an increase in serum sodium to >145 mg/dL as a diagnostic criterion for DI was not fulfilled, but the urinalysis results obtained urine Urine Specific Gravity <1.005, so it remains suggestive to the diagnosis of DI.

The deprivation test was performed in our patient where fluid administration was minimal, administered only as large as IWL, and the urine output remained large. [6] In normal individuals, with dehydration, the urine osmolality usually increases up to 800 – 1200 mOsm/kg. A urine osmolality of <300 mOsm/kg with a concomitant plasma osmolality of >300 mOsm/kg or a sodium level above upper limit of normal following dehydration (>146 mmol/L) is suggestive of either central or nephrogenic DI. Desmopressin could be administered at this time (08.00 – 09.00 am). An increase of at least >50% in urine osmolality after desmopressin administration suggests complete central DI (the increase can be up to 200% to 400%)

while a <50% increase points towards complete nephrogenic DI. [9] Once the diagnosis of DI is confirmed, vasopressin should be administered subcutaneously to help differentiate between CDI and NDI. Patients with CDI usually respond rapidly to vasopressin with decreased urine output and increased urine osmolality, whereas patients with NDI do not. [5], [8]

The intravenous (IV) and subcutaneous (SC) routes of administration have both benefits and drawbacks. IV delivery is advantageous as it allows the effect of the drug to take place immediately, the rate of distribution can be controlled, it assists those patients who cannot tolerate a drug orally or who have swallowing difficulties, large doses can be infused expeditiously, and it permits continuous medication to be delivered. Advantages of the SC route include the possibility of self-administration, greater mobility for patients, an alternative for patients with poor venous access, and administration at home, away from the hospital setting. [10], [11]

This patient was given argipressin because no other drugs were available. Intravenous drip administration is an option to monitor the response and drug effects that can occur. The patient was not given subcutaneously because the appropriate dose for these patients with the desired target diuresis is not known yet.

Arginine-vasopressin (AVP) is the natural human nonapeptide, which (in addition to its antidiuretic, vasoconstrictive, glycogenolytic, and platelet aggregation actions) plays an important role in the regulation of the corticotropin (ACTH)-adrenal axis while Desmopressin (1-deamino, 8-D arginine-vasopressin) or dDAVP is its analogs. Desmopressin is a selective V2-agonist with an antidiuretic-to-vasopressor ratio 4000 times than that of AVP. As compared to AVP, dDAVP has a longer plasma half-life of 90–190 min while the plasma half-life of AVP is 6-20 min. dDAVP is more resistant to degradation by pancreatic proteases (mostly by trypsin) and has superior affinity to V2. Desmopressin also has 1500 times less vasoconstrictor action. [12]-[14]

Due to potent vasoconstrictor action, there is always a concern that vasopressin therapy may impair capillary blood flow and tissue oxygenation. Cardiac complications include coronary ischemia, myocardial infarction, ventricular arrhythmias (ventricular tachycardia and asystole), and severe hypertension. Other reported adverse effects include severe GI ischemia leading to bowel necrosis, hyponatremia, anaphylaxis, bronchospasm, urticaria, angioedema, rashes, venous thrombosis, local irritation at injection site, and peripheral vasoconstriction leading to cutaneous gangrene. [12], [13] While Desmopressin's notable features are its effectiveness and the low occurrence of side effects. [14], [15]

Doses Argipressin for Central Diabetes Insipidus: 2.5–10 units IM or subcutaneously 2–4 times per day or 0.0005–0.01 U/kg/h (0.5–10 mU/kg/h) Doses Desmopressin for Central Diabetes Insipidus: Intranasally: 5-30 µg/d Q 8-12 hr Orally: 0.05-0.2 mg/d Q 8-12 hr IV/SC: 2-4 µg/d Q 8-12 hr. [12], [16] In these patients, the dose was started from the lowest dose which was increased gradually until the desired target diuresis was achieved.

In these patients the adverse effects were present from the start of argipressin and worsened with time the argipressin was given. On monitoring with maintaining the same dose of Argipressin to maintain the desired volume of diuresis, the effect of tachycardia and increased blood pressure is increasing by the time. In this patient, the Argipressin drip was stopped for 15-30 minutes when hypertension developed, but was restarted immediately before the patient's urine production increased again.

Assessing the effect of Desmopressin being more effective with fewer adverse effects, this patient was immediately given oral Desmopressin when the drug became available. In this patient the oral dose that responds to the desired target diuresis of about 2-3 mL/kg/hour is 0.1 mg/time every 8 hours via NGT. After monitoring 2x24 hours the patient's condition was stable, the patient went home with oral medications, given a strict medication schedule.

IV. CONCLUSION

In conclusion, diagnosis of DI in area with limited laboratory examinations should combined with clinical finding, strict monitoring and available laboratory examination. Limited laboratory facilities should not cause delay in diagnosis and management, because patients with DI are emergency cases that will worsen quickly which can end in death if treated too late.

ACKNOWLEDGMENT

The authors received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

AUTHORS' CONTRIBUTIONS

RA and DRS are equally contributed to overall patient's management and writing this manuscript. AHP, CNH, and SOP as consultant in specific patient's condition.

RA, DRS, AHP, and CNH revised the manuscript.

REFERENCES

- [1] K. A. Strauss, E. G. Puffenberg, V. J. Carson, "Maple syrup urine disease", In: GeneReviews® [Internet], M. P. Adam, G. M. Mirzaa, R. A. Pagon, et al, Ed. Seattle (WA): University of Washington, Seattle; 1993-2022. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK1319/>
- [2] O. A. Schchelochkov, I. Manoli, C. P. Venditti, "Isoleucine, Leucine, Valine, and Related Organic Acidemias" in Nelson Nelson textbook of pediatric 21th ed. vol. 1, R. M. Kliegman, J. W. St. Geme III, N. J. Blum, S. S. Shah, R. C. Tasker, K. M. Wilson, R. E. Behrman, Ed. Canada: Elsevier, 2020, pp. 708-719.
- [3] D. M. Frazier, C. Algerier, C. Homer, et al. "Nutrition management guideline for Maple syrup urine disease: an evidence- and consensus-based approach." *Molecular genetics and metabolism* vol. 112,3 (2014): 210-7. doi:10.1016/j.ymgme.2014.05.006.
- [4] D. T. Breault, A. Majzoub, "Diabetes Insipidus" in Nelson Nelson textbook of pediatric 21th ed. vol. 4, R. M. Kliegman, J. W. St. Geme III, N. J. Blum, S. S. Shah, R. C. Tasker, K. M. Wilson, R. E. Behrman, Ed. Canada: Elsevier, 2020, pp. 2887-2889
- [5] K. Lithgow, B. Corneblum, "Polyuria: a pathophysiologic approach", *Can Journ Gen Int Med* vol 12. 2 (2017). Available from: <https://cjmim.ca/index.php/csim/article/view/247>
- [6] A. Weiner, and P. Vuguin. "Diabetes Insipidus." *Pediatrics in review* vol. 41,2 (2020): 96-99. doi:10.1542/pir.2018-0337
- [7] R. S. Miller, S. M. Libber, and L. P. Plotnick, "Polyuria" in American Academy of Pediatrics Textbook of Pediatric Care. 2nd ed. T. K. McInerney, H. M. Adam, D. E. Campbell, J. M. Foy, D. M. Kamat, Ed. Elk Grove Village, IL: American Academy of Pediatrics; 2017, pp. 1528-1533
- [8] R. Biswas, "Paediatric Diabetes Insipidus: A Review". *Dhaka Shishu (Children) Hospital Journal*, vol. 37, no. 1, Apr. 2022, pp. 64-70, doi:10.3329/dshj.v37i1.59119.
- [9] S. Gubbi, F. Hannah-Shmouni, C. A. Koch, et al, "Diagnostic testing for diabetes insipidus," in Endotext [Internet], K. R. Feingold B. Anawalt, a. Boyce, et al, Ed. South Dartmouth (MA): MDText.com, Inc.; 2000-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK537591/>.
- [10] S. Kwatra, G. Taneja, and N. Nasa. "Alternative routes of drug administration-transdermal, pulmonary & parenteral," *Indo Global Journal of Pharmaceutical Sciences* vol 2, 4 (2012): 409-426.
- [11] K. L. Stoner, H. Harder, L. J. Fallowfield, V. A. Jenkins, "Intravenous versus Subcutaneous Drug Administration. Which Do Patients Prefer? A Systematic Review." *The patient*, 12 Jul. 2014, doi:10.1007/s40271-014-0075-y.
- [12] A. Agrawal, V. K. Singh, A. Varma, and R. Sharma. "Therapeutic applications of vasopressin in pediatric patients," *Indian Pediatr*, vol 49, 4 (2012): 297-305, doi: 10.1007/s13312-012-0046-0.
- [13] K. Choong, "Vasopressin in Pediatric Critical Care." *Journal of pediatric intensive care* vol. 5,4 (2016): 182-188. doi:10.1055/s-0036-1583282.
- [14] M. Glavaš, A. Gitlin-Domagalska, D. Dębowski, N. Ptaszyńska, A. Łęgowska, and K. Rolka, "Vasopressin and Its Analogues: From Natural Hormones to Multitasking Peptides." *International journal of molecular sciences* vol. 23,6 3068. 12 Mar. 2022, doi:10.3390/ijms23063068
- [15] S. Iseas, E. L. Roca, J. M. O'Connor, M. Eleta, A. Sanchez-Luceros, D. Di Leo, et al "Administration of the vasopressin analog desmopressin for the management of bleeding in rectal cancer patients: results of a phase I/II trial." *Investigational new drugs* vol. 38,5 (2020): 1580-1587. doi:10.1007/s10637-020-00914-5 .
- [16] C. Takemoto, J. Hodding, and H. D. Kraus. *Pediatric and Neonatal Dosage Handbook*. OH: Lexi-Comp, 2014.

Antimicrobial Properties of Catha Edulis

Dennis Kithinji, Susan Maina, Stanley Ndwigah, Hannington Mugo, Julius Oyugi.

Abstract—

Background: The increasing risk of emergence of antimicrobial resistance can be addressed by discovering alternatives to antibiotics such as plant-based botanicals. In the present study, the antimicrobial properties of aqueous and methanolic extracts of *Catha edulis* (Miraa) were tested on select pathogenic bacteria and fungi.

Methods: Antimicrobial susceptibility tests were conducted in-vitro using the agar well diffusion method. The aqueous and methanolic extracts were dissolved in water to form 1000 mg/ml, 100 mg/ml, and 10 mg/ml doses. The antimicrobial susceptibility testing was done in appropriate culture media and conditions. Diameters of zones of inhibition were obtained, their means calculated, and t-tests applied to test significance of differences between means.

Results: The aqueous and methanol Miraa extracts at all three concentrations significantly inhibited the growth of all bacterial pathogens except *E. coli* but did not have an effect on *C. albicans*. The largest zones of inhibition for the aqueous extracts were observed at 1000 mg/ml against *S. pneumoniae* (28.41 mm), *S. pyogenes* ATCC 19615 (24.27 mm), MRSA (21.86 mm), and *S. aureus* clinical isolate (20.38 mm). Similarly, the largest zones of inhibition for the methanol extracts were at 1000 mg/ml against *S. pneumoniae* clinical isolate (26.75 mm), *S. pyogenes* ATCC 19615 (25.38 mm), *S. aureus* clinical isolate (19.71 mm), and MRSA ATCC 43300 (16.38 mm).

Conclusions: Crude Miraa extracts have significant antimicrobial effects in vitro against the tested microorganisms. Further studies on Miraa extracts to identify the active phytochemicals and investigate their therapeutic effects in-vivo in animal models are indicated.

Keywords— Antimicrobial, *Catha edulis*, Miraa, pathogens.

Non Pharmacological Approach to IBS (Irritable Bowel Syndrome)

A. Aceranti, L. Moretti, S. Vernocchi, M. Colorato, P. Caristia

Abstract—Irritable bowel syndrome (IBS) is the association between abdominal pain, abdominal distension and intestinal dysfunction for recurring periods. About 10% of the world's population has IBS at any given time in their life, and about 200 people per 100,000 receive an initial diagnosis of IBS each year. Persistent pain is recognized as one of the most pervasive and challenging problems facing the medical community today. Persistent pain is considered more as a complex pathophysiological, diagnostic and therapeutic situation rather than as a persistent symptom. The low efficiency of conventional drug treatments has led many doctors to become interested in the non-drug alternative treatment of IBS, especially for more severe cases. Patients and providers are often dissatisfied with the available drug remedies and often seek complementary and alternative medicine (CAM), a unique and holistic approach to treatment that is not a typical component of conventional medicine. Osteopathic treatment may be of specific interest in patients with IBS. Osteopathy is a complementary health approach that emphasizes the role of the musculoskeletal system in health and promotes optimal function of the body's tissues using a variety of manual techniques to improve body function. Osteopathy has been defined as a patient-centered health discipline based on the principles of interrelation between body structure and function, the body's innate capacity for self-healing and the adoption of a whole person health approach, mainly by practicing manual processing. Studies reported that osteopathic manual treatment (OMT) reduced IBS symptoms, such as abdominal pain, constipation, diarrhea, and improved general well-being. The focus in the treatment of IBS with osteopathy has gone beyond simple spinal alignment, to directly address the abnormal physiology of the body using a series of direct and indirect techniques. The topic of this study was chosen for different reasons: due to the large number of people involved who suffer from this disorder and for the dysfunction itself, since nowadays there is still little clarity about the best type of treatment and, above all, to its origin. The visceral component in the osteopathic field is still a world to be discovered, although it is related to a large part of patient series, it has contents that affect numerous disciplines and this makes it an enigma yet to be solved. The study originated in the didactic practice where the curiosity of a topic is marked that, even today, no one is able to explain and, above all, cure definitively. The main purpose of this study is to try to create a good basis on the osteopathic discipline for subsequent studies that can be exhaustive in the best possible way, resolving some doubts about which treatment modality can be used with more relevance. The path was decided to structure it in such a way that 3 types of osteopathic treatment are used on 3 groups of people who will be selected after completing a questionnaire, which will deem them suitable for the study. They will, in fact, be divided into three groups where: - the first group was given a visceral osteopathic treatment. - The second group was given a manual osteopathic treatment of neurological stimulation. - The third group received a placebo treatment. At the end of the treatment, questionnaires will be re-proposed respectively one week after the session and one month after the treatment from which any data will be collected that will demonstrate the effectiveness or otherwise of the treatment received. The sample of 50 patients examined underwent an oral interview to evaluate the inclusion and exclusion criteria to participate in the study. Of the 50

patients questioned, 17 people who underwent different osteopathic techniques were eligible for the study. Comparing the data related to the first assessment of tenderness and frequency of symptoms with the data related to the first follow-up shows a significant improvement in the score assigned to the different questions, especially in the neurogenic and visceral groups. We are aware of the fact that it is a study performed on a small sample of patients, and this is a penalizing factor. We remain, however, convinced that having obtained good results in terms of subjective improvement in the quality of life of the subjects, it would be very interesting to re-propose the study on a larger sample and fill the gaps.

Keywords—IBS, osteopathy, colon, intestinal inflammation.

Exercise Intervention for Women After Treatment for Ovarian Cancer

Deirdre Mc Grath, Joanne Reid

Abstract— Background: Ovarian cancer is the leading cause of mortality among gynaecologic cancers in developed countries and the seventh most common cancer worldwide with nearly 240,000 women diagnosed each year. Although it is recognized engaging in exercise results in positive health care outcomes, women with ovarian cancer are reluctant to participate. No evidence currently exists focusing on how to successfully implement an exercise intervention program for patients with ovarian cancer, using a realist approach. There is a requirement for the implementation of exercise programmes within the oncology health care setting as engagement in such interventions has positive health care outcomes for women with ovarian cancer both during and following treatment. Aim: To co-design the implementation of an exercise intervention for women following treatment for ovarian cancer. Methods: This study is a realist evaluation using quantitative and qualitative methods of data collection and analysis. Realist evaluation is well-established within the health and social care setting and has in relation to this study enabled a flexible approach to investigate how to optimise implementation of an exercise intervention for this patient population. This single centre study incorporates three stages in order to identify the underlying contexts and mechanisms which lead to the successful implementation of an exercise intervention for women who have had treatment for ovarian cancer. Stage 1 - A realist literature review. Stage 2 -Co-design of the implementation of an exercise intervention with women following treatment for ovarian cancer, their carer's, and health care professionals. Stage 3 -Implementation of an exercise intervention with women following treatment for ovarian cancer. Evaluation of the implementation of the intervention from the perspectives of the women who participated in the intervention, their informal carers, and health care professionals. The underlying program theory initially conceptualised before and during the realist review was developed further during the co-design stage. The evolving program theory in relation to how to successfully implement an exercise for these women is currently been refined and tested during the final stage of this realist evaluation which is the implementation and evaluation stage. Results: This realist evaluation highlights key issues in relation to the implementation of an exercise intervention within this patient population. The underlying contexts and mechanisms which influence recruitment, adherence, and retention rates of participants are identified. Conclusions: This study will inform future research on the implementation of exercise interventions for this patient population. It is anticipated that this intervention will be implemented into practice as part of standard care for this group of patients.

Keywords— ovarian cancer, exercise intervention, implementation, Co-design.

Analysis of Maternal Death Surveillance and Response: Causes and Contributing Factors in Addis Ababa, Ethiopia, 2022

Authors: Sisay Tiroro^{1*}, Tolcha Kebebew², Abrham Lilay³, Abdulnasir Abagero⁴

*Corresponding Author: Sisay Tiroro, email: sisaytiroro3@gmail.com

Abstract

Background: Ethiopia has been implementing the maternal death surveillance and response system to provide real-time actionable information, including causes of death and contributing factors. Analysis of maternal mortality surveillance data was conducted to identify the causes and underlying factors in Addis Ababa, Ethiopia.

Methods: We carried out a retrospective surveillance data analysis of 324 maternal deaths reported in Addis Ababa, Ethiopia, from 2017 to 2021. The data were extracted from the national maternal death surveillance and response database, including information from case investigation, verbal autopsy, and facility extraction forms. The data were analyzed by computing frequency and presented in numbers, proportions, and ratios.

Results: Of 324 maternal deaths, 92% died in the health facilities, 6.2% in transit, and 1.5% at home. The mean age at death was 28 years, ranging from 17 to 45. The maternal mortality ratio per 100,000 live births was 77 for the five years, ranging from 126 in 2017 to 21 in 2021. The direct and indirect causes of death were responsible for 87% and 13%, respectively. The direct causes included obstetric haemorrhage, hypertensive disorders in pregnancy, puerperal sepsis, embolism, obstructed labour and abortion. The third delay (delay in receiving care after reaching health facilities) accounted for 57% of deaths, while first delay (delay in deciding to seek health care) and the second delay (delay in reaching health facilities) and accounted for 34% and 24%, respectively. Late arrival to the referral facility, delayed management after admission, and non-recognition of danger signs were underlying factors.

Conclusion: Over 86% of maternal deaths were attributed by avoidable direct causes. The majority of women do try to reach health services when an emergency occurs, but the third delays present a major problem. Improving quality of care at healthcare facility level will help to reduce maternal death.

Keywords: maternal death, surveillance, delays, factors

A Comparative Study of Maternal Health Among Urban Slums and Non-Slums Women (Special Reference To Indore City)

Shiksha Thakur

Designation: Research Scholar, School of Social Science, Devi Ahilya Vishwavidyalaya, Indore,
Madhya Pradesh

Dr. Rashmi Jain

Designation: Faculty, School of Social Science, Devi Ahilya Vishwavidyalaya, Indore, Madhya
Pradesh

Contact Details: Mob. 91-78050-41142, Email: thakurshiksha90@gmail.com

Abstract:

Maternal health is the most crucial element in the primary health care delivery system of any healthy society. We aware that the maternal health situation in India has been a cause of concern for us, in spite of the rapidly progressing socio-economic environment overall. India has realized impressive gains in Mother & Child survival over the last two decades. MMR as per 2012-2013 in India is 167 as per MMR bulletin, though there are variations between states in the Country. In 2013, an estimated 2,89,000 women worldwide died from complications arising from pregnancy & childbirth. In view of the above facts, a study was conducted in Indore to analyse the maternal health status among urban slums and non-slums women.

Key Words: Antenatal care, Postnatal care, JSY, Maternal Health, Child Health, Reproductive Health

INTRODUCTION

Health is a major economic concern for every human being, particularly for women. The unhealthy physical environment leads to sickness, demanding medical treatment, which results in the reduction of workdays, followed by economic loss. Economic loss leads to inability to invest in a clean environment. The vicious cycle continues. Slums have frequently been conceptualized as social clusters that produce a distinct set of health problems. The poor environmental condition coupled with high population density makes them a major reservoir for a wide spectrum of adverse health conditions such as under-nutrition, delivery-related complications, postpartum morbidity, etc. In India, there have been limited efforts to study the health of individuals, especially women living in slums as well non-slums. The inequalities between slums and non-slums women are probably the outcome of factors such as employment patterns, literacy levels, availability of health services, traditional customs, sex status, etc. which influence the use of reproductive health services.

In general, women not only in slum but non-slums too remain unaware of their own reproductive health problems such as menstruation, sexuality, concept of menstrual hygiene and family planning methods. Further risk involved in repeated pregnancies and proper utilization of antenatal and postnatal care. Hence it is necessary to impart knowledge about these reproductive health problems. Women in the urban slums are unaware of the existing health facilities and even if available it has been adequately utilized.

However, the major limitation of most of these studies is that they have been confined to specific cities, and therefore the findings cannot be generalized.

Defining Maternal Health

According to WHO (World Health Organization) “Maternal health refers to the health of women during pregnancy, childbirth and the postpartum period. While motherhood is often a positive and fulfilling experience, for too many women it is associated with suffering, ill-health and even death. The major direct causes of maternal morbidity and mortality include haemorrhage, infection, high blood pressure, unsafe abortion, and obstructed labour.”¹

MATERIAL & METHODS

Study design: This study was cross sectional in design. Interviews were conducted with women who are pregnant and gave birth within three month prior to the survey.

Study area: Slum and Non Slum area of Indore.

Study population: Pregnant women & Lactating mothers.

INCLUSION CRITERIA

1. Pregnant women with first pregnancy.
2. Lactating mothers who have delivered within past 3 months of the study.

EXCLUSION CRITERIA

Mothers who have delivered beyond past 3 months from the time of study.

Sample Size: 120 pregnant women and lactating mothers have delivered within past 3 months.

Data Collection: Using a pretested questionnaire. Help of ASHA and AWW's were taken to identify these respective women and available documents.

Sample design: Purposive sampling- The study units are selected deliberately, with an expectation that they will be appropriate for the purpose of the study.

OBJECTIVES

In view of the holistic approach adopted for the study, the following will be set out as the study objectives:

1. To compare the socio-economic status of maternal health among urban slum and non-slum women.
2. To study the maternal problems faced by urban slum women compare then non- slum women.
3. To study the differences between maternal health awareness among urban slum and non-slum women.

TABULATION AND RESULTS

SOCIO-ECONOMIC STATUS

TABLE: 01- Education qualification of the respondent

¹http://www.who.int/topics/maternal_health/en/

S.NO	EDUCATION	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	ILLITERATE	14	07	23.33	11.67
2.	PRIMARY/MIDDLE	22	17	36.67	28.33
3.	HIGH/HIGHER SECONDARY	10	14	16.67	23.33
4.	GRADUATE/POST	14	22	23.33	36.67
5.	GRADUATE OTHER COURSE	00	00	00.00	00.00
	TOTAL	60	60	100	100

Table 1 show that 36.67% respondents are primary/ middle, 23.33% respondents are graduate/post graduate, 23.33% respondents are illiterate and 16.67% respondents are high/higher secondary in slum area and 36.67% respondents graduate/post graduate, 28.33% respondents are primary/middle, 23.33% respondents are high/higher secondary and 11.67% respondents are illiterate in non-slum area, so furthestmost of the respondents educated in non-slum compare than slum.

TABLE: 02- Caste

S.NO	CASTE	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	ST	00	00	00.00	00.00
2.	SC	22	15	36.67	25.00
3.	OBC	25	18	41.67	30.00
4.	GENERAL	13	27	21.66	45.00
5.	OTHERS	00	00	00.00	00.00
	TOTAL	60	60	100	100

Table 2 show that 41.67% respondents belongs to other backward class, 36.67% respondents belongs to schedule caste, 21.66% respondents belongs to general category in slum, and 45% respondents belongs to general category, 30% respondents belongs to other backward class, 25% respondents belongs to schedule caste in non-slum area, so furthestmost of the respondents belongs to general category in non-slum and other backward class in slum.

TABLE: 03- Number of family members

S.NO	NO. OF FAMILY MEMBERS	FREQUENCY	
		Slum	Non Slum
1.	MALE	95	78
2.	FEMALE	95	76
3.	CHILDREN(0-18)	102	76
4.	DEPENDENT	00	03
	TOTAL	292	233

Table 3 shows that 60 respondents in slum have 95 male members, 95 female members, 102 children in their family, and 60 respondents in non-slum have 78 male members, 76 female members, 76 children and 03 dependents in their family. So there are more population density in slum compare than non-slum.

TABLE: 04- Monthly family Income (Average)

S.NO	MONTHLY FAMILY INCOME	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	1000 – 5000	22	05	36.67	08.33
2.	5000 – 10000	30	26	50.00	43.33
3.	10000 – 15000	08	25	13.33	41.67
4.	15000 – 20000	00	04	00.00	06.67
5.	20000 – ABOVE	00	00	00.00	00.00
	TOTAL	60	60	100	100

Table 4 show that 50% respondents have 5000-10000 income group, 36.67% respondents have 1000-5000 income group, 13.33% respondents have 10000-15000 income group in slum, and 43.33% respondents have 5000-10000 income group, 41.67% respondents have 10000-15000 income group, 8.33% respondents have 1000-5000 income group and 6.67% respondents have 15000-20000 income group, so furthermost of the respondents are belongs to 5000-10000 income group both in slum and non- slum.

TABLE: 05- Occupational Status

S.NO	OCCUPATIONAL STATUS	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	UNEMPLOYED	06	00	10.00	00.00
2.	STUDENT	00	00	00.00	00.00
3.	HOUSEWIFE	48	48	80.00	80.00
4.	WORKING	06	12	10.00	20.00
	TOTAL	60	60	100	100

Table 5 show that 80% respondents are housewife, 10% respondents are unemployed, 10% respondents are working in slum, and 80% respondents are housewife, 20% respondents are working in non-slum, so furthermost of the respondents are housewife both in slum and non- slum.

TABLE: 06- Type of work (If working)

S.NO	TYPE OF WORK	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum

1.	PRIVATE JOB	01	10	01.67	16.66
2.	GOVT. JOB	00	01	00.00	01.67
3.	BUSINESS	00	00	00.00	00.00
4.	AGRICULTURE	01	00	01.67	00.00
5.	DAILY WAGS	03	00	05.00	00.00
6.	OTHER	01	01	01.66	01.67
7.	NOT APPLICABLE	54	48	90.00	80.00
	TOTAL	60	60	100	100

Table 6 shows that 90% respondents in slum and 80% respondents in non-slum are not working so this response are not applicable, 5% respondents are works daily wages, 01.67% have private job, 01.67% have agriculture work, 01.67% have other work in slum, and 16.77% respondent have private job, 01.67% have government job, 01.67% have other work in non-slum, so maximum respondents have private job in non-slum and daily wages in slum

HEALTH SERVICES RECEIVED DURING PREGNANCY

TABLE: 07- Registration by Govt. Aanganwadi workers

S.NO	REGISTRATION BY GOVT. AANGANWADI	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	YES	50	28	83.33	46.67
2.	NO	10	32	16.67	53.33
	TOTAL	60	60	100	100

Table 7 show that 83.33% respondents were registered by government Aanganwadi worker, 16.67% respondents were not registered in slum, 46.67% respondents were registered by government Aanganwadi worker, 53.33% respondents were not registered in non-slum, so maximum respondents were registered by government Aanganwadi worker in slum compare than non-slum.

TABLE: 08- Place of check up

S. NO	PLACE OF CHECK UP	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	GOVT.HOSPITAL/DISPANSARY	28	40	46.67	66.67
2.	PVT. HOSPITAL / DISPANSARY	11	20	18.33	33.33
3.	AANGANWADI CENTER	21	00	35.00	00.00
4.	HEALTH CAMPS	00	00	00.00	00.00
5.	NGO	00	00	00.00	00.00
	TOTAL	60	60	100	100

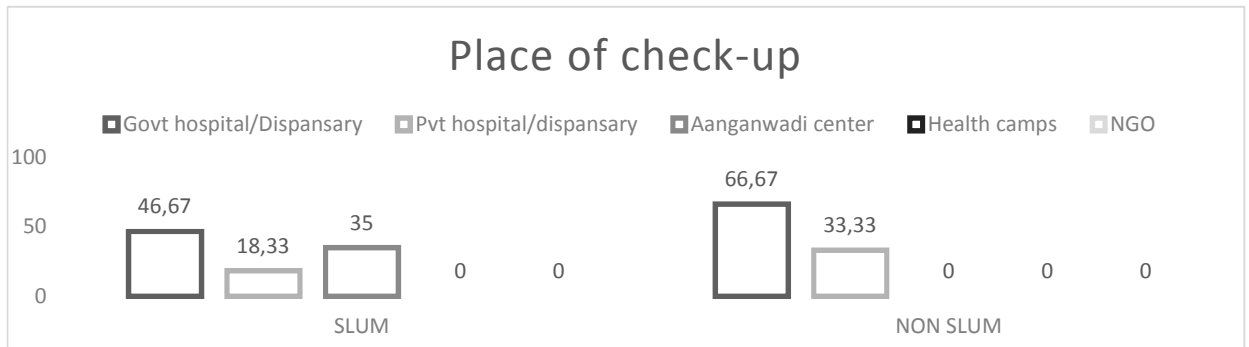


Table 8 shows place of health check-up during pregnancy. 46.67% respondents were procured treatment in government hospital/dispensary, 35% respondents were procured in Aanganwadi centers, 18.33% respondents were procured in private hospital/dispensary in slum, and 66.67% respondents were procured check-up in government hospital/dispensary, 33.33% respondents were procured treatment in private hospital/dispensary in non-slum, so maximum respondents were procured treatment in government hospital/dispensary both in slum and non-slum.

TABLE: 09- Availed ANC (Ante Natal checkup)

S.NO	AVAILED ANC	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	YES	51	59	85.00	98.33
2.	NO	09	01	15.00	01.67
	TOTAL	60	60	100	100

Table 9 shows that 85% respondents were availed ante natal check-up, 15% respondents were not availed ante natal check-up in slum, 98.33% respondents were availed ante natal check-up, 1.67% respondents were not availed ante natal check-up in non-slum, so maximum respondents were availed ante natal check-up in non-slum compare than slum.

TABLE: 10- No. of ANC (Ante Natal checkup) availed

S.NO	NO. OF ANC	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	ONE TIME	03	00	05.00	00.00
2.	TWO TIMES	18	12	30.00	20.00
3.	THREE TIMES	16	38	26.67	63.33
4.	MORE THAN THREE TIMES	14	09	23.33	15.00
5.	NOT APPLICABLE	09	01	15.00	01.67
	TOTAL	60	60	100	100

Table 10 shows that 15% respondents in slum and 01.67% respondents in non-slum were not availed ante natal check-up so this response are not applicable, 30% respondents were availed ante natal check-up in two time, 26.67% respondents were availed ante natal check-up in three time, 23.33% respondents were availed ante natal check-up more than three times, 5% respondents were availed ante natal check-up one time in slum, and 63.33% respondents were availed ante natal check-up three time, 20% respondents were availed ante natal check-up two time, 15% respondents were availed ante natal check-up more than three

times in non-slum, so maximum respondents were availed ante natal check-up two time in slum and three times in non-slum.

TABLE: 11- Immunization (TT) during Pregnancy

S.NO	IMMUNIZATION (TT) DURING PREGNANCY	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	ONE TIME	03	00	05.00	00.00
2.	TWO TIMES	17	04	28.33	06.67
3.	THREE TIMES	40	56	66.67	93.33
4.	NONE	00	00	00.00	00.00
	TOTAL	60	60	100	100

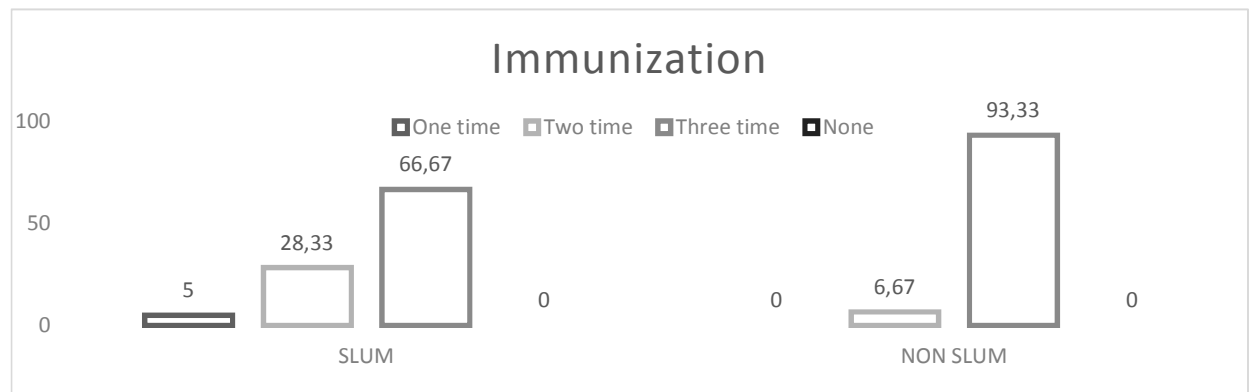


Table 11 shows that 66.67% respondents immunized tetanus tocsin three times, 28.33% respondents immunized tetanus tocsin two times, 5% respondents immunized tetanus tocsin one times in slum, and 93.33% respondents immunized tetanus tocsin three times, 6.67% respondents immunized tetanus tocsin two times in non-slum, so maximum respondents were immunized tetanus tocsin three times both in slum and non-slum.

TABLE: 12- Reason for not availing ANC (Ante Natal checkup)

S.NO	REASON FOR NOT AVAILING ANC	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	FINANCIAL PROBLEM	08	00	13.33	00.00
2.	NO FAMILY SUPPORT	00	01	00.00	01.67
3.	NORMAL DELIVIRY ANTICIPATED	00	00	00.00	00.00
4.	TOO SICK TO GO TO HOSPITAL	01	00	01.67	00.00
5.	NOT APPLICABLE	51	59	85.00	98.33
	TOTAL	60	60	100	100

Table 12 shows that 85% respondents in slum and 98.33% respondents in non-slum were availed ante natal check-up so this response are not applicable, 13.33% respondents were not availed ante natal check-up due to financial problem, 1.67% respondents were not availed ante natal check-up due to sick to go to hospital in slum, and 1.67% respondents were not availed ante natal check-up due to no family support in non-slum, so maximum respondents were not availed ante natal check-up due to financial problem in slum.

TABLE: 13- health services received when visited the clinic during pregnancy

S.NO	HEALTH SERVICES	FREQUENCY	
		Slum	Non Slum
1.	PHYSICAL EXAMINATION	53	59
2.	GYNAECOLOGICAL EXAMINE	34	34
3.	ULTRASOUND	08	15
4.	HIV/STD TESTING	36	36
5.	BLOOD TESTS	45	45
6.	NUTRITIONAL SUPPLEMENTS	17	14
7.	TETANUS VACCINE	60	54

Table 13 shows multiple responses of respondents, that 60 respondents received Tetanus vaccine, 53 received Physical examination, 45 received Blood testing, 36 received HIV/STD testing, 34 received Gynecological examine 17 received Nutrition supplements, 08 received Ultrasound related services in slum out of 60 women respondents and 59 respondents received Physical examination, 53 received Tetanus vaccine, 45 received Blood testing, 36 received HIV/STD testing, 34 received Gynecological examine 15 received Ultrasound, 14 received Nutrition supplements related services in non-slum out of 60 women respondents.

TABLE: 14- Any complications detected during pregnancy

S.NO	COMPLICATIONS DETECTED DURING PREGNANCY	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	YES	13	03	21.67	05.00
2.	NO	47	57	78.33	95.00
	TOTAL	60	60	100	100

Table 14 shows that 78.33% respondents were not detected complications during pregnancy, 21.67% respondents were detected complications during pregnancy in slum, 95% respondents were not detected complications during pregnancy, 5% respondents were detected complications during pregnancy in non-slum, so maximum respondents were detected complications during pregnancy in slum compare than non-slum.

TABLE: 15- Referred to secondary hospital for treatment of these complications

S.NO	REFERRED TO SECONDARY HOSPITAL	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	YES	01	00	01.67	00.00
2.	NO	59	60	98.33	100.0

	TOTAL	60	60	100	100
--	-------	----	----	-----	-----

Table 15 shows that 98.33% respondents were not referred to a secondary hospital for treatment of these complications, only 1.67% respondents were referred to a secondary hospital in slum, 100% respondents were not referred to a secondary hospital for treatment of these complications in non-slum, so only 1.67% respondents were referred to a secondary hospital in slum.

HEALTH SERVICES RECEIVED DURING DELIVERY

TABLE: 16- Place of Delivery

S.NO	PLACE OF DELIVERY	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	GOVT. HOSPITAL	47	37	78.33	61.67
2.	PVT. HOSPITAL	11	23	18.33	38.33
3.	CHARITABLE/ NGO HOSPITAL	00	00	00.00	00.00
4.	HOME	02	00	03.34	00.00
	TOTAL	60	60	100	100

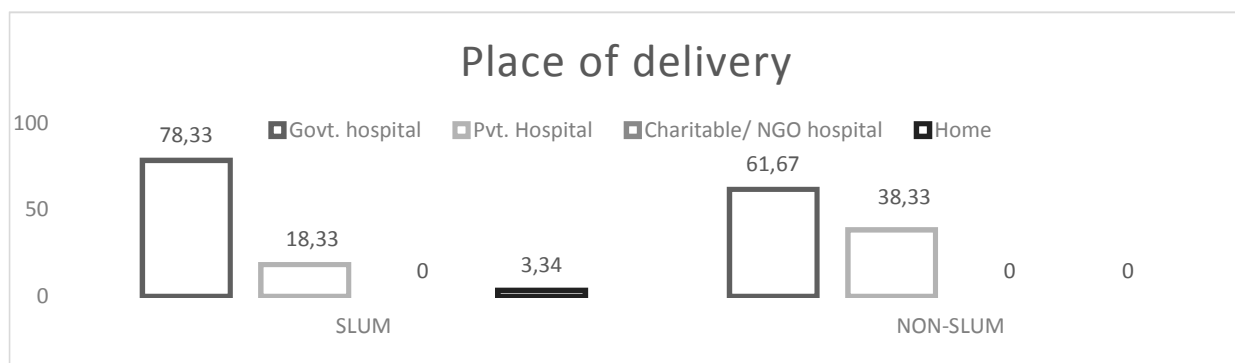


Table 16 shows that 78.33% respondents were got delivery in government hospital, 18.33% respondents were got delivery in private hospital, 3.34% respondents were got delivery at home in slum, 61.67% respondents were got delivery in government hospital, 38.33% respondents were got delivery in private hospital in non-slum, so maximum respondents were got delivery in government hospital both in slum and non-slum.

TABLE: 17- Reason for Home Delivery

S.NO	HOME DELIVERY REASON	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	FINANCIAL PROBLEM	01	00	01.67	00.00
2.	NO FAMILY SUPPORT	00	00	00.00	00.00
3.	NORMAL DELIVIRY ANTICIPATED	01	00	01.67	00.00
	TOO SICK TO GO TO	00	00	00.00	00.00

4.	HOSPITAL	00	00	00.00	00.00
5.	ANY OTHER RESPONSE	00	00	00.00	00.00
6.	NOT APPLICABLE	58	60	96.66	100.0
	TOTAL	60	60	100	100

Table 17 shows that 96.66% respondents in slum and 100% respondents in non-slum were availed institutional delivery so this response is not applicable. 1.67% respondents had financial problem, 1.67% respondents had normal delivery anticipated in slum, so respondent in slum got home delivery.

TABLE: 18- Availed benefits of schemes for pregnancy and Delivery

S.NO	AVAILED BENEFITS OF SCHEMES	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	JANANI SURAKSHA YOJNA	39	24	65.00	40.00
2.	ANY OTHER	02	01	03.33	01.67
3.	NO	19	35	31.67	58.33
	TOTAL	60	60	100	100

Table 18 shows that 65% respondents were got benefits of scheme Janani Suraksha Yojna, 3.33% respondents were got benefits of other scheme, 31.67% respondents were not got benefits of scheme in slum, 40% respondents were got benefits of scheme Janani Suraksha Yojna, 1.67% respondents were got benefits of other scheme, 58.33% respondents were not got benefits of scheme in non-slum, so maximum respondents were got benefits of scheme Janani Suraksha Yojna in slum and respondents were not got benefits of scheme in slum in non-slum.

TABLE: 19- During delivery attended by a skilled birth attendant

S.NO	ATTENDED BY SKILLED BIRTH ATTENDANT	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	YES	59	60	98.33	100.0
2.	NO	01	00	01.67	00.00
	TOTAL	60	60	100	100

Table 19 shows that 98.33% respondents were attended by skilled birth attendant, 1.67% respondents were not attended by skilled birth attendant in slum, 100% respondents were attended by skilled birth attendant in non-slum, so respondents were not attended by skilled birth attendant in slum compare than non-slum.

TABLE: 20- Attended by

S.NO	ATTENDED BY	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	DOCTOR	58	60	96.67	100.0
2.	NURSE	00	00	00.00	00.00
3.	MIDWIFE	02	00	03.33	00.00
4.	OTHER	00	00	00.00	00.00

TOTAL	60	60	100	100
-------	----	----	-----	-----

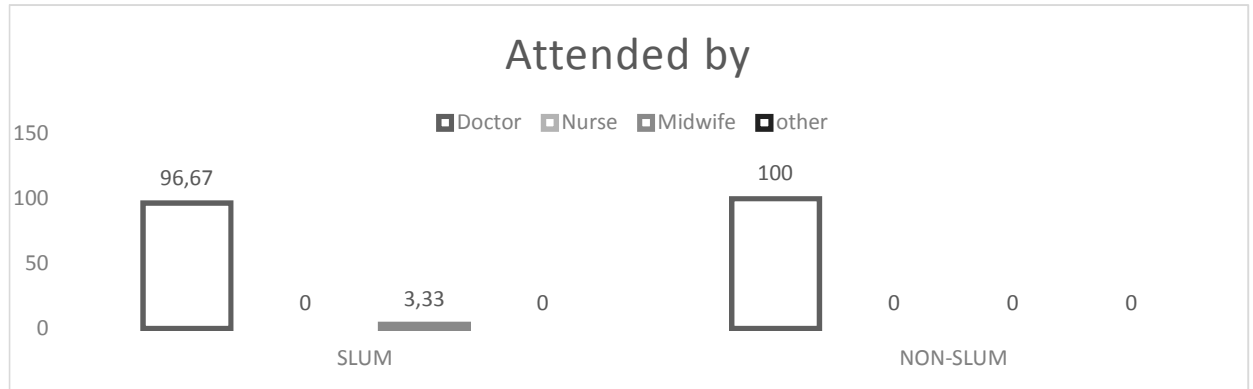


Table 20 shows that 96.67% respondents were attended by doctor, 3.33% respondents attended by midwife in slum, 100% respondents were attended by skilled doctors in non-slum, so maximum respondents were attended by doctors both in slum and non-slum.

TABLE: 21- Satisfied with the care received from the skilled birth attendant

S.NO	SATISFIED WITH CARE RECEIVED	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	COMPLETELY SATISFIED	33	38	55.00	63.33
2.	PARTIALLY SATISFIED	05	10	08.33	16.67
3.	NEITHER SATISFIED NOR DISSATISFIED	21	11	35.00	18.33
4.	DISSATISFIED	01	01	01.67	01.67
	TOTAL	60	60	100	100

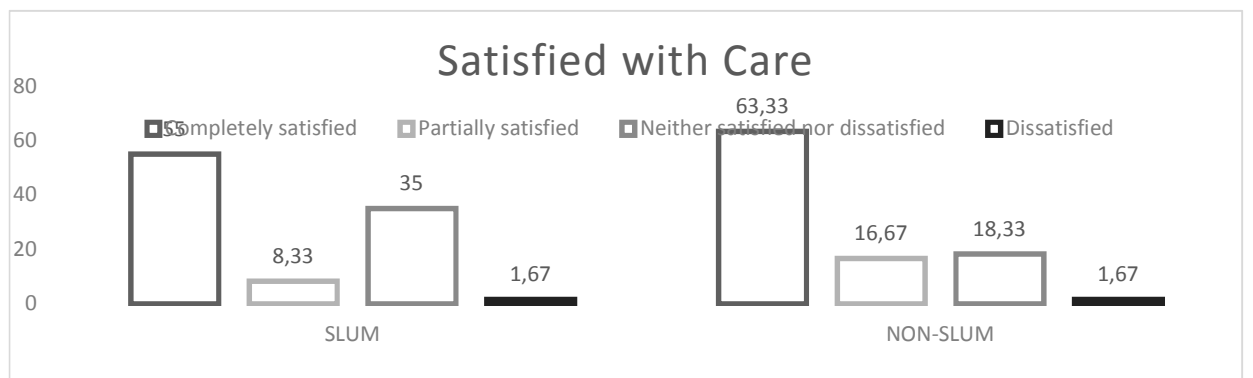


Table 21 shows that 55% respondents completely satisfied, 8.33% respondents partially satisfied, 35% respondents neither satisfied nor dissatisfied, 1.67% respondents dissatisfied in slum, 63.33% respondents completely satisfied, 16.67% respondents partially satisfied, 18.33% respondents neither satisfied nor

dissatisfied, 1.67% respondents dissatisfied in non-slum, so maximum respondents completely satisfied both in slum and non-slum.

TABLE: 22- Experience any complications during delivery

S.NO	COMPLICATIONS DURING DELIVERY	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	YES	05	03	08.33	05.00
2.	NO	55	57	91.67	95.00
	TOTAL	60	60	100	100

Table 22 shows that 91.67% respondents were not experience any complications during delivery,8.33% respondents were experience in slum,95.00% respondents were not experience any complications during delivery,5% respondents were experience in non-slum, so maximum respondents experience complications during delivery in slum compere than non-slum.

TABLE: 23- Primary clinic provide emergency care for these complications

S.NO	PROVIDE EMERGENCY CARE FOR COMPLICATIONS	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	YES	04	01	06.67	01.67
2.	NO	56	59	93.33	98.33
	TOTAL	60	60	100	100

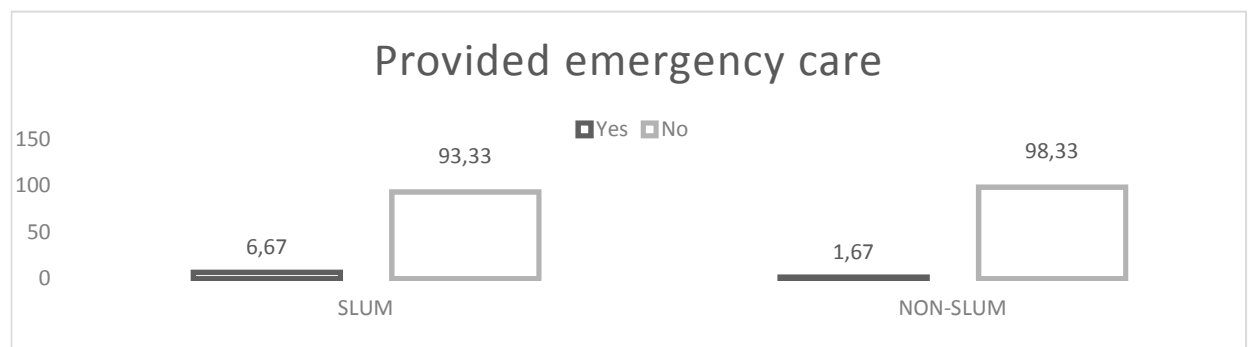


Table 23 shows that 93.33% respondents were not get emergency care for complications during delivery,6.67% were get emergency care for complications in slum,98.33% respondents were not get emergency care for complications during delivery,1.67% were get emergency care for complications in non-slum, so maximum respondents were get emergency care for complications in slum compere than non-slum.

TABLE: 24- Taken to a secondary hospital for emergency care

S.NO	TAKEN TO SECONDARY HOSPITAL FOR EMERGENCY	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum

1.	YES	00	02	00.00	03.33
2.	NO	60	58	100.0	96.67
	TOTAL	60	60	100	100

Table 24 shows that 100% respondents were not taken to a secondary hospital for emergency care in slum,66.67% respondents were not taken to a secondary hospital for emergency care,3.33% respondents were taken to secondary hospital for emergency care in non-slum, so maximum respondents were get emergency care for complications in non-slum compare than slum.

TABLE: 25- Duration since last delivery

S.NO	DURATION SINCE LAST DELIVERY	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	LESS THAN ONE YEAR	55	39	91.67	65.00
2.	ONE TO TWO YEAR	05	21	08.33	35.00
3.	MORE THAN TWO YEAR	00	00	00.00	00.00
	TOTAL	60	60	100	100

Table 25 shows that 91.67% respondent have less than one year duration since last delivery,8.33% respondent have one to two year duration in slum, 65% respondent have less than one year duration since last delivery,35% respondent have one to two year duration in non-slum, so maximum respondents have less than one year duration since last delivery both in slum and non-slum.

HEALTH SERVICES RECEIVED AFTER DELIVERY

TABLE: 26- Receive medical care after delivery

S.NO	RECEIVE MEDICAL CARE AFTER DELIVERY	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	YES	50	56	83.33	93.33
2.	NO	10	04	16.67	06.67
	TOTAL	60	60	100	100

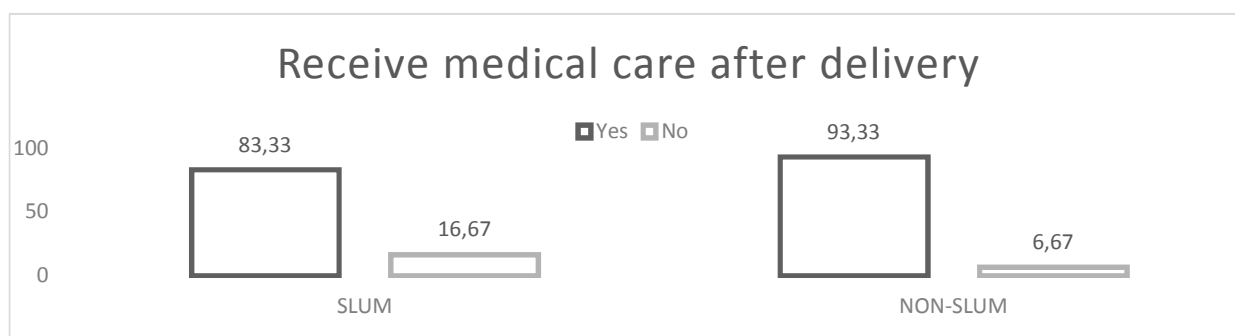


Table 26 shows that 83.33% respondent received medical care after delivery,16.67% respondents were not

received medical care after delivery in slum, 93.33% respondent received medical care after delivery, 6.67% respondent were not received medical care after delivery in non-slum, so maximum respondents were not received medical care after delivery in slum compare than non-slum.

TABLE: 27- Visit the clinic after delivery

S.NO	VISIT THE CLINIC AFTER DELIVERY	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	ONE TO TWO VISITS	12	07	20.00	11.67
2.	MORE THAN TWO VISITS	38	49	63.33	81.67
3.	NOT APPLICABLE	10	04	16.67	06.66
	TOTAL	60	60	100	100



Table 27 shows that 16.67% respondent in slum and 6.67% respondent in non-slum were not received medical care after delivery so this response are not applicable. 63.33% respondents were visited more than two visits at clinic after delivery, 20% respondents were visited one or two visits at clinic in slum, 81.67% respondents were visited more than two visits at clinic after delivery, 11.67% respondents were visited one or two visits at clinic in non-slum, so maximum respondents were visited at clinic in non-slum compare than slum.

TABLE: 28- Experience any problems after delivery

S.NO	EXPERIENCE ANY PROBLEM AFTER DELIVERY	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	YES	02	00	03.33	00.00
2.	NO	58	60	96.67	100.0
	TOTAL	60	60	100	100



Table 28 shows that 96.67% respondents were not experience any complications after delivery, 3.33% respondents were experience in slum, 100% respondent were not experience any complications after delivery in non-slum, so maximum respondents experience complications during delivery in slum compare than non-slum.

TABLE: 29- Receive a referral to a secondary hospital

S.NO	RECEIVE REFERRAL TO SECONDARY HOSPITAL	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	YES	00	00	00.00	00.00
2.	NO	60	60	100.0	100.0
	TOTAL	60	60	100	100

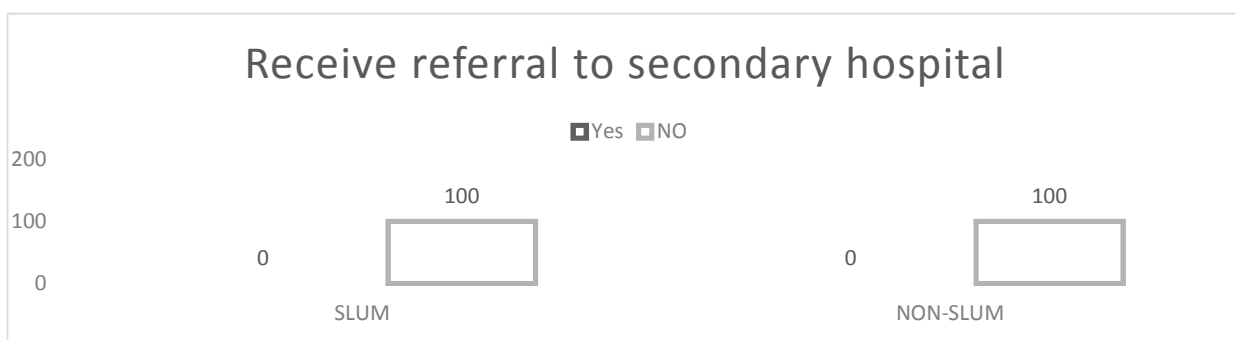


Table 29 shows that 100% respondents were not referred to secondary hospital in slum and 100% respondent were not referred to secondary hospital in non-slum, so respondents were not referred to secondary hospital both in slum and non-slum.

TABLE: 30- Availd PNC (Post Natal care) Check-up

S.NO	AVAILD PNC	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	YES	48	54	80.00	90.00
2.	NO	12	06	20.00	10.00
	TOTAL	60	60	100	100



Table 30 shows that 80% respondents were not availed post natal care after delivery,20% respondents were availed post natal care after delivery in slum, and 90% respondents were not availed post natal care after delivery,10% respondents were availed post natal care after delivery in non-slum, so maximum respondents were not availed post natal care in slum compare than non-slum.

TABLE: 31- Availed PNC (Post Natal care) after

S.NO	AVAILED PNC AFTER	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	WITHIN 45 DAYS	41	43	68.33	71.67
2.	MORE THAN 45 DAYS	07	11	11.67	18.33
3.	NOT APPLICABLE	12	06	20.00	10.00
	TOTAL	60	60	100	100

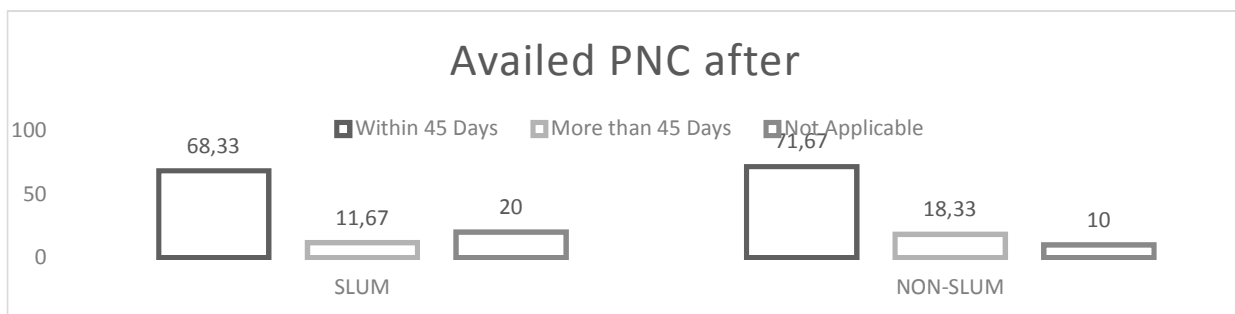


Table 31 shows that 20% respondents in slum and 10% respondent in non-slum were not availed post natal care after delivery so this response are not applicable,68.33% respondents were availed post natal care within 45 days, 11.67% respondents were availed post natal care more than 45 days in slum, 71.67% respondents were availed post natal care within 45 days, 18.33% respondents were availed post natal care more than 45 days in non-slum, so maximum respondents were availed post natal care within 45 days in non-slum compare than slum.

TABLE: 32- Place of check-up

S.NO	PLACE OF CHECK UP	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	HOME VISIT BY AWC WORKER	07 30	04 20	11.67 50.00	06.67 33.33

2.	GOVT HOSPITAL	00	07	00.00	11.67
3.	GOVT DISPENSARY	05	07	08.33	11.67
4.	PVT HOSPITAL	06	16	10.00	26.66
5.	PVT CLINIC	00	00	00.00	00.00
6.	HEALTH CAMPS	12	06	20.00	10.00
7.	NONE				
	TOTAL	60	60	100	100

Table 32 shows that 20% respondents in slum and 10% respondent in non-slum were not availed post natal care after delivery so this response are not applicable, 50% respondents were availed post natal care at government hospital, 11.67% respondents were availed post natal care at home visited by AWC workers, 10% respondents were availed post natal care at private clinic, 8.33% respondents were availed post natal care at private hospital in slum, 33.33% respondents were availed post natal care at government hospital, 26.66% respondents were availed post natal care at private clinic, 11.67% respondents were availed at government dispensary, 11.67% respondents were availed at private hospital, 6.67% respondents were availed post natal care at home visited by AWC workers in non-slum, so maximum respondents were availed post natal care at government hospital both in slum and non-slum.

TABLE: 33- Type of health facility visited for maternal health services during recent pregnancy

S.NO	TYPE OF HEALTH FACILITIES	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	GOVT CLINIC/HOSPITAL	48	37	80.00	61.67
2.	PVT CLINIC/HOSPITAL	10	23	16.67	38.33
3.	NGO	00	00	00.00	00.00
4.	TRADITIONAL BIRTH ATTENDANT	02	00	03.33	00.00
	TOTAL	60	60	100	100

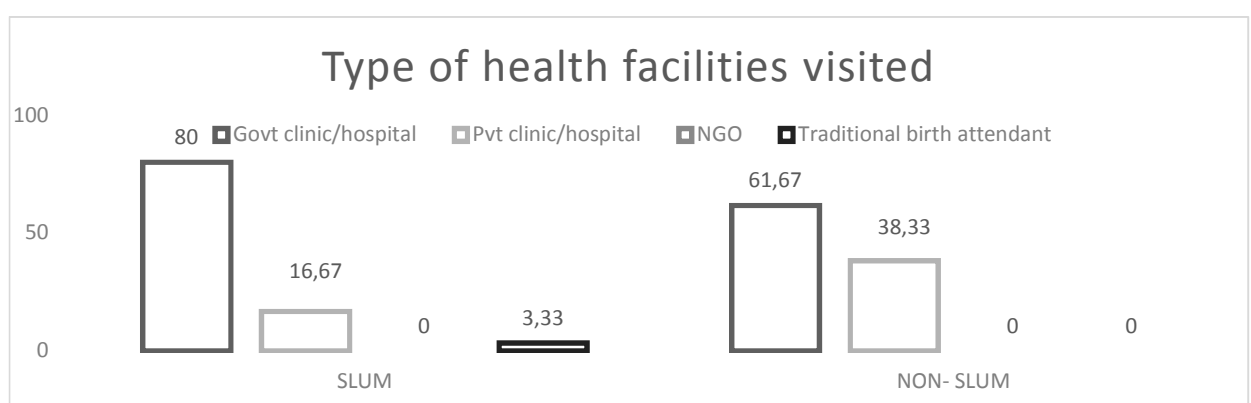


Table 33 shows that 80% respondents were get health facilities for maternal health at government clinic/hospital, 16.67% respondents were get health facilities at private clinic/hospital, 3.33% respondents were get traditional birth attendant in slum, and 61.67% respondents were get health facilities for maternal health at government clinic/hospital, 38.33% respondents were get health facilities at private clinic/hospital

in non-slum, so maximum respondents were get health facilities for maternal health at government clinic/hospital in slum compare than non-slum.

TABLE: 34- Reason for not using government clinic/hospital

S.N O	REASON FOR NOT USING GOVT CLINIC/ HOSPITAL	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	SERVICE NOT SATISFACTORY	08	18	13.33	30.00
2.	LONG WAITING PERIODS	02	05	03.33	08.33
3.	DOCTORS ARE NOT AVAILABLE	00	00	00.00	00.00
4.	MEDICINES A NOT AVAILABLE	00	00	00.00	00.00
5.	LONG DISTANCE	00	00	00.00	00.00
6.	TREATMANT IS COSTLY	00	00	00.00	00.00
7.	ANY OTHER	02	02	03.33	03.33
8.	NA	48	35	80.00	58.34
	TOTAL	60	60	100	100

Table 34 shows reason for not using government clinic/hospital. 13.33% respondents were respond services are not satisfactory, 3.33% respondents were respond long waiting periods, 3.33% respondents were gave any other response in slum, 30% respondents were respond services are not satisfactory, 8.33% respondents were respond long waiting periods, 3.33% respondents were gave any other response and in non-slum, so maximum respondents were respond services are not satisfactory both in slum and non-slum.

TABLE: 35- Time for travel to the government primary health clinic

S.NO	TIME FOR TRAVEL TO GOVT PRIMARY HEALTH CLINIC	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	LESS THAN 30 MINUTES	08	07	13.33	11.67
2.	30 MINUTES TO 1 HOUR	40	37	66.67	61.67
3.	1 HOUR TO 1.5 HOUR	12	16	20.00	26.66
4.	1.5 HOUR TO 2 HOUR	00	00	00.00	00.00
5.	MORE THAN 2 HOUR	00	00	00.00	00.00
	TOTAL	60	60	100	100

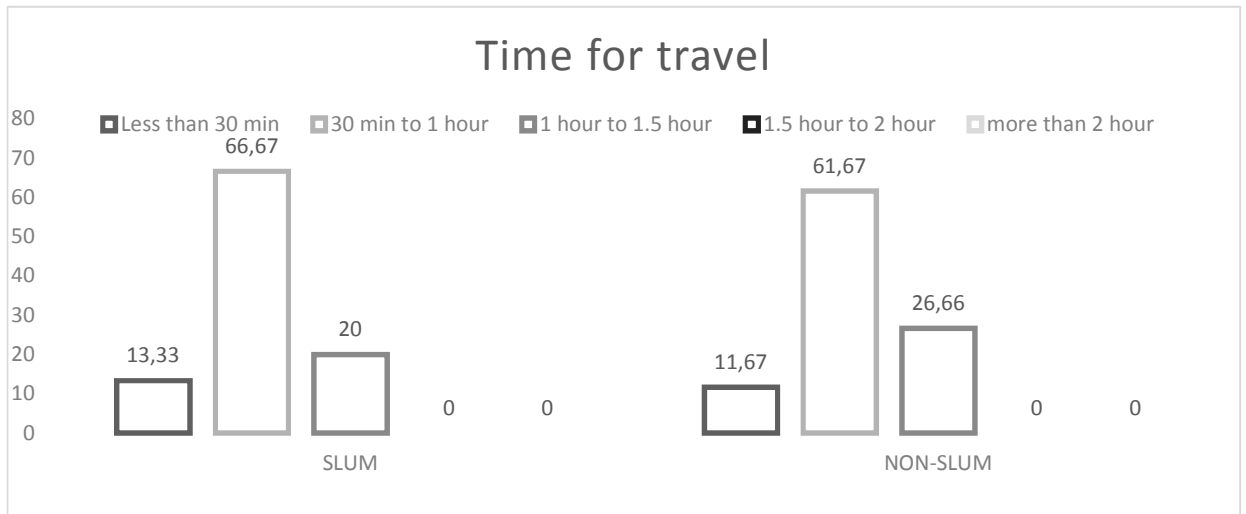


Table 35 shows Time for travel to the government primary health clinic.66.67% respondents were respond 30 minutes to one hour,20% respondents were respond one hour to one and half hour, 13.33% respondents were respond less than 30 minutes in slum, and 61.67% respondents were respond 30 minutes to one hour,26.66% respondents were respond one hour to one and half hour, 11.67% respondents were respond less than 30 minutes in non-slum, so maximum respondents were respond 30 minutes to one hour both in slum and non-slum.

TABLE: 36- Transport used to go to the government primary health clinic

S.NO	TRANSPORT USED FOR GOVT PRIMARY HEALTH CLINIC	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	WALKING	00	00	00.00	00.00
2.	BICYCLE	00	00	00.00	00.00
3.	BIKE	33	31	55.00	51.67
4.	PUBLIC TRANSPORT	26	01	43.33	01.67
5.	CAR	01	28	01.67	46.66
	TOTAL	60	60	100	100

Table 36 shows that55% respondents were used Bike for going government primary health clinic,43.33% respondents were used public transport for going government primary health clinic,1.67% respondents were used Car for going government primary health clinic in slum, and 51.67% respondents were used Bike for going government primary health clinic,1.67% respondents were used public transport for going government primary health clinic,46.66% respondents were used Car for going government primary health clinic in non-slum, so maximum respondents were used personal vehicle both in slum and non-slum.

TABLE: 37- Average amount of time that waited to see medical staff when visited the clinic.

S.NO	AVERAGE AMOUNT OF TIME WAITING FOR STAFF	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum

1.	LESS THAN 30 MINUTES	09	08	15.00	13.33
2.	30 MINUTES TO 1 HOUR	20	32	33.33	53.33
3.	1 HOUR TO 1.5 HOUR	31	20	51.67	33.34
4.	1.5 HOUR TO 2 HOUR	00	00	00.00	00.00
5.	MORE THAN 2 HOUR	00	00	00.00	00.00
	TOTAL	60	60	100	100

Table 37 shows average amount of time that waited to see medical staff when visited the clinic. 51.67% respondents were respond one hour to one and half hour, 33.33% respondents were respond 30 minutes to one hour, 15% respondents were respond less than 30 minutes in slum, and 53.33% respondents were respond 30 minutes to one hour, 33.34% respondents were respond one hour to one and half hour, 13.33% respondents were respond less than 30 minutes in non-slum, so maximum respondents were waited more time in slum compare than non-slum.

COSTS

TABLE: 38- Household spend for maternal health services during last pregnancy

S.NO	HOUSEHOLD SPEND FOR MATERNAL SERVICES HEALTH	FREQUENCY		PERCENTAGE	
		Slum	Non Slum	Slum	Non Slum
1.	LESS THAN 5000	03	03	05.00	05.00
2.	5000-10000	39	27	65.00	45.00
3.	MORE THAN 10000	18	30	30.00	50.00
	TOTAL	60	60	100	100

Table 38 shows 65% respondents were spend 5000-10000 for maternal health services during last pregnancy, 30% respondents were spend more than 10000 for maternal health services, 5% respondents were spend less than 5000 for maternal health services during last pregnancy in slum, and 50% respondents were spend more than 10000 for maternal health services during last pregnancy, 45% respondents were spend 5000-10000 for maternal health services during last pregnancy, 5% respondents were spend less than 5000 for maternal health services in non-slum, so maximum respondents were spend more for maternal health services in non-slum compare than slum.

FINDINGS & SUGGESTIONS

It is found that hazardous health practices are more in slum compare than non-slum. 36.67% respondents are primary/ middle, 23.33% respondents are illiterate and in slum area and 36.67% respondents graduate/post graduate, and 11.67% respondents are illiterate in non-slum area, so furthestmost of the respondents educated in non-slum compare than slum.

HEALTH SERVICES RECEIVED DURING PREGNANCY

83.33% respondents were registered by government Aanganwadi worker, 16.67% respondents were not registered in slum, 46.67% respondents were registered by government Aanganwadi worker, 53.33% respondents were not registered in non-slum, so maximum respondents were registered by government Aanganwadi worker in slum compare than non-slum. Aanganwadi centers provides maternal health services during and after delivery not even any cost of services so its batter option for the slum pregnant and mothers for availing services for herself and their child. So the present study shows high percentage of registration at Aanganwadi centers of slum's respondents. Place of health check-up during pregnancy. 46.67% respondents were procured treatment in government hospital/dispensary, 35% respondents were

procured in Aanganwadi centers, 18.33% respondents were procured in private hospital/dispensary in slum, and 66.67% respondents were procured check-up in government hospital/dispensary, 33.33% respondents were procured treatment in private hospital/dispensary in non-slum, so maximum respondents were procured treatment in government hospital/dispensary both in slum and non-slum.

The present study shows that 85% respondents were availed ante natal check-up, 15% respondents were not availed ante natal check-up in slum, 98.33% respondents were availed ante natal check-up, 1.67% respondents were not availed ante natal check-up in non-slum, so maximum respondents were availed ante natal check-up in non-slum compare than slum. Intake of ANC is an important intervention for reducing maternal and perinatal morbidity and mortality. In the current study most of the respondents availed ante natal check-up both in slum and non-slum areas.

15% respondents in slum and 01.67% respondents in non-slum were not availed ante natal check-up so this response are not applicable, 30% respondents were availed ante natal check-up in two time, 5% respondents were availed ante natal check-up one time in slum, and 63.33% respondents were availed ante natal check-up three time, 20% respondents were availed ante natal check-up two time, 15% respondents were availed ante natal check-up more than three times in non-slum, so maximum respondents were availed ante natal check-up two time in slum and three times in non-slum, at least two or three ante-natal visit was availed of by the mothers, In the present study, using either the government or private facility.

In the present study it was shows that 66.67% respondents immunized tetanus tocsin three times, 5% respondents immunized tetanus tocsin one times in slum, and 93.33% respondents immunized tetanus tocsin three times, 6.67% respondents immunized tetanus tocsin two times in non-slum, so maximum respondents were immunized tetanus tocsin three times both in slum and non-slum.a number of mothers visited private or government facilities for availing of tetanus tocsin injection only. Thus, the rate of utilization of three tetanus tocsin injection was more than the rate of ante-natal check-ups.

85% respondents in slum and 98.33% respondents in non-slum were availed ante natal check-up so this response are not applicable, 13.33% respondents were not availed ante natal check-up due to financial problem, 1.67% respondents were not availed ante natal check-up due to sick to go to hospital in slum, and 1.67% respondents were not availed ante natal check-up due to no family support in non-slum, so maximum respondents were not availed ante natal check-up due to financial problem in slum.

The study shows that 78.33% respondents were not detected complications during pregnancy, 21.67% respondents were detected complications during pregnancy in slum, 95% respondents were not detected complications during pregnancy, 5% respondents were detected complications during pregnancy in non-slum, so maximum respondents were detected complications during pregnancy in slum compare than non-slum among them 98.33% respondents were not referred to a secondary hospital for treatment of these complications, only 1.67% respondents were referred to a secondary hospital in slum, 100% respondents were not referred to a secondary hospital for treatment of these complications in non-slum, so only 1.67% respondents were referred to a secondary hospital in slum.

HEALTH SERVICES RECEIVED DURING DELIVERY

For many of these slums families, pregnancy and childbirth are not an area of concern on a priority basis. In developing countries like India, it takes a huge effort to change the practice of home delivery by traditional untrained attendants to delivery by trained birth attendants or from home delivery to institutional delivery. This is despite the fact that the emphasis on the Reproductive and Child Health Programme (RCH) across the country is to promote institutional deliveries. Moreover, there is evidence to show that skilled birth attendants, ANMs or doctor is an important variable in promoting maternal and child health. It is also possible to reduce maternal mortality and morbidity even where resources are limited by using a variety of models of care.

The findings in the current study are consistent with other studies. Institutional and safe delivery was the preferred choice in both the slums and non- slum for a majority of women. Most of the deliveries were conducted by trained birth attendants. 78.33% respondents were got delivery in government hospital, 3.34% respondents were got delivery at home in slum,61.67% respondents were got delivery in government

hospital, 38.33% respondents were got delivery in private hospital in non-slum, Hazardous home delivery practices were found in slum but the reason was acceptable that lack of finance and normal delivery anticipated.

65% respondents were got benefits of scheme Janani Suraksha Yojna, 3.33% respondents were got benefits of other scheme, 31.67% respondents were not got benefits of scheme in slum,40% respondents were got benefits of scheme Janani Suraksha Yojna, 1.67% respondents were got benefits of other scheme, 58.33% respondents were not got benefits of scheme in non-slum, so maximum respondents were got benefits of scheme Janani Suraksha Yojna in slum because of institutional government deliveries and respondents were not got benefits of scheme in non-slum because of institutional but private hospitals or clinic delivery.

The present study shows that 98.33% respondents were attended by skilled birth attendant,1.67% respondents were not attended by skilled birth attendant in slum,100% respondents were attended by skilled birth attendant in non-slum, so only 1.67% respondents were not attended by skilled birth attendant in slum because of non-institutional delivery, and 55% respondents completely satisfied,8.33% respondents partially satisfied,35% respondents neither satisfied nor dissatisfied, 1.67% respondents dissatisfied in slum,63.33% respondents completely satisfied,16.67% respondents partially satisfied,18.33% respondents neither satisfied nor dissatisfied, 1.67% respondents dissatisfied in non-slum, so maximum respondents completely satisfied both in slum and non-slum from the services related deliveries.

The study shows that 91.67% respondents were not experience any complications during delivery,8.33% respondents were experience in slum,95.00% respondents were not experience any complications during delivery,5% respondents were experience in non-slum, so maximum respondents experience complications during delivery in slum compere than non-slum.

93.33% respondents were not get emergency care for complications during delivery,6.67% were get emergency care for complications in slum,98.33% respondents were not get emergency care for complications during delivery,1.67% were get emergency care for complications in non-slum, so maximum respondents were get emergency care for complications in slum compere than non-slum, among them 100% respondents were not taken to a secondary hospital for emergency care in slum,66.67% respondents were not taken to a secondary hospital for emergency care,3.33% respondents were taken to secondary hospital for emergency care in non-slum, so maximum respondents were get emergency care for complications in non-slum compere than slum.

In that study maximum respondents have less than one year duration since last delivery both in slum and non-slum.

HEALTH SERVICES RECEIVED AFTER DELIVERY

The present study shows that 83.33% respondent received medical care after delivery,16.67% respondents were not received medical care after delivery in slum, 93.33% respondent received medical care after delivery,6.67% respondent were not received medical care after delivery in non-slum, so maximum respondents were not received medical care after delivery in slum compare than non-slum, among them 20% respondents were visited one or two visits at clinic in slum,81.67% respondents were visited more than two visits at clinic after delivery, 11.67% respondents were visited one or two visits at clinic in non-slum, so maximum respondents were visited at least two or more visits at clinic both in non-slum and slum.

Intake of PNC is an important factor for reducing maternal and child morbidity and mortality. In the current study most of the respondents availed post natal care both in slum and non-slum areas.

80% respondents were not availed post natal care after delivery,20% respondents were availed post natal care after delivery in slum, and 90% respondents were not availed post natal care after delivery,10% respondents were availed post natal care after delivery in non-slum, so maximum respondents were not availed post natal care in slum compere than non-slum, among them68.33% respondents were availed post natal care within 45 days, 11.67% respondents were availed post natal care more than 45 days in slum, 71.67% respondents were availed post natal care within 45 days, 18.33% respondents were availed post natal care more than 45 days in non-slum, so maximum respondents were availed post natal care with in 45

days in non-slum compare than slum, within 45 days of post natal care is ideal period for maternal and child care.

Maximum respondents were availed post natal care at government hospital both in slum and non-slum. 80% respondents were get health facilities for maternal health at government clinic/hospital in slum, and 61.67% respondents were get health facilities for maternal health at government clinic/hospital in non-slum, so maximum respondents were get health facilities for maternal health at government clinic/hospitals both in slum and non-slum.

The reasons behind not using government clinic/hospitals for maternal health. 13.33% respondents were respond services are not satisfactory, 3.33% respondents were respond long waiting periods, 3.33% respondents were gave any other response in slum, 30% respondents were respond services are not satisfactory, 8.33% respondents were respond long waiting periods, 3.33% respondents were gave any other response and in non-slum, so maximum respondents were respond services are not satisfactory both in slum and non-slum.

To understand the difference in availing of the healthcare facilities, we must keep in mind the factors such as physical accessibility, household practices, cultural norms and economic affordability. It has also been shown that in two urban slum and non-slum areas, the contrasting healthcare availability causes differences in the use of maternal health care services. In the present study, as the socio-cultural background was almost similar in both the populations, the difference was probably because of lack of physical accessibility to healthcare facilities in slum, where the nearest maternal healthcare facility is taking time for travel at least minimum 30 minutes.

The study shows time for travel to the government primary health clinic. 66.67% respondents were respond 30 minutes to one hour, 20% respondents were respond one hour to one and half hour, 13.33% respondents were respond less than 30 minutes in slum, and 61.67% respondents were respond 30 minutes to one hour, 26.66% respondents were respond one hour to one and half hour, 11.67% respondents were respond less than 30 minutes in non-slum, so maximum respondents were respond 30 minutes to one hour both in slum and non-slum, and using personal transport facilities that 55% respondents were used Bike for going government primary health clinic, 43.33% respondents were used public transport for going government primary health clinic, 1.67% respondents were used Car for going government primary health clinic in slum, and 51.67% respondents were used Bike for going government primary health clinic, 1.67% respondents were used public transport for going government primary health clinic, 46.66% respondents were used Car for going government primary health clinic in non-slum, so maximum respondents were used personal vehicle both in slum and non-slum.

In spite of time of traveling respondent waited for the medical staff the average amount of time that waited to see medical staff when visited the clinic. 51.67% respondents were respond one hour to one and half hour, 33.33% respondents were respond 30 minutes to one hour, 15% respondents were respond less than 30 minutes in slum, and 53.33% respondents were respond 30 minutes to one hour, 33.34% respondents were respond one hour to one and half hour, 13.33% respondents were respond less than 30 minutes in non-slum, so maximum respondents were waited more time in slum compare than non-slum.

The present study shows 65% respondents were spend 5000-10000 for maternal health services during last pregnancy in slum, and 50% respondents were spend more than 10000 for maternal health services during last pregnancy, 45% respondents were spend 5000-10000 for maternal health services during last pregnancy in non-slum, so maximum respondents were spend more for maternal health services in non-slum compare than slum.

In the present study, the knowledge, awareness and attitude for institutional delivery was observed to be most of the women feel home delivery is abnormal process that require expert intervention. Tradition as a reason for choosing institutional deliveries reflects knowledge and awareness of importance of safe delivery practices. This knowledge was significantly more common in slum and non-slum.

Attitude of healthcare workers and their rude behavior may also create barriers to Access facilities, turning the mothers away from the government facilities to private hospitals or to traditional home delivery

practices. In the private sector (and also in the public sector where drugs and investigations have to be paid for), poverty may be the limiting factor. In the present study, in slum, where healthcare facilities are physically accessible, the main reasons for home deliveries are economic constraints and rude behavior of the hospital staff.

CONCLUSION

Utilization of healthcare services is poor in urban slums even though physical accessibility is present. Social and cultural barriers are more common in slums where healthcare services are not reachable. Skilled birth attendants are reaching to those who need them the most. Access to health services leads to improved intake of maternal healthcare facilities. Accessibility to healthcare services of slum population must be taken into account in the district health planning process. Healthcare services need to be scaled up so that ante-natal services and skilled birth attendants are available for all. The health education and awareness component of care can bring about changes in attitude and practice. This component should be strengthened in the healthcare delivery system.

REFERENCES

1. A 2003 paper for Washington, D.C. Policy Institute, the Carnegie Endowment of International Peace www.carnegieendowment.org/files/wp41.pdf.
2. Almeida, A. (2011, November). Impact of the Vishaka Judgment. Infochange News and Features. Retrieved from <http://infochangeindia.org/women/features/impact-of-the-vishaka-judgment.html>. Accessed on 18/10/16
3. Asia Pacific Human Development Report. (2010). Power, Voice and Rights, A Turning Point for Gender Equality in the Asia and the Pacific. UNDP. Macmillan Publishers India Ltd.
4. Barua, P. (2012, August). Are women responsible for their own safety at work? Hindustan Times. Uploaded on Shine.com Retrieved from <http://info.shine.com/Career-Advice-Articles/Career-Advice/Are-women-responsible-for-their-own-safety-at-work/6091/cid2.aspx> Accessed on 5th July 2016.
5. Centre for Transforming India. (2010). The Workplace Sexual Harassment Survey. New Delhi.
6. Confederation of Indian Industries. (2005). Understanding the Levels of Women Empowerment in the Workplace.
7. Dual Career and Single Career Families', the Indian Journal of Social Work, LIII (2), pp 232-43.
8. JacobsomWadely,(1977);Women in India (Two Prespective),Manohar,pp.77.
9. Jawahar, I. M., &Hammasi, P. (2006). Perceived organizational support for women's advancement and turnover intentions. Women in Management Review, 21(8), 643– 661.
10. Panda, S. (2000). Women's Empowerment through NGO Interventions: A Framework for Assessment, Working Paper 145. Institute of Rural Management. taken from https://www.irma.ac.in/pdf/randp/763_34974.pdf
11. R.L.Panigrahy,S.S.Nayak,(2008);Economic Empowerment of Women, Discovery Publication House PVT.LTD New Delhi pp-87
12. Savita Thakur Joshi,(1991);Women & Development (The Changing Scenario);Mittal Publication,pp-5

13. Sudha K. D. (2000); Gender Roles A.P.H Publishing Corporation (5, Ansari Road, Darya Ganj, New Delhi 02), pp. 27-42.
14. SushmaSahay,(2013);Women & empowerment (Approach&Strategies),Discovery Publication House (New Dehli),pp162.
15. Coonrod, S. (1998). Chronic Hunger &The Status of Women in India. The Hunger Project.
16. National Population Policy (2000). Population and Family Planning: Laws, Policies and Regulations, A Database, Appendix I, Action Plan. http://www.unescap.org/esid/psis/population/database/poplaws/law_india/indiaappend1.htm.
17. Tinker, A., Finn, K. &Epp, J. (2000). Health, Nutrition & Population Discussion Paper: Improving Women's Health, Issues & Interventions. The International Bank for Reconstruction & Development. The World Bank , Washington, DC.
18. IIPS & ORC Macro, (2000). National Family Health Survey (NFHS-2) India 1998-99, IIPS (International Institute of Population Sciences) and ORS Macro, Mumbai.

Antiviral Properties of Indian Medicinal Plants for the Management of COVID -19 (Sars CoV 2) – A Review

Peramachi Sathiyamoorthy

Indian EthnoMedicine Research Foundation, P K S Garden, Palavakkam Chennai 600 041, India

Abstract

The richest heritage of India is ethno botanical knowledge comprising 500 tribal communities, belonging to 227 ethnic groups. An ethno botanical survey meta-analysis was undertaken to collect information regarding drugs used in south India for respiratory diseases. Spread of severe acute respiratory syndrome Corona virus (SARS-CoV-2) made a historic transition in December 2019 to till date. The potentially fatal corona virus disease (COVID-19), caused by air droplets and airborne as the main transmission modes, clearly induces a spectrum of respiratory clinical manifestations, but it also affects the immune, gastrointestinal, hematological, nervous, and renal systems. The dramatic scale of disorders and complications arises from the inadequacy of current treatments and specific anti-COVID-19 drugs to suppress viral replication, inflammation, and additional pathogenic conditions. This highlights the importance of understanding the SARS-CoV-2 mechanisms of actions and the urgent need of prospecting for new or alternative treatment options. In the present scenario SARS-CoV-2 has become a pandemic hazard and major burden for public, causing economic instability of societies around the globe. In India too, it is spreading very rapidly, although the case fatality rate is below 1.50%, which is markedly less than in other countries, despite the dense population and minimal health infrastructure in rural areas. May be due to the use of many antiviral Indian medicinal plants and traditional herbal formulations. Out of 250 medicinal herbs used by Kolli hills tribals 17 plants used for cold, cough and fever. Sirumalali tribals are using about 9 herbs for cold and fever out or 90 medicinal plants available in their area. Traditional formulations such as Nilavembu kudineer and Kabasura kudineer are playing an important role in the management of Covid 19 in Tamil Nadu. There is an urgent need to find a specific cure for the disease and global efforts are directed at developing SARS-CoV-2 specific antiviral herbal formulations. The most commonly and repeatedly reported species are *Adathoda vasica* Nees, *Tylophora indica* Burm. f. Merr. *Datura metal* Linn., *Clerodendrum serratum* Linn., *Terminalia chebula* Retz., *Leucas aspera* (Willd.)Link., *Ocimum sanctum* Linn. This review aimed to summarize and analyze therapeutic potential of Indian medicinal plants in the eradication and management of corona virus and its complications. The compounds obtained from *Withania somnifera*, *Tinospora cordifolia* and *Ocimum sanctum* could bind to SARS-CoV-2 Mpro and decrease the viral transcription and replication serving as a potential inhibitor . Based on the information available probability of developing a new herbal anti viral formulation from Indian medicinal plants for the management or treatment of COVID-19 is suggested.

Introduction

According to the Botanical Survey of India, India is home to more than 8,000 species of medicinal plants. The country has a rich history of traditional healing systems, many of which list the use of these plants. Many communities, especially indigenous ones, still rely almost entirely on traditional systems of medicine for their health. The Indian Traditional System of Medicine is one of the oldest systems of medical practice in the world and has played an essential role in providing health care service to human civilization, right from its inception. Ethnomedicine and traditional Indian medicine are an important part of primary health care in Asian countries that has utilized complex herbal formulations for treating diseases over thousands of years. Traditional Indian medical practices are a vast reservoir of knowledge about medicinal plants. The promising pharmacological properties of these plants have paved the way for developing therapy against novel Corona virus (CoV) infection.

This review discusses the possible alternative strategies for the management of the SARS-CoV-2 infection by reducing its morbidity in patients as an adjuvant to modern therapy and also by providing prophylactic management. Further, potential testing targets of botanicals from Indian medicinal plants need to be explored against SARS-CoV-2 infection and categorized on a priority basis in view of their reported antiviral, immunomodulatory and other related activities.

Starting from December 2019, novel corona virus disease 2019 (COVID-19) pandemic has caused tremendous economic loss and unprecedented health crisis across the globe. Viral infections and associated diseases are responsible for a substantial number of mortality and public health problems around the world. Each year, infectious diseases kill 5.2 million people worldwide. The current pandemic caused by COVID-19 has become the greatest health hazard to people in their lifetime. While the development of cure is at full speed, less attention and less effort have been spent on the prevention of this rapidly spreading respiratory infectious disease. Third world countries may have difficulties to afford costly Allopathic medicines or vaccines.

Natural products and herbal medicines have been historically used for acute respiratory infection and generally show acceptable toxicity. There are many antiviral drugs, but they have many disadvantages, too. There are numerous side effects for conventional drugs, and active mutation also creates drug resistance against various viruses. This has led scientists to search herbs as a source for the discovery of more efficient new anti-viral natural products

possess promising antiviral effects against human SARS-CoV-2, (Niti Yashvardhini et al., 2021) which may guide the development of novel antiviral prophylactics. Our main aim is that plant extracts and their isolated pure compounds are essential sources for the current viral infections and useful for future challenges.

Major Tribes in India: Arranged State-wise

Andhra Pradesh: Andh, Sadhu Andh, Bhagata, Bhil, Chenchus (Chenchawar), Gadabas, Gond, Goundu, Jatapus, Kammara, Kattunayakan, Kolawar, Kolam, Konda, Manna Dhora, Pardhan, Rona, Savaras, Dabba Yerukula, Nakkala, Dhulia, Thoti, Sugalis, Banjara, Kondareddis, Koya, Mukha Dhora, Valmiki, Yenadis, Sugalis, Lambadis.

Arunachal Pradesh: Apatanis, Abor, Dafla, Galong, Momba, Sherdukpen, Singpho, Nyishi, Mishmi, Idu, Taroan, Tagin, Adi, Monpa, Wancho

Assam: Chakma, Chutiya, Dimasa, Hajong, Garos, Khasis, Gangte, Karbi, Boro, Borokachari, Kachari, Sonwal, Miri, Rabha, Garo

Bihar: Asur, Baiga, Birhor, Birjia, Chero, Gond, Parhaiya, Santhals, Savar, Kharwar, Banjara, Oraon, Santal, Tharu

Chhattisgarh: Agariya, Bhaina, Bhattra, Biar, Khond, Mawasi, Nagasia, Gond, Binjhar, Halba, Halbi, Kawar, Sawar,

Goa: Dhodia, Dubia, Naikda, Siddi, Varli, Gawda.

Gujarat: Barda, Bamcha, Bhil, Charan, Dhodia, Gamta, Paradhi, Patelia, Dhanka, Dubla, Talavia, Halpati, Kokna, Naikda, Patelia, Rathawa, Siddi.

Himachal Pradesh: Gaddis, Gujjars, Khas, Lamba, Lahaulas, Pangwala, Swangla, Beta, Beda Bhot, Bodh.

Jammu and Kashmir: Bakarwal, Balti, Beda, Gaddi, Garra, Mon, Purigpa, Sippi, Changpa, Gujjar.

Jharkhand: Birhors, Bhumij, Gonds, Kharia, Mundas, Santhals, Savar, Bedia, Ho, Kharwar, Lohra, Mahli, Parhaiya, Santal, Kol, Banjara.

Karnataka: Adiyana, Barda, Gond, Bhil, Iruliga, Koraga, Patelia, Yerava, Hasalaru, Koli Dhor, Marati, Meda, Naikda, Soligar.

Kerala: Adiyana, Arandan, Eravallan, Kurumbas, Malai arayan, Moplals, Uralis, Irular, Kanikaran, Kattunayakan, Kurichchan, Muthuvan.

Madhya Pradesh: Baigas, Bhils, Bharia, Birhors, Gonds, Katkari, kharia, Khond, Kol, Murias, Korku, Mawasi, Pardhan, Sahariya,

Maharashtra: Bhaina, Bhunjia, Dhodia, Katkari, Khond, Rathawa, Warlis, Dhanka, Halba, Kathodi, Kokna, Koli Mahadev, Pardhi, Thakur,

Manipur: Naga, Kuki, Meitei, Aimol, Angami, Chiru, Maram, Monsang, Paite, Purum, Thadou, Anal, Mao, Tangkhul, Thadou, Poumai Naga.

Meghalaya: Chakma, Garos, Hajong, Jaintias Khasis, Lakher, Pawai, Raba, Mikir.

Mizoram: Chakma, Dimasa, Khasi, Kuki, Lakher, Pawi, Raba, Synteng, Lushai

Nagaland: Angami, Garo, Kachari, Kuki, Mikir, Nagas, Sema, Ao, Chakhesang, Konyak, Lotha, Phom, Rengma, Sangtam,

Odisha: Gadaba, Ghara, Kharia, Khond, Matya, Oraons, Rajuar, Santhals, Bathudi, Bathuri, Bhattada, Bhumij, Gond, Juang, Kisan, Kolha, Kora, Khayara, Koya, Munda, Paroja, Saora, Shabar, Lodha.

Rajasthan: Bhils, Damaria, Dhanka, Meenas(Minas), Patelia, Sahariya, Naikda, Nayaka, Kathodi.

Sikkim: Bhutia, Khas, Lepchas, Limboo, Tamang

Tamil Nadu: Adiyar, Aranadan, Eravallan, Irular, Kadar, Kanikar, Kotas, Todas, Kurumans, Malayali,

FIGURE1. Graphical Abstract of Phytomedicines/Herbal Medicines/Bioactive compounds/Functional Foods/Nutraceuticals for the development of anti-COVID-19 therapies (Alam, S. et al., 2021).

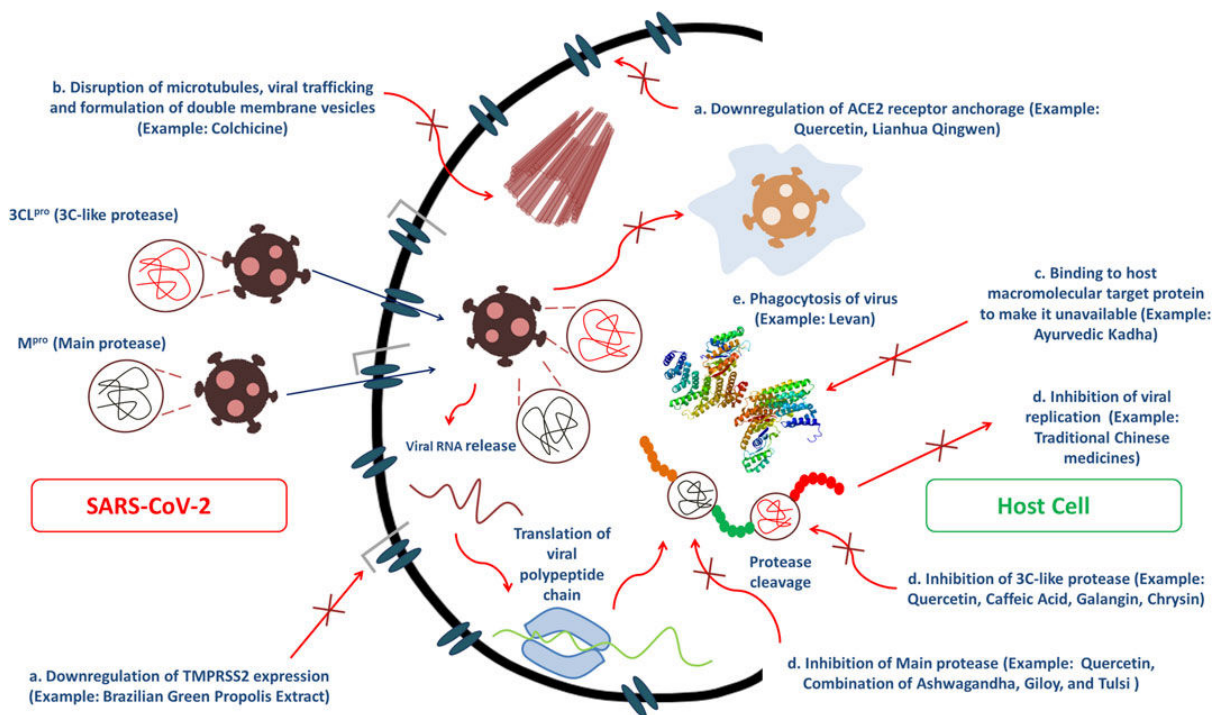
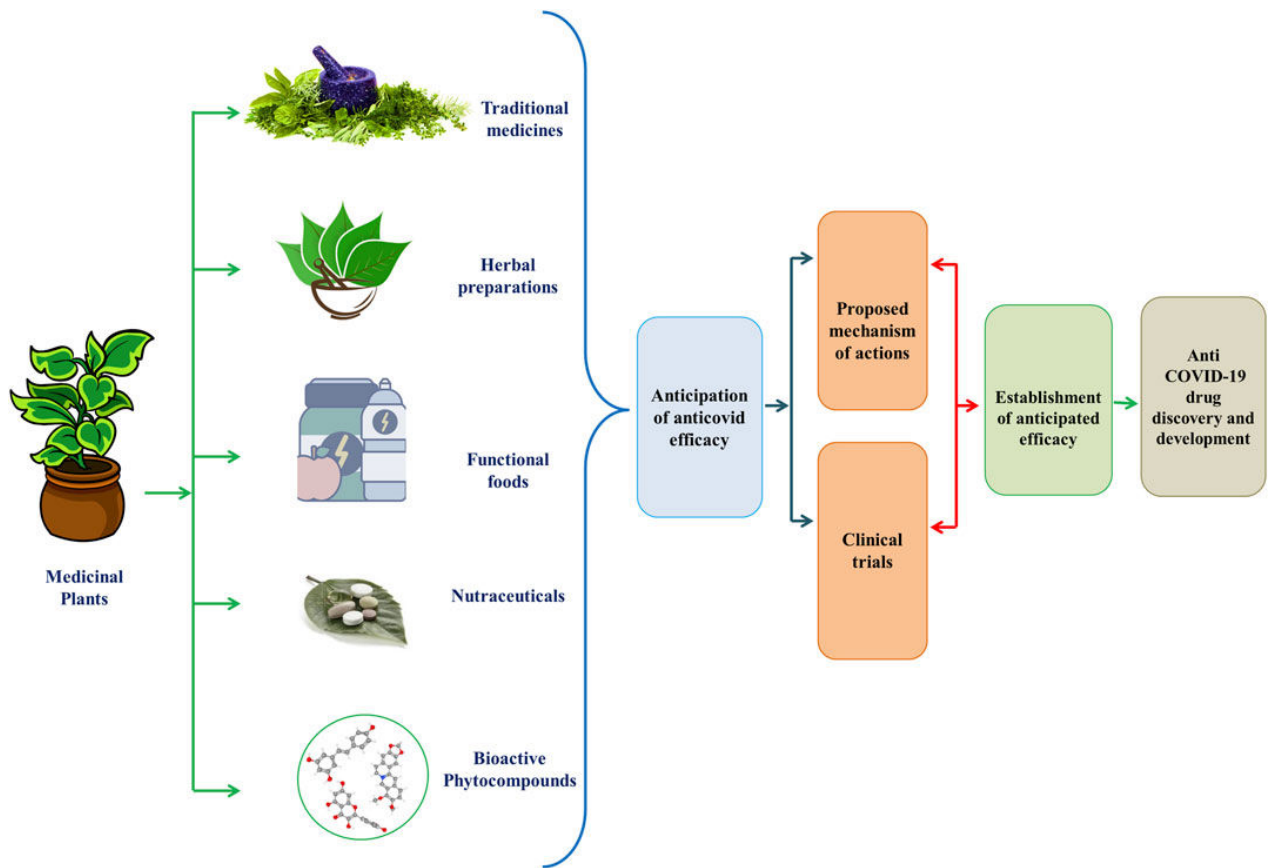


FIGURE 2. Several modes of bioactive phytoconstituents and traditional herbal medicines to exert anti-COVID-19 efficacy including (A) inhibition of main protease and 3C-like protease, (B) Disruption of microtubules, viral trafficking and formulation of double membrane

vesicles, **(C)** Binding affinity toward host macromolecular target protein to make it unavailable and **(D)** Down regulation of ACE2 receptor anchorage and TMPRSS2 expression which ultimately causes inhibition of viral replication (Alam, S. et al., 2021).

Ethnomedicinal plants used by Malayali tribals in Kolli hills

An ethnobotanical survey was carried out among the Malayali tribals in various villages of kollihills, Nammakkal District, Tamilnadu, India during July 2011 to June 2013. A total 250 species of ethnomedicinal plants belonging to 198 genera and 81 families and 21 habitats, 228 dicotyledons, 22 monocotyledons were reported with the help of standardised 50 tribal informants between the ages of 40-75. In India, medicinal plants are widely used by all sections of the population with an estimated 7,500 species of plants used by several ethnic communities and it is known that India has the second largest tribal population in the world after Africa (Anjalum, A. et al 2016).

Table 1. Medicinal Plants used for cold cough and fever by the tribals of Kolli hills (Ghouse Basha, M. et al., 2013)

S. No.	Botanical Name Family Name	Local Name	Parts used	Ethnomedicinal Uses
1	Hybanthus enneaspermus(L.) F. Muell Violaceae	Orithal thamarai	Leaves	Fever
2	Waltheria indica, L. Sterculiaceae	Chem poondu	Whole plant	Cough
3	Atalantia monophylla, Corr. Rutaceae	Kattu elumpichai	Root	Cough, phlegm
4	Garuga pinnata, Roxb. Burseraceae	Karuvambu	Leaves	Asthma
5	Ventilago madraspatana, Gaertn. Rhamnaceae	Vambadamkodi	Root	fever.
6	Lepisanthes tetraphylla, Radlk. Sapindaceae	Gukamathi	Leaves	Coughs, fever
7	Anogeissus latifolia Wall. Combretaceae	Vellai naga maram	Stem bark leaves	Cough
8	Trichosanthes cucumerina, L. Cucurbitaceae	Pei putal	seeds	Fever
9	Evolvulus alsinoides, L. Convolvulaceae	Vishnugaandh	Whole plant	Fever
10	Solanum trilobatum, L. Solanaceae	Tuthuvalai	Leaves,	Cough fever
11	Rungia pectinata, Nees. Acanthaceae	Kodaka salai	Whole plants	Asthma, bronchitis
12	Vitex altissima, L. f. Verbenaceae	Mailai notch	Leaves	Fever
13	Peperomia tetraphylla,	Kalbirahmi	Whole	Cold, Asthma

	(G.Forst.) Piperaceae		plant	
14	Piper brachystachyum, Wall. Piperaceae	Kattu milagu kodi	Root	Asthma, Bronchitis,
15	Piper trioicum, Roxb. Piperaceae	Kattu milagu	Fruit	Cough, cold
16	Euphorbia hirta, L. Euphorbiaceae	Ammann pacharishi	Leaves	Asthma bronchial infections
17	Dioscorea pentaphylla, L. Dioscoreaceae	Kattuvalli kodi	Root	Cough

Table 2: Medicinal plants used by the Paliyan tribes of Sirumalai hills for Cold, Cough and Fever (Karuppusamy, S. 2007)

S.No	Botanical name and Family	Local Name	Parts used	Ethnomedicine use
1	Buddleja asiatica Lour. Buddlejaceae	Karukattan	Leaves	Headache with cold.
2	Cissampelos pareira Linn. Menispermaceae	Appata	Leaves	fever
3	Exacum pedunculatum Linn. Gentianaceae	Chakkalathi	Whole plant	fever
4	Kedrostis foetidissima Cogn. Cucurbitaceae	Appakovai	Leaves	common cold
5	Lobelia nicotianaefolia Heyne/ Lobeliaceae	Kattupugaielai	Leaves	cold
6	Ocimum tenuifolium Linn. Lamiaceae	Thulasi	Leaves	fever
7	Piper betle Linn. Piperaceae	Vettilai	Leaves	cough
8	Trichosanthes lobata Roxb. Cucurbitaceae	Paeipudal	Leaves	Malarial fever.
9	Vitex negundo Linn. Verbenaceae	Notchi	Leaves	cold and cough.

In the Indian medical system, the formulation named Nilavenbu kudineer has proven clinical track record in the management of Dengue viral infection during outbreak in southern zone of India. This formulation is officially recommended by the department of health and family welfare, Government Formulation of Tamil Nadu for managing dengue crisis. Research outcome strongly evident the anti-viral potential of the formulation NVK against dengue and chikungunya viral culture. Dengue and Chikungunya were treated successfully with polyherbal Nilavembu Kudineer (Rubeena M, et al., 2018). Recently Chinese successfully treated COVID-19 with combined treatment of western medicine with Traditional Chinese medicine (Lei Zhang and Yunhui Liu, 2020) They have reported that glycyrrhizin is an active component of liquorice roots could inhibit the replication of SARS associated virus in vitro and it had already been suggested as an alternative option for treatment of SARS at that time. Baicalin. is a flavonoid which is isolated from *Radix scutellaria* was also found to have the ability to inhibit SARS-CoV *in vitro*. Ginseng stem, leaf saponins could highly enhance the specific antibody responses for New castle disease virus and infectious bronchitis virus. They

suggested that Chinese Traditional Medicine could also be considered as a choice to enhance host immunity against the infection of COVID-19. Although Corona viruses have been recognized as human pathogens for about 50 years, no effective treatment strategy has been approved. This shortcoming became evident during the SARS-CoV and COVID -19 outbreak. Even after the outbreak of COVID -19, we are still lacking an effective commercially available drug to treat infected millions. Viral infections are being managed therapeutically through available antiviral regimens with unsatisfactory clinical outcomes. The refractory viral infections resistant to available antiviral drugs are alarming threats and a serious health concern.

Since, traditional Indian medicine plays a good role in the fight against viral diseases our research is expected to find potent antiviral therapeutic agents in medicinal plants against Corona virus 19. Based on our preliminary results a potent formulation will be put through the protocol of standardization, pre clinical and clinical trials to support our findings. The newly developed herbal formulations as alternative medicine may contribute to the eradication of complicated viral infection significantly.

Table 3 Ingredients of Kapa Sura kudineer

<u>Botanical Name</u>	<u>Local Name</u>
1. <i>Zingiber officinale</i>	Chukku Rhizome
2. <i>Piper longum</i>	Thippili fruit
3. <i>Syzygium aromaticum</i>	Kirambu fruit
4. <i>Anacyclus pyrethrum</i>	Akkirakaram ver
5. <i>Tragus involucrata</i>	Sirukanchori ver
6. <i>Hygrophila auriculata</i>	Neermulli ver
7. <i>Terminalia chebula</i>	Kadukkai fruit
8. <i>Justicia adhatoda</i>	Adathodai leaves
9. <i>Anisochilus carnosus</i>	Karpooravalli leaves
10. <i>Costus speciosus</i>	Koshtam ver
11. <i>Tinospora cordifolia</i>	Seendhil ver
12. <i>Clerodendrum serratum</i>	Siruthekku ver
13. <i>Andrographis paniculata</i>	Nilavembu Stem, Leaves
14. <i>Cyperus rotundus</i>	Koraikizhangu

15. *Sida acuta*

Vattathiruppi ver

Table 5

Siddha medicinal plants to be screened for anti malarial anti viral properties Vatha Sura kudineer ingredients (The list other than Kapa Sura Kudineer)

<u>Botanical Name</u>	<u>Local Name</u>
1 <i>Plumbago indica</i>	Sithiramoolum
2. <i>Azima tetraantha</i>	Sangan ver (Kandaki)
3. <i>Caesalpinia crista</i>	Kalarch ver
4. <i>Enicostemma littorale</i>	Vellerukku samoolum
5 <i>Solanum xanthocarpum</i>	Kandan kathari samolum
6. <i>Alpinia calcarata</i>	Sitharathai
7. <i>Crataeva religiosa</i>	Mavalinga ver
8. <i>Alpinia galangal</i>	Perarathai pattai
9. <i>Tragia involucrata</i>	Sirukanchoori ver
10. <i>Anethum sowa</i>	Sathakuppai
11. <i>Evolvulus alsinoides</i>	Visnu kranthai

Table 6.

Molecular docking studies showed some bio active molecules inhibits Covid – 19
(Sivaraman D and Pradeep P.S, 2020)

Medicinal plants**Bio active molecules**1. *Zingiber officinale*

6-Shogaol

2. <i>Zingiber officinale</i>	6-Gingerol
3. <i>Terminalia arjuna</i> <i>Aperagus racemosus</i> <i>Piper longum</i> , <i>Curcuma longa</i>	Beta Sitosterol
4. <i>Piper nigrum</i>	Piperidine
5. onion chamomile, thyme, , basil	Apigenin
6. <u><i>Piper nigrum</i></u> , <u><i>Piper longum</i></u>	Piperine
7. <i>Emblica officinalis</i> <i>Melia azadirachta</i> ,	Quercetin
8. <i>Matricaria chamomilla</i>	Alpha-Bisabolol
9. <i>Andrographis paniculata</i>	Andrographolide
10. <i>Nigella sativa</i> , <i>Coleus amboinicus</i>	Carvacrol
11. <i>Cissampelos pareira</i>	Cissamine
12. <i>Saussurea lappa</i>	Costunolide
13. <i>Momordica charantia</i> , <i>Trichosanthes sp</i>	Cucurbitacin B
14. <i>Portulaca oleracea</i> L <i>Sessame indicum</i>	Linoleic acid
15. <i>Anacyclus pyrethrum</i> (<i>Akrakara</i>)	Pellitorine
16. <u><i>Ruta graveolens</i></u> , <u><i>Phyllanthus emblica</i></u>	Rutin
17. <i>Vetiveria Zizanoides</i>	Vetiverol
18. <i>Saussurea lappa</i>	Cynaropicrin

Table 7. List of some common medicinal plants of India having antiviral properties

Plants (Scientific Name)	English name	Family	Effective against virus
<i>Withania somnifera</i>	Indian ginseng	Solanaceae	HSV-1
<i>Hibiscus sabdariffa</i>	Roselle	Malvaceae	Measles
<i>Glycyrrhiza glabra</i>	Liquorice	Fabaceae	Japanese encephalitis, Polio
<i>Phyllanthus amarus</i>	Indian gooseberry	Euphorbiaceae	Polio

Table 7. List of some common medicinal plants of India having antiviral properties

Plants (Scientific Name)	English name	Family	Effective against virus
<i>Ocimum sanctum</i>	Holy Basil	Lamiaceae	Vaccinia
<i>Alpinia officinarium</i>	Lesser galangal	Zingiberaceae	H1N1
<i>Zingiber officinale</i>	Ginger	Zingiberaceae	Hepatitis C
<i>Chrysanthemum morifolium</i>	Florist's daisy	Asteraceae	HIV-1
<i>Gardenia sp.</i>	Cape jasmine	Rubiaceae	Influenza
<i>Cinnamomum cassia</i>	Chinese cassia, Chinese cinnamon	Lauraceae	HIV-1, HIV-2
<i>Allium sativum</i>	Garlic	Alliaceae	SARS
<i>Vitex trifolia</i>	Indian wild pepper	Lamiaceae	SARS-CoV
<i>Avicenna marina</i>	Gray mangrove	Avecennaceae	Fowl pox
<i>Punica granatum</i>	Pomegranate	Puniaceae	Influenza
<i>Nigella sativa</i>	Black cumin	Ranunculaceae	Newcastle
<i>Sorghum bicolor</i>	Great millet	Poaceae	HSV-1

INDIAN MEDICINAL PLANTS EFFECTIVE AGAINST COVID-19

***Ocimum sanctum* Family: Labiatae; Lamiaceae**

Ocimum sanctum (Tulsi) has been used traditionally for prevention and cure of common cold, headache, cough, influenza, earache, fever, colic pain, sore throat, bronchitis, asthma, hepatic diseases, malarial fever, as an antidote for snake bite and scorpion sting, flatulence, migraine headaches, fatigue, skin diseases, wound, insomnia, arthritis, digestive disorders, night blindness and diarrhea.



Tulsi contains Tulsinol (A, B, C, D, E, F, G) and dihydrodieugenol-B which inhibits COVID-19 main protease and papain like protease, and also possess ACE 2 blocking properties with immune-modulatory feature Varshney et al 2020, Manoharan et al 2020. According to the research done by Mohapatra *et al.* 2008 the ethanolic extract of aerial parts of Holy Basil contain flavonoids and polyphenolic acids especially luteolin-7-O-glucuronide and chlorogenic acid may bind covalently to the active residue Cys145 of main protease of SARS-CoV-2 and inhibit the viral enzyme irreversibly when screened *in silico*.

***Tribulus terrestris* Family Zygophyllaceae**

It is used in traditional medicine for chest pain, heart problems, dizziness, skin and eye disorders, to expel kidney stones, and as a diuretic and tonic.



Several natural compounds were found to possess promising PLpro inhibitory effects. Indeed, Song et al. (2014) demonstrated that six **cinnamic amides** (N-trans-Feruloyloctopamine, N-trans-Coumaroyl-tyramine, N-trans-Caffeoyltryamine, Terrestrimine, N-trans-Feruloyl-tryamine, and Terrestriamide) extracted from *Tribulus terrestris* L. fruits were able to inhibit SARS-CoV PLpro in a dose-dependent manner.

Withania somnifera Family: **Solanaceae**

Ashwagandha is traditionally used as stress, anxiety, fatigue, pain, skin conditions, diabetes, arthritis, epilepsy



As Ashwagandha prevents cytokine storms as well as viral infections, it can be a potential candidate for treatment of SARS-CoV-2 Dar *et al* 2015. Withanolides, a group of bioactive compound found in *W. somnifera*, are potent immunity boosters; Withanolide_G, Withanolide_I and Withanolide_M have the highest binding affinity with PLpro, 3CLpro and spike proteins respectively Saha *et al.*,2012. It can prove to be effective against SARS-CoV-2 through modulation of host Th-1/Th-2 immunity Varshney *et al.*, 2020.

Tinospora cordifolia Family: **Menispermaceae**

Tinospora cordifolia has many medicinal properties like anti-diabetic, anti-periodic, anti-spasmodic, anti-inflammatory, anti-arthritic, anti-oxidant, anti-allergic, anti-stress, anti-leprotic, anti-malarial, hepatoprotective, immunomodulatory and anti-neoplastic activities



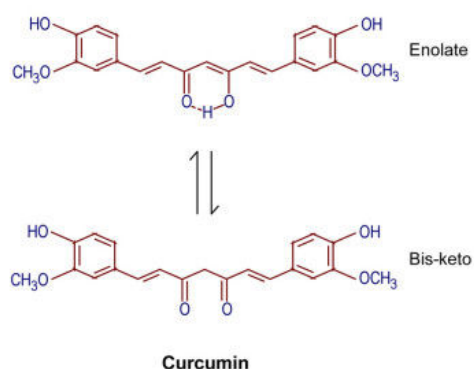
According to Sagar and Kumar, **2012**, the binding efficacy of natural components Berberine, Isocolumbin, Magnoflorine and Tinocordiside isolated from *T. cordifolia* were assessed using *in silico* tools against four SARS-CoV-2 targets (Receptor binding domain (6M0J), surface glycoprotein (6VSB), RNA dependent RNA polymerase (6M71) and main protease (6Y84)), and all the four compounds showed high binding efficacy against all the four targets, making giloy a potential herb for the management of COVID-19 infection.

Curcuma longa Family: **Zingiberaceae**

Traditionally turmeric used for common cold, leprosy, liver tonic, dropsy, inflammation and wound healing. contraception, swelling, insect stings, wounds, whooping cough, inflammation, pimples, injuries, as a skin tonic



Turmeric Plant with Rhizome



Das *et al.* 2020 reported that curcumin isolated from turmeric can neutralize the entry of SARS-CoV-2 viral protein. The study used *in silico* approach, which demonstrated the binding of curcumin to RBD site of viral S protein along with the viral attachment sites of ACE 2 receptor. Curcumin can suppress pulmonary edema and fibrosis-associated pathways associated with COVID-19 infection Babaei *et al.* 2020. It has several molecular mechanisms and inhibitory effects on toll like receptor, inflammatory cytokines, chemokines and bradykinin Adem *et al.* 2020. Diacetylcurcumin isolated from *C. longa* have been found more effective on SARS-CoV-2 (Mpro) compared to Nelfinavir Manoharan *et al.* 2020. Immunity and protective defence against COVID-19 infections boosted in many hospitalized patients in India due to the uptake of curcumin with vitamin C and Zinc O'Hara *et al.* 1998. Therefore, curcumin could be considered as a preventive herb in the inhibition of transmission of COVID-19.

Zingiber officinalis Family: **Zingiberaceae**



The phytochemical 6-gingerol obtained from ginger depicts ginger as a promising candidate for drug discovery against COVID-19, as it proved to have the highest binding affinity with

multiple targets of SARS-CoV-2, such as viral protease, RNA binding proteins and viral proteases through DFT (Density Functional Theory) study Chang et al 2013.

Azadirachta indica Family: **Meliaceae**



Baidya *et al.* 2020 studied the inhibitory potential of neem extracts on PLpro (papain like protease) of SARS-CoV-2 through molecular docking and molecular dynamics simulation, and it was found that desacetylgedunin (DCG) found in neem showed the highest binding affinity towards PLpro. The bioactive compound found in neem, such as Azadiradione, Epiazadiradione, Nimbione, and Vepnin were assessed by Sharon et al 2020 through Autodock 4.2, and Pymol and was found to be potential inhibitor of COVID-19 Mpro (6Y2E, 6LU7, and 2GTB).

Nigella sativa Family: **Ranunculaceae**

N. sativa has been traditionally used for the treatment of a variety of disorders, diseases and conditions pertaining to respiratory system, digestive tract, kidney and liver function, cardio vascular system and immune system support.



Studies have shown that thymoquinone (TQ) has an inhibitory property on SARS-CoV-2 protease, and has shown good antagonism to ACE 2 receptors Badary et al 2021. Koshak and

Koshak 2020 reported that at least eight *in silico* studies have demonstrated that compounds of *N. sativa* have moderate to high affinity with SARS-CoV-2 enzymes and proteins.

Piper nigrum Family: **Piperaceae**



Piperine found in black pepper can inhibit SARS-CoV-2 virus. The phenolic compounds Kadsurenin L and methysticin found in *Piper nigrum* was found inhibiting COVID-19 main protease as studied by Davella *et al.*2021.

Allium sativum Family: **Liliaceae, Alliaceae**

Shojai *et al.*2016 reported that concentration of 0.1 ml of garlic clove extract showed *in vivo* inhibitory effects against SARS-CoV-1 multiplication, possibly due to the blocking capacity of extract towards its structural proteins. Alliin found in *A. sativum* showed the highest binding ability, with the target protein of SARS-CoV- 2 (6LU7) when studied *in silico* by Pandey *et al.*2019. Bioactives found in garlic and the serine-type protease found in SARS-CoV-2 form hydrogen bonds in the active site regions suppressing the outbreak of COVID-19, and it can act as a preventive measure against COVID-19 infection Kubber *et al* 2020.

Glycyrrhiza glabra Family: **Papilionaceae; Fabaceae**

Licorice is used for eczema, swelling (inflammation) of the liver (hepatitis) and mouth sores



Zhang *et al.* 2020; assessed licorice, demonstrating that it contains three orally antiviral natural components which inhibit Mpro, S-proteins, 3C like protease and papain like protease of SARS-CoV-2. Licorice extract inhibits the main protease of SARS-CoV-2, and glycyrrhizin shows a high binding affinity and better ADMET (Absorption, Distribution,

Metabolism, Excretion, and Toxicity) properties compared to other constituents of licorice
Srivastava A.K., et al 2020. van de Sand *et al.* 2021 demonstrated that glycyrrhizin inhibits
3CL protease of SARS-CoV-2

CONCLUSION

India has always been known for its rich biodiversity and extensive varieties of plants, which are found from Himalayas to the marine and desert to the rain forests. The present study revealed the status of medicinal plants and herbs of India and their various therapeutic benefits. Use of herbal medicines is not only safe and cost-effective, but it is also free from side effects. AYUSH system of medication emphasizes on simple natural remedies for the improvement and development of strong immune system.

Efforts should be made to explore and promote the knowledge of healing through such medicinal plants. The proper use of medicinal plants against COVID-19 could safeguard lives of several people reducing the risks of infection, thereby minimizing the rate of mortality.

While available studies offer several indications that these plant-derived products may help in fighting COVID-19, further studies should be carried out to evaluate the clinical usefulness of such products against COVID-19 infection. Furthermore, the bioavailability of natural products with possible anti-SARS-CoV-2 effects such as tannins should be considered besides the need for clinical validation of their usefulness and safety. The herbal mixtures, medicinal plants, or natural products with possible anti-SARS-CoV-2 effects must be evaluated through prospective and interventional studies. A combination of natural products or herbal mixtures with validated anti-COVID-19 drugs may constitute a promising preventive and therapeutic alternative to be assessed.

<https://doi.org/10.3389/fphar.2021.671498>



References

1. Adem S., Eyupoglu V., Sarfraz I., Rasul A., Ali M., Identification of Potent COVID-19 Main Protease (Mpro) Inhibitors from Natural Polyphenols: An in Silico Strategy Unveils a Hope against CORONA. Preprints. 2020; 2020 .
2. Alam, S. Et al., 2021 Traditional Herbal Medicines, Bioactive Metabolites, and Plant Products Against COVID-19: Update on Clinical Trials and Mechanism of Actions, Front. Pharmacol., <https://doi.org/10.3389/fphar.2021.671498>
3. Anjalam, A. et al 2016. Documentation of medicinal plants used by malayali tribes in Kolli Hills. Int. J. Adv. Res. Biol. Sci. . 3(3): 101-107
4. Babaei F., Nassiri-Asl M., Hosseinzadeh H., Curcumin (a constituent of turmeric): new treatment option against COVID-19. Food Science {&}amp; Nutrition. 2020; 8 (10) : 5215-27 .

5. Badary O.A., Hamza M.S., Tikamdas R., Thymoquinone: A Promising Natural Compound with Potential Benefits for COVID-19 Prevention and Cure. *Drug Design, Development and Therapy*. 2021; 15 : 1819-33 .
6. Chang J.S., Wang K.C., Yeh C.F., Shieh D.E., Chiang L.C., Fresh ginger (*Zingiber officinale*) has anti-viral activity against human respiratory syncytial virus in human respiratory tract cell lines. *Journal of Ethnopharmacology*. 2013; 145 (1) : 146-51 .
7. Ghouse Basha, M. et al., 2013. Studies on ethnomedicinal plants used by malayali tribals in Kolli hills of Eastern ghats, Tamilnadu, India *Asian J. Plant Sci. Res.*, 3(6):29-45.
8. Dar N.J., Hamid A., Ahmad M., Pharmacologic overview of *Withania somnifera*, the Indian Ginseng. *Cellular and Molecular Life Sciences*. 2015; 72 (23) : 4445-60 .
9. Davella R., Gurrapu S., Mamidala E., Phenolic compounds as promising drug candidates against COVID-19 - An integrated molecular docking and dynamics simulation study. *Materials Today: Proceedings*. 2021 . Protease to Treat COVID-19 (March 14, 2020). Available at SSRN:
10. Khare C.P., *Indian Medicinal Plants: An Illustrated Dictionary*. Springer Science & Business Media, 2008.. .
11. Manoharan Y., Haridas V., Vasanthakumar K.C., Muthu S., Thavoorullah F.F., Shetty P., Curcumin: a Wonder Drug as a Preventive Measure for COVID19 Management. *Indian Journal of Clinical Biochemistry*. 2020; 35 (3) : 373-5 .
12. Mohapatra P.K., Chopdar K.S., Dash G.C., Raval M.K., In Silico Screening of Phytochemicals of *Ocimum Sanctum* Against Main Protease of SARS-CoV-2. *ChemRxiv*. 2020; 2020 .
13. Karuppusamy, S. 2007. Medicinal plants used by Paliyan tribes of Sirumalai hills of southern India *Product Radiance*, Vol. 6(5), pp.436-442.
14. Khubber S., Hashemifesharaki R., Mohammadi M., Gharibzahedi S.M., Garlic (*Allium sativum* L.): a potential unique therapeutic food rich in organosulfur and flavonoid compounds to fight with COVID-19. *Nutrition Journal*. 2020; 19 (1): 124 .
15. Koshak D.A., Koshak P.E., *Nigella sativa* L as a potential phytotherapy for coronavirus disease 2019: A mini review of in silico studies. *Current Therapeutic Research, Clinical and Experimental*. 2020; 93 : 100602 .
16. Mohajer Shojai T., Ghalyanchi Langeroudi A., Karimi V., Barin A., Sadri N., The effect of *Allium sativum* (Garlic) extract on infectious bronchitis virus in specific pathogen free embryonic egg. *Avicenna Journal of Phytomedicine*. 2016; 6 (4): 458-26 .
17. Niti Yashvardhini, Samiksha and Deepak Kumar Jha 2021 Pharmacological intervention of various Indian medicinal plants in combating COVID-19 infection *Biomedical Research and Therapy* Vol 8 No 7 : 4461-4475
18. O'Hara M., Kiefer D., Farrell K., Kemper K., A review of 12 commonly used medicinal herbs. *Archives of Family Medicine*. 1998; 7 (6) : 523-36 .

19. Pandey P., Khan F., Kumar A., Srivastava A., Jha N.K.. Screening of potent inhibitors against 2019 novel coronavirus (Covid-19) from *alliumsativum* and *allium cepa*: an in silico approach. *Biointerface Research in Applied Chemistry*. 2021; 11 (1): 7981-93 .
20. Saha S., Ghosh S., *Tinospora cordifolia*: one plant, many roles. *Ancient Science of Life*. 2012; 31 (4) : 151-9 .
21. Santhosh Kumar P. 2014,. Ethnobotanical survey of drugs used in South India for respiratory disorders: A Meta-Analysis *The Journal of Ethnobiology and Traditional Medicine*. Photon 121- 787-792
22. Sharon S.F., Molecular docking of selected bioactive compounds from *azadirachta indica* for the inhibition of COVID-19 protease. *International Journal of Pharmacy and Pharmaceutical Sciences*. 2020; 12 (9): 71-7.
23. Srivastava A.K., Chaurasia J.P., Khan R., Dhand C., Verma S., Role of Medicinal plants of Traditional Use in Recuperating Devastating COVID-19 Situation. *Med Aromat Plants (Los Angeles)*. 2020; 9 (5) : 359 .
24. Sharma U., Bala M., Kumar N., Singh B., Munshi R.K., Bhalerao S., Immunomodulatory active compounds from *Tinospora cordifolia*. *Journal of Ethnopharmacology*. 2012; 141 (3) : 918-26 .
25. Song, Y. H., Kim, D. W., Curtis-Long, M. J., Yuk, H. J., Wang, Y., Zhuang, N., et al. (2014). Papain-like protease (PLpro) inhibitory effects of cinnamic amides from *Tribulus terrestris* fruits. *Biol. Pharm. Bull.* 37 (6), 1021–1028. doi: 10.1248/bpb.b14-00026
26. van de Sand L., Bormann M., Alt M., Schipper L., Heilingloh C.S., Steinmann E., Glycyrrhizin Effectively Inhibits SARS-CoV-2 Replication by Inhibiting the Viral Main Protease. *Viruses*. 2021; 13 (4): 609 .
27. Varshney K.K., Varshney M., Nath B., Molecular Modeling of Isolated Phytochemicals from *Ocimum sanctum* Towards Exploring Potential Inhibitors of SARS Coronavirus Main Protease and Papain-Like
28. Zahedipour F., Hosseini S.A., Sathyapalan T., Majeed M., Jamialahmadi T., Al-Rasadi K., Potential effects of curcumin in the treatment of COVID-19 infection. *Phytotherapy Research*. 2020; 34 (11) : 2911-20 .
29. Zhang D.H., Wu K.L., Zhang X., Deng S.Q., Peng B., In silico screening of Chinese herbal medicines with the potential to directly inhibit 2019 novel coronavirus. *Journal of Integrative Medicine*. 2020; 18 (2) : 152-8 .

<https://www.frontiersin.org/articles/10.3389/fphar.2020.578970/full>

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7675695/>
2. <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0248479>
3. <http://www.bmrat.org/index.php/BMRAT/article/view/685>
4. <https://www.hindawi.com/journals/ecam/2020/2560645/>
5. <https://link.springer.com/article/10.1007/s11010-021-04084-7/tables/1>
6. <https://www.mdpi.com/1420-3049/26/6/1775/htm>.

The Accessibility and Probability of Encountering Catastrophic Health Expenditure by Lao Patients in Thai Hospital

Somdeth Bodhisane, Sathirakorn Pongpanich

Abstract—It is common for people in Laos to use health services in Thailand and other foreign countries. This study analyzes and compares the probability of using health care services and the financial catastrophe occurring due to health service utilization in both local and Thai hospitals. This study includes 390 respondents from Savannakhet Province, Laos. Households' income levels play an essential role in selected locations of hospital admission. The regression model proves that lower income quintiles were more likely to use local health services, whereas the higher income households preferred Thailand's hospital services. There is a negative relationship between income level and the probability of experiencing catastrophic health expenditure. The National Health Insurance (NHI) is recommended to seek greater cooperation with foreign hospitals, to allow Lao patients to use NHI's coverage as a co-payment system for specific health services not available in Lao hospitals. NHI should have to include proper-nutrition meal services in hospitals for patients to reduce the need for accompanied household members during patients' time at hospitals. It is proven that NHI successfully enhances accessibility to local health services; in the long run, the government should expand national hospitals' capacity, medical equipment availability and quantity of health care personnel.

Keywords—health impact assessment, health protection, health services, National Health Insurance.