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EXPLORING THE CURRENT STATE OF GENERATION Z HEALTH LITERATURE IN ASEAN: A BIBLIOMETRIC REVIEW AND FUTURE RESEARCH DIRECTIONS

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ABSTRACT

This study investigates the health of Generation Z in ASEAN countries, focusing on the bibliometric trends of journal articles published between 1980 and 2026, specifically examining mental health and well-being. Through a quantitative approach, bibliometric analysis was conducted using tools such as VOSviewer, Biblioshiny (R-package), and Publish or Perish, with data collected from the Scopus database based on a systematic search strategy guided by the PRISMA framework. A total of 688 eligible articles were analyzed, revealing a steady annual publication growth rate of 2.42%. Malaysia, Singapore, and Thailand emerged as the leading countries in Generation Z health research, with Malaysia contributing the highest number of publications. Dominant keywords include "mental health," "adolescents," "stress," and "social media," indicating a strong focus on psychological well-being, digital environments, and lifestyle factors. Influential journals such as the International Journal of Environmental Research and Public Health and BMC Public Health play a significant role in shaping the field. The analysis identifies key research themes, including mental health challenges, the impact of social media, and the effects of the COVID-19 pandemic. However, certain areas such as digital health tools, gender-specific health concerns, and regional health disparities remain underexplored, highlighting potential future research directions. This study provides a comprehensive overview, offering insights into the evolving landscape of Generation Z health research in ASEAN and suggesting avenues for future investigation.

***Keywords*:** Generation Z, Bibliometric Review, Generation Z Health

INTRODUCTION

Generation Z, defined as individuals born between 1997 and 2012, is an emerging demographic group that presents unique health challenges and opportunities, particularly in the context of ASEAN countries[1]. Unlike previous generations, Gen Z's health behaviors are influenced by a range of factors, including technological advancements, social media, and evolving public health trends[2]. Given the distinct characteristics of this generation, there is a growing body of research exploring various aspects of their health, from mental well-being to physical fitness[3,4]. Over the past decade, the health literature on Generation Z in ASEAN has evolved considerably. Recent studies have explored topics such as the impact of digital health interventions on mental health[5]. the influence of online health information on Gen Z's behavior[6], and the rising concerns around obesity and sedentary lifestyles[2].

A prominent research theme in this area focuses on mental health issues, including anxiety, depression, and stress, which have seen a significant rise among Gen Z individuals [7,8] . Furthermore, the role of social media in shaping these health outcomes has been frequently discussed [2,9].The shift towards digital health tools has also spurred research on e-therapy and telemedicine, particularly as a response to the COVID-19 pandemic [10].This increased academic interest reflects a broader recognition of Generation Z as a distinct and influential demographic group whose health behaviors will have a profound impact on public health policy in ASEAN [1,11].As such, the growing body of literature on Gen Z's health serves not only as an academic pursuit but also as a critical tool for developing tailored public health initiatives that address the specific needs of this generation.

However, existing studies often focus on different aspects of health, and regional variations in research themes have emerged. For example, in Indonesia, research has focused on Gen Z's perceptions of mental health [12,13], while in Malaysia, there is greater emphasis on nutrition and physical activity[14,15]. Meanwhile, studies in Thailand and Vietnam have increasingly examined the role of technology in influencing health behaviors [16,17]. This disparity in focus across ASEAN countries highlights the importance of understanding how cultural, socioeconomic, and policy differences shape health outcomes for Generation Z. Therefore, the purpose of this bibliometric review is to explore the current landscape of Generation Z health literature in ASEAN and identify emerging trends, key themes, and potential gaps. The following research questions (RQs) guide this study:

RQ1: What are the trends in Generation Z health literature over time, including the most frequently cited journals, countries, institutions, and productive authors?

RQ2: What are the key themes and authors' keywords that frequently appear in Generation Z health literature?

RQ3: What gaps exist in the current literature on Generation Z's health, and what are the potential future research directions?

RESEARCH METHODOLOGY

Research design.

This research presents a quantitative approach using bibliometric analysis from the Scopus database. Bibliometrics is the optimal technique for examining the conceptual structure of a research domain and identifying potential future research directions. For a more comprehensive bibliometric analysis, this study combines bibliometric and content analysis [18-20] to synthesise research streams from various journals in the Scopus database from 1980 to 2026. The main reason for selecting the Scopus database is that a study on Generation Z health utilising the Web of Science (WoS) database has already been conducted. Additionally, the WoS database is relatively limited and often overlaps with the Scopus database or includes journals indexed by both. Furthermore, the Scopus database grants access to a comprehensive database and offers more comprehensive citation coverage than the WoS database.

Search strategy, criteria, and data collection

In our data search strategy, we adapted the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) model as adopted. Figure 1 presents a detailed flowchart of the PRISMA protocol employed in our search strategy. Data were collected on December 10, 2025, from the Scopus database using the search query ("Generation Z" OR "Gen Z" OR "youth" OR "teenager" and "health" OR "well-being" OR "wellness" OR "fitness" and "mental health" OR "psychological" OR "emotional" OR "stress"). To guarantee the inclusiveness of our bibliometric review and content analysis, we follow the bibliometric study. Hence, after screening literature relevant to the topic, we evaluate the document based on eligibility criteria, including full-text search and cross-verification by their citation and relevance to the subject, which is not included in the data search query.

The initial records screened in the Scopus database (n = 45,214) were based on article titles, abstracts, and keywords from journals, proceedings, book chapters, and reviews. Three search criteria were used to ensure article quality and review validity: article universality, publication quality, and relevance. The universality of articles is represented by articles from journals written in English only. Therefore, we continued to extract using LIMIT-TO (DOCTYPE, "ar"), LIMIT-TO (SRCTYPE, "j"), and LIMIT-TO (LANGUAGE, "English"). Subsequently, we excluded documents that did not meet the inclusion criteria (i.e., money donations did not meet Generation Z health specifically, non-article document type, non-journal source type, ASEAN, and non-English) (n = 44.526). The remaining records deemed eligible (n = 688) were included for further descriptive, bibliometric, and content analyses.

Tools and data analysis

Various tools were utilised to conduct this study. For frequency analysis and chart generation tasks, R-Biblioshiny and Excel were employed for calculations and visualisation. VOSviewer was employed to construct and visualise bibliometric networks, examine abstract keywords and authorship, and explore relationships and collaborations across authors, countries, and publications. Harzing's Publish or Perish software was utilised to compute citation metrics and identify highly cited documents. This research employed a comprehensive methodology to explore the domain of cash waqf research, combining bibliometric analysis with content and network analysis. This approach aims to uncover insights into various field facets, including publication years, contributing countries and institutions, prominent journals, influential authors, keyword associations among authors, document citations, author citations and co-citations, international collaborations, and research stream

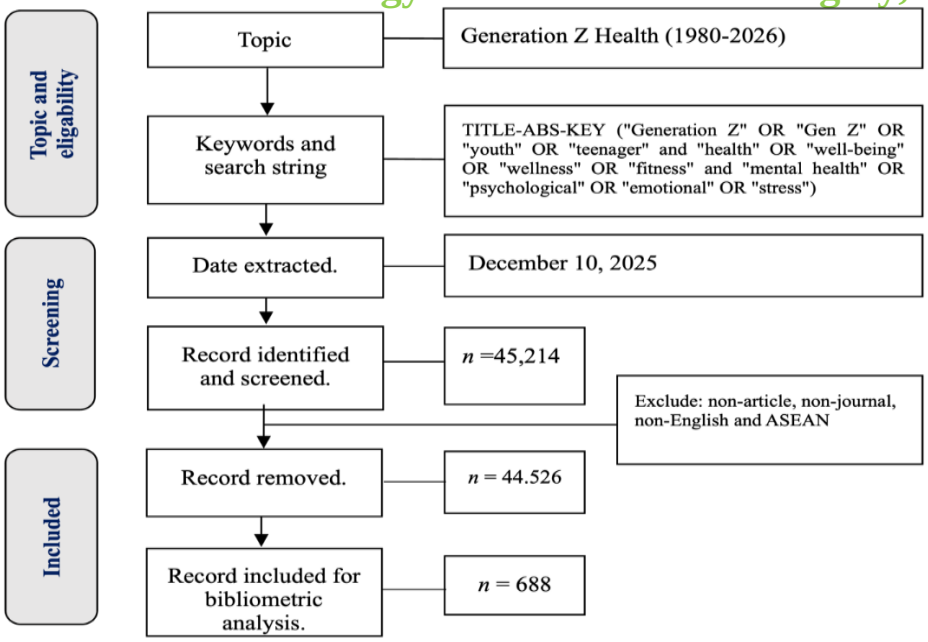

Figure 1. Diagram PRISMA

RESEARCH FINDINGS AND DISCUSSION

Descriptive analysis

The author looked at a set of 688 journal articles that were published between 1980 and 2026 for this study. There were 421 sources looked at in total. There were 3,538 authors who contributed to the dataset, but no articles were published by only one author. There were an average of 12.8 co-authors per document, and a large 39.83% of the publications had international co-authors. The yearly growth rate of publications was 2.42%, which shows that scholarly activity in this area is steadily rising. The average age of each document was 4.64 years, and there were 6,160 references in all of the publications. The average number of citations per document was 13.79, which shows that these papers had a big effect on the academic community. The study also found that the authors used 1,853 different keywords, which shows how many different topics the research covered. This overall picture shows that the field is growing and that researchers from all over the world are working together, as shown by the rising number of citations (Figure. 2).

Figure 2. Dataset

Figure 3 In this study, the author examined journal articles published between 1980 and 2026, focusing on the development of scholarly work during this period. The first article was published in 1980, but there were several years with no publications, particularly in the early years. However, the number of publications started to rise gradually, with a significant increase after 2017. The most notable growth occurred in recent years, especially in 2021, 2022, and 2023, reflecting an accelerated interest in the topic. A total of 553 articles were identified through a search in the Scopus database. The analysis of the publication trends showed an impressive annual growth rate of 11.5%. On average, each article received 19.4 citations per year, with 1.56 citations per paper. The total number of references across all articles amounted to 7,842 (Table 1). This upward trend highlights the increasing academic focus and research activity in the field, particularly in the last few years.

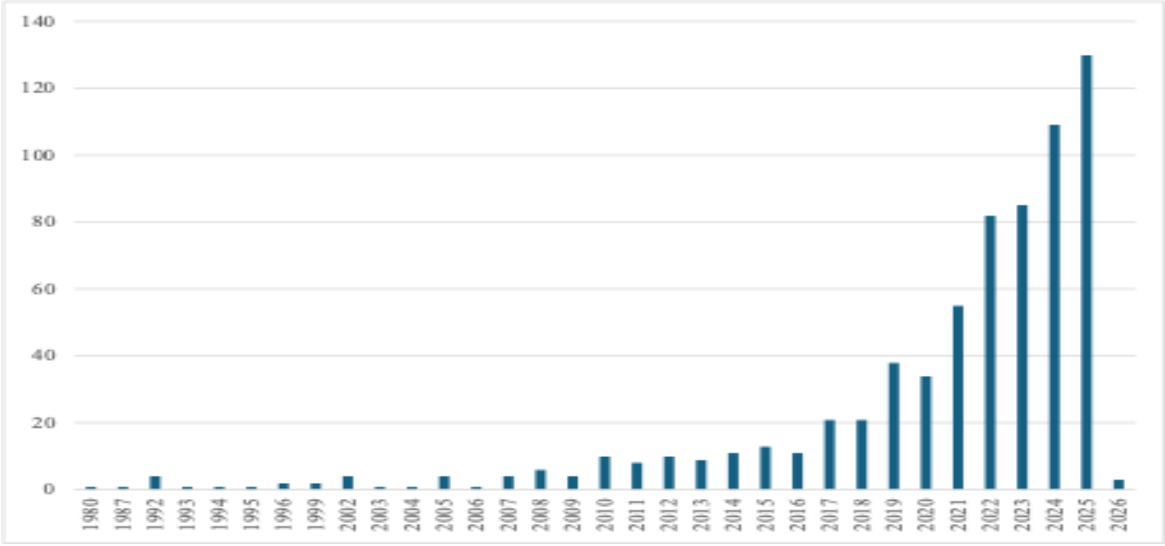

Figure 3. Number of publications per year

Research trend analysis

Table 1 shows that there are many different subject areas that are important to Generation Z health research in ASEAN. Medicine has the most publications at 56.98%, followed by Social Sciences at 31.25%. This shows that the focus is on both physical and social health. Psychology makes up 22.53% of the total, which shows that people are becoming more interested in mental health issues. The smaller fields that make up the research are Nursing (7.99%), Arts and Humanities (6.98%), Environmental Science (5.09%), and Computer Science (3.78%). This shows how interdisciplinary the research is. These results show that Generation Z is worried about their mental and physical health, as well as the effects of technology and society as a whole.

Table 1. Subject area

Subject Area	TP	%
Medicine	392	56,98%
Social Sciences	215	31,25%
Psychology	155	22,53%
Nursing	55	7,99%
Arts and Humanities	48	6,98%
Environmental Science	35	5,09%
Computer Science	26	3,78%

Table 2 shows that the International Journal of Environmental Research and Public Health was the most popular health research journal for Generation Z in ASEAN, with 17 TP (2.47%). The BMC Public Health journal came next, with 11 TP (1.60%), and the Journal of the Medical Association of Thailand came after that, with 9 TP (1.31%). Plos One (9 TP, 1.31%) and Frontiers in Psychiatry (8 TP, 1.16%) are also important sources. This means that the most well-known journals, like the International Journal of Environmental Research and Public Health, BMC Public Health, and Plos One, are the best at publishing research about Generation Z's health. These journals are very important for getting important research on the mental and physical health problems that Generation Z faces out to the public.

Table 2. Top 10 journal sources title

No.	Source Title and Scopus Rank	TP	%	TC	C/P	h	g	Publisher
1	International Journal of Environmental Research and Public Health	17	2,47	309	18,18	12	17	Multidisciplinary Digital Publishing Institute (MDPI)
2	BMC Public Health	11	1,60	103	9,36	5	10	BioMed Central Ltd
3	Journal of the Medical Association of Thailand	9	1,31	64	7,11	6	7	Medical Association of Thailand
4	Plos One	9	1,31	51	5,67	4	7	Public Library of Science
5	Frontiers in Psychiatry	8	1,16	112	14,00	5	8	Frontiers Media SA
6	Malaysian Journal of Medicine and Health Sciences	8	1,16	44	5,50	4	6	Faculty of Medicine and Health Sciences, UPM
7	Pertanika Journal of Social Sciences and Humanities	8	1,16	26	3,25	3	4	Universiti Putra Malaysia
8	Asian Journal of Psychiatry	7	1,02	156	22,29	5	7	Elsevier B.V.
9	Child Abuse and Neglect	6	0,87	194	32,33	6	6	Elsevier Ltd
10	Frontiers in Public Health	6	0,87	76	12,67	5	6	Frontiers Media SA

Note(s): TP=total number of publications; TC=total citations; C/P=average citations per publication; and h=h-index; g=g-index;

However, the figure 4 shows that the British Journal of Sports Medicine has the most local impact, with a total of 670 citations (TC). The Journal of Affective Disorders is next, with 321 TC. BMC Women's Health is in third place with 409 TC, and the International Journal of Environmental Research and Public Health is in fourth place with 309 TC. Other journals, like the Medical Journal of Australia (207 TC), Child Abuse and Neglect (194 TC), and the Revista De Psicologia Clinica Con Ninos Y Adolescentes (176 TC), have different but still significant effects on the local area. Figure 3 shows the top ten journals that have had the most impact in their areas (TC).

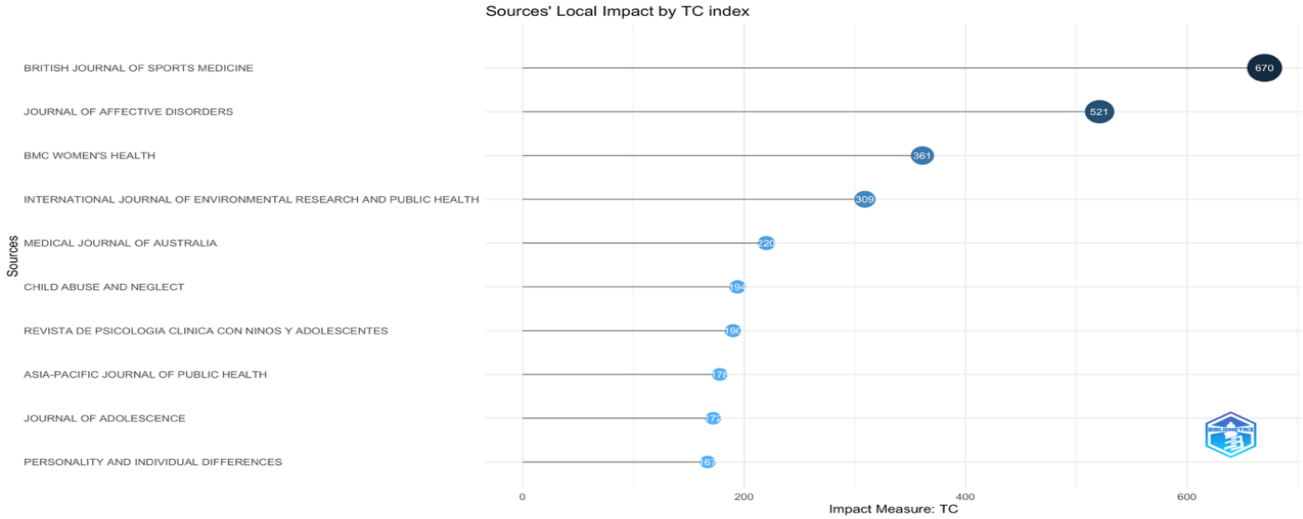

Figure 4. Journal local impact related to the topic

Most influential countries, affiliates, and productive author

Table 3 shows a study of the ten most important countries in ASEAN for health research on Generation Z. Malaysia is in first place with 161 publications (23.40%), and Singapore is in second place with 153 publications (22.24%). As previous studies have shown, Malaysia and Singapore are the countries that do the most research in this area. Thailand is third with 138 publications (20.06%), and Indonesia is close behind with 137 publications (19.91%). It's interesting that the Philippines and Vietnam have fewer publications (68 TP, 9.88% and 62 TP, 9.01%, respectively), but they make a big difference, especially when it comes to citations per publication (C/P). The Philippines has the highest C/P of 12.09, which shows how much their research has affected others, even though they have fewer publications. Cambodia, Myanmar, Brunei Darussalam, Papua New Guinea, and Timor-Leste are among the other countries that publish fewer papers, with each country publishing fewer than 20 papers. This distribution shows that some countries,

especially those in Southeast Asia, are more likely to do health research on Generation Z. It also shows that the impact of citations can vary. The difference also shows how important it is to build global partnerships to encourage collaborative research, especially in countries with fewer publications. This will help fill in research gaps and make sure that valuable health research is more widely available across the ASEAN region.

Table 3. Top 10 Countries contributed to the publications

Country	TP	%	TC	C/P	Continent
Malaysia	161	23,40%	840	5,22	Asia
Singapore	153	22,24%	1454	9,50	Asia
Thailand	138	20,06%	624	4,52	Asia
Indonesia	137	19,91%	516	3,77	Asia
Philippines	68	9,88%	822	12,09	Asia
Viet Nam	62	9,01%	44	0,71	Asia
Cambodia	13	1,89%	82	6,31	Asia
Myanmar	5	0,73%	24	4,80	Asia
Brunei Darussalam	3	0,44%	10	3,33	Asia
Papua New Guinea	3	0,44%	4	1,33	Asia
Timor-Leste	1	0,15%	2	2,00	Asia

The figure 5 shows the most important connections based on how many articles were published about Generation Z health research in ASEAN. With 172 articles, the Singapore Institute of Mental Health is at the top of the list. This shows how important it is to the field. Next are Universiti Kebangsaan Malaysia and Universitas Indonesia, both of which have 78 articles. This shows how important they are for health research on Generation Z in the area. The National University of Singapore publishes 76 articles, while Mahidol University and Universiti Malaya each publish 58 articles. This shows how much they are involved in the research. Chiang Mai University (56 articles), Universitas Airlangga (47 articles), and Universiti Putra Malaysia (47 articles) are also important partners. The Yong Loo Lin School of Medicine at NUS wrote 48 articles. This distribution shows that the best research and academic institutions in ASEAN are adding to the growing body of work on the health of Generation Z.

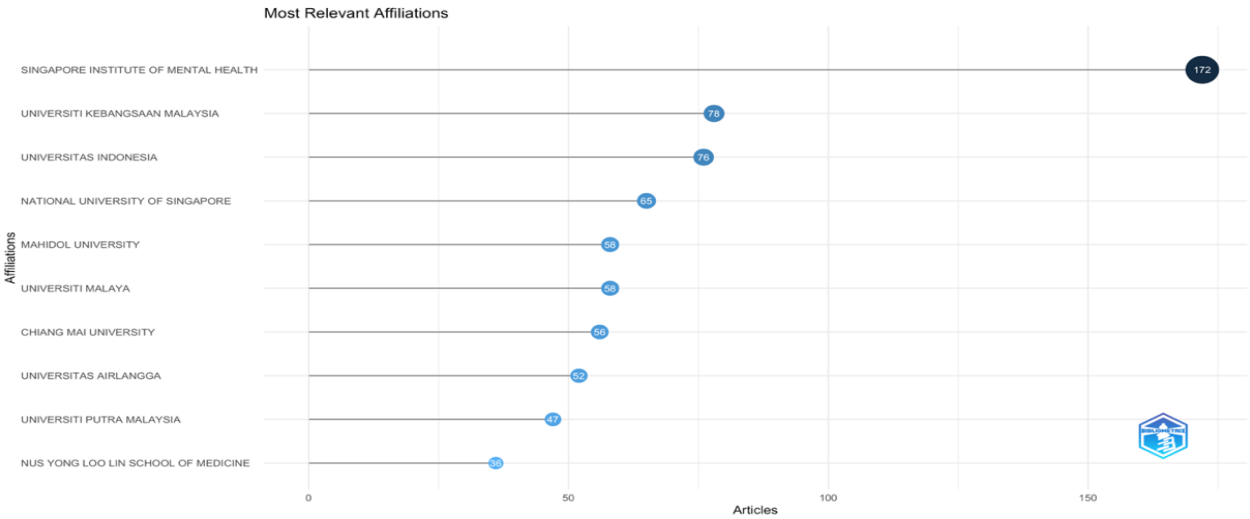

Figure 5. The top 10 Relevant Affiliations

Table 4 shows the top 10 authors who have done the most work on cash waqf research, along with their important contributions and how often they are cited. Subramaniam, M. has the most publications (17), which is 2.47% of the total. He has 449 citations, an average of 26.41 citations per paper, an h-index of 8, and a g-index of 18. Latkin, C.A. and Vaingankar, J.A. each wrote 10 papers (1.45% each), with Latkin's papers getting an average of 16.50 citations and Vaingankar's papers getting an average of 28.10 citations. Ho, R.C.M. has 9 publications, but his h-index is only 2. However, he has an amazing average of 88.44 citations per publication. Peltzer, K. also wrote 9 papers, but they only got an average of 14.67 citations each. Verma, S., on the other hand, has 9 publications with an average of 52.11 citations per paper, an h-index of 7, and a g-index of 15. Abdin, E., Chang, S., and Chong, S.A. each wrote 8 papers (1.16%), which were very important to the field. The average number of citations per paper ranged from 32.88 to 53.25. Finally, Lee, Y.P. wrote 8 papers, but they were cited less often, with an average of 5.88 citations per paper. Lee also had an h-index of 4 and a g-index of 6. These authors all show how cash waqf research is becoming more popular around the world. Some of them have had a big impact on citations, which shows how important they are to the field's growth.

Table 4. Most Productive Authors

Author Name	TP	%	TC	C/P	h-indeks	g-indeks
Subramaniam, M.	17	2,47%	449	26,41	8	18
Latkin, C.A.	10	1,45%	165	16,50	7	10
Vaingankar, J.A.	10	1,45%	281	28,10	5	10
Ho, R.C.M.	9	1,31%	796	88,44	2	24
Peltzer, K.	9	1,31%	132	14,67	3	9
Verma, S.	9	1,31%	469	52,11	7	15
Abdin, E.	8	1,16%	265	33,13	5	8
Chang, S.	8	1,16%	263	32,88	5	10
Chong, S.A.	8	1,16%	426	53,25	7	13
Lee, Y.P.	8	1,16%	47	5,88	4	6

Note(s): TP=total number of publications; TC=total citations; C/P=average citations per publication; and h=h-index; g=g-index

Citation analysis

Based on the information given, a number of studies on the health of Generation Z have made a big difference in this area. Bergeron, with 670 citations, is at the top of this list. His work is about how to help young athletes grow and improve [21]. Tee which looks at the psychological effects of COVID-19 in the Philippines, is in second place with 453 citations [22],. Moradi {Citation} has 361 citations for her work on how endometriosis affects women's lives. Hetrick looks at integrated youth healthcare and has 220 citations [23]. Fernandes looks at how the COVID-19 lockdown changed how teens use the internet and escape from reality, with 190 citations [24]. Von, with 172 citations, looks at why kids miss school [26], and Srinivasan, with 166 citations, looks at mental health in Singapore [8]. Doăn looks at how COVID-19 affects people's mental health (150 citations) [26], and Do looks at how long teens sleep and how it affects their health (139 citations) [27]. Lastly, Reid, with 127 citations, looks at sleep issues in young kids [28]. These studies give us important information about how the COVID-19 pandemic has affected young people's mental health, sleep, and other areas of their lives.

Table 5. The top ten most cited documents

Author	Paper	DOI	T/C	TC/Y	Normalized TC
Bergeron et al. 2015	International Olympic Committee consensus statement on youth athletic development	10.1136/bjsports-2015-094962	670	60,91	8,86
Tee et al. 2020	Psychological impact of COVID-19 pandemic in the Philippines	10.1016/j.jad.2020.08.043	453	75,50	12,36
Moradi et al. 2014.	Impact of endometriosis on women's lives: a qualitative study	10.1186/1472-6874-14-123	361	30,08	6,79
Hetrick, et al 2017.	Integrated (one-stop shop) youth health care: best available evidence and future directions	10.5694/MJA17.00694	220	24,44	6,62
Fernandes, et al 2020,	The impact of COVID-19 lockdown on internet use and escapism in adolescents	10.21134/rpcna.2020.mon.2056	190	31,67	5,18
Vaughn, et al 2013.	Prevalence and correlates of truancy in the US: Results from a national sample	10.1016/j.adolescence.2013.03.015	172	13,23	3,64
Subramaniam et al 2020.	Tracking the mental health of a nation: prevalence and correlates of mental disorders in the second Singapore mental health study	10.1017/S2045796019000179	166	27,67	4,53
Doanh et al 2021.	The impact of fear and anxiety of Covid-19 on life satisfaction: Psychological distress and sleep disturbance as mediators	10.1016/j.paid.2021.110869	150	30,00	8,93
Do et al 2013.	The associations between self-reported sleep duration and adolescent health outcomes: What is the role of time spent on Internet use?	10.1016/j.sleep.2012.09.004	139	10,69	2,94
Reid et al 2009.	The relation between common sleep problems and emotional and behavioral problems among 2- and 3-year-olds in the context of known risk factors for psychopathology	10.1111/j.1365-2869.2008.00692.x	127	7,47	2,79

Note(s): TC=total citations; C/Y=average citations per years

Keyword analysis

Table 6 shows how often keywords related to Generation Z health research show up in the Scopus database. "Human" is the most common keyword, appearing in 53.20% of the articles. "Adolescent" comes in second with 45.78%, and "Female" comes in third with 43.90%. "Male" (43.31%), "Article" (42.59%), and "Humans" (37.50%) are some of the other most common keywords. This shows that there is a strong focus on studies that are centered on humans, especially those that deal with teens and health issues related to gender. Mental health is a big part of this field, and the word "Mental Health" is used in 31.83% of articles. Also, words like "Psychology" (17.44%), "Depression" (16.28%), and "Youth" (12.21%) show how worried people are getting about mental health in young people. The distribution also shows that study designs are a big focus, with terms like "Major Clinical Study," "Controlled Study," and "Cross-sectional Study" showing up in a lot of articles. This shows that there is a lot of research on Generation Z health, with a focus on mental health and the well-being of teens and young adults.

Table 6. 20 Top Keywords

Keywords	TP	%	Keywords	TP	%
Human	366	53,20%	Psychology	120	17,44%
Adolescent	315	45,78%	Major Clinical Study	118	17,15%
Female	302	43,90%	Controlled Study	113	16,42%
Male	298	43,31%	Depression	112	16,28%
Article	293	42,59%	Cross-sectional Study	109	15,84%
Humans	258	37,50%	Questionnaire	101	14,68%
Mental Health	219	31,83%	Youth	84	12,21%
Adult	196	28,49%	Prevalence	81	11,77%
Young Adult	130	18,90%	Thailand	73	10,61%
Child	126	18,31%	Risk Factor	72	10,47%

Source: Scopus database

The figure is a network visualization map created using VOSviewer, illustrating the connections between keywords in the field of adolescent mental health research. At the center of the map is the core theme of "mental health," surrounded by related terms that reflect different aspects of the topic. The blue cluster includes keywords such as "stress," "anxiety," "depression," and "psychological distress," which are linked to emotional and psychological dimensions of mental health. The yellow cluster focuses on "adolescents," "youth," and "young adults," emphasizing the mental health issues specific to younger populations. In the red cluster, terms like "adolescent," "substance use," "violence," and "sexual behavior" point to research on risk factors, behaviors, and challenges faced by adolescents. The green cluster features terms like "social media," "physical activity," "social support," and "COVID-19," highlighting environmental and lifestyle influences on mental health. Additionally, the map shows a geographical focus on countries such as "Indonesia," "Thailand," "Vietnam," "Malaysia," and "Singapore," indicating that the research is particularly concerned with adolescent mental health in these regions. Overall, the network illustrates the interconnectedness of psychological well-being, lifestyle factors, social influences, risk behaviors, and the impact of the COVID-19 pandemic on adolescent mental health.

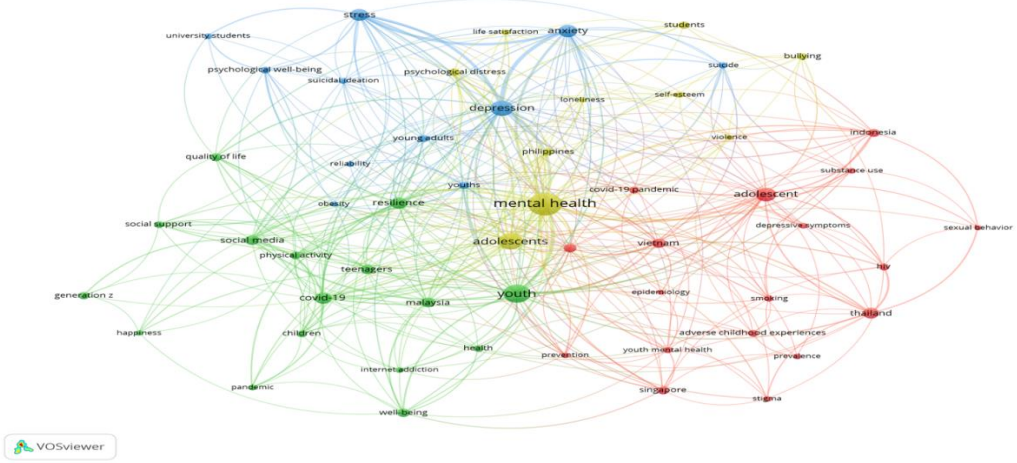

Figure 4. VOSviewer visualisation of a keyword co-occurrence

Note(s): Unit of analysis = Authors keywords; Counting method: Full counting; co-occurrences of a keyword = 6; meet the threshold = 55

Co-authorship analysis

Based on the co-authorship network visualization (Figure 6), we identified several clusters. The first cluster (blue) is associated with the co-authorship network of Kaligis, F., Ong, D.H., and Tjin, W., focusing on research related to mental health and the impact of the COVID-19 pandemic in ASEAN. The second cluster (green) is related to the work of authors like Vainganakam, S., Abdin, E., and Rajeswari, S., who focus on adolescent mental health and the psychological impacts of stressors on youth. The third cluster (yellow) features authors like Zhang, J., and Hwee, L., with research on the intersection of sleep, stress, and health outcomes in adolescents. The fourth cluster (red) is associated with Nguyen, T.T., Zhang, M., and other authors, who have explored the relationship between mental health, social behavior, and environmental factors in Generation Z. This network map provides a comprehensive overview of collaborative research efforts, highlighting key areas of focus in Generation Z health and mental well-being, especially in Southeast Asia.

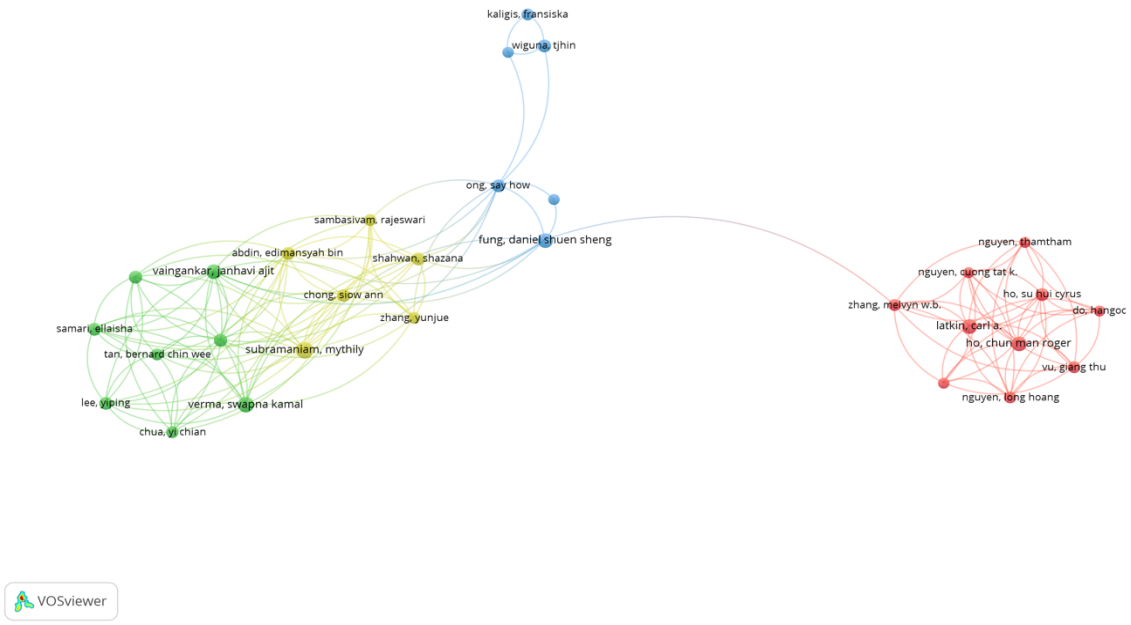

Figure 6. Co-authorship network visualisation map.

Note(s): Unit of analysis = cited Authors; Counting method: Full counting; Minimum number of documents of an author = 2; Minimum number of citations of an author = 4; meet the threshold = 53

DISCUSSION

Adolescent Health and Socioeconomic Factors in ASEAN

The intricate nexus between socioeconomic conditions, urban policy, and adolescent well-being in Southeast Asia reveals a critical public health challenge that extends beyond individual psychology. In Singapore, a nation lauded for urban excellence, youths experience a paradoxical high rate of psychological distress despite high satisfaction with physical and social neighbourhood features. Research indicates that while well-planned environments may buffer against anxiety and depression, they are insufficient for fostering resilience and life satisfaction; economic factors such as housing affordability and job prospects emerge as the most potent determinants of positive well-being, challenging universal livability metrics[29]. This underscores a pressing need for urban policies to transcend physical infrastructure and address the foundational economic insecurities that undermine youth ontological security.

Further compounding regional challenges are risky health behaviours strongly tied to socioeconomic and psychosocial stressors. In the Philippines, one in seven school-aged adolescents engages in current illicit drug use, with prevalence linked to psychological distress, exposure to drugs, and interpersonal violence, while protective factors like high parental support and school-based drug education show mitigating effects [30]. Similarly, in Thailand, premarital sex a precursor to unwanted pregnancy and STIs is being addressed through digital interventions like mobile applications, which have proven effective in reducing risk factors among high school students[31].These findings collectively advocate for integrated, multi-sectoral approaches that combine economic empowerment, targeted education, and digital health strategies to address the complex socio-ecological drivers of adolescent health in ASEAN.

Generation Z Well-being and the Impact of the COVID-19 Pandemic

Generation Z's well-being is increasingly mediated by digital environments, with the COVID-19 pandemic

acting as a profound accelerant for both risks and adaptive behaviours. A staggering 38.4% of youths across 26 countries exhibit problematic internet addiction, significantly associated with internalizing symptoms, high negative emotionality, and limited parental control over internet use[32]. Concurrently, social media use among Vietnamese youth shows a strong correlation with psychological distress, though it also serves primary functions for communication and news, highlighting its dualistic role[33].The pandemic amplified these digital stressors while creating unique adversities, as evidenced by the increased behavioural challenges and caregiver stress experienced by families of children with autism spectrum disorders in Thailand [34].

Despite digital risks, Gen Z also demonstrates a capacity for conscious and sustainable engagement, pointing to avenues for positive intervention. Indonesian Gen Z consumers can be segmented by motives for sustainable food choices, revealing groups from "Frugal Indifferent Foodies" to "Eco-Friendly Enthusiasts," which can inform targeted behavioural interventions[35]. Furthermore, mindful consumption practices among Thai Gen Z directly enhance sustainability values and green purchase intentions, a relationship strengthened by social influence[36]. These insights necessitate a nuanced public health response that leverages digital tools for promotion such as apps for mental well-being while simultaneously mitigating the harms of excessive and unstructured screen time through education and fostering digital literacy.

Mental Health Challenges Among Young Adults and University Students

University students and young adults globally constitute a high-risk population for mental disorders, facing a confluence of academic, social, and developmental pressures. The global burden of anxiety and depressive disorders is immense and growing, with projections suggesting a rise to over 515 million and 466 million cases respectively by 2040, heavily impacting low- and middle-resource settings[37]. This burden manifests acutely on campuses; in Indonesia, key risk factors for student mental health include academic pressure, poor time management, and heavy workloads, while protective factors involve sufficient sleep and engagement with nature[38]. Specific pathologies are prevalent, such as eating disorder psychopathology in Malaysian young women, which is directly predicted by body dissatisfaction and mediated by binge eating[39].

The economic and personal costs of these untreated conditions are profound, necessitating innovative, cost-effective, and early intervention strategies. In Indonesia, anxiety and depression among youth incur a substantial economic burden through direct healthcare costs and caregiver productivity losses, estimated at over US$2.1 billion annually, yet a vast majority of symptomatic youth remain undiagnosed[40]. Promisingly, school-based indicated prevention programs for depression in Thailand are highly cost-effective, and novel detection methods using computational linguistics and machine learning on speech patterns can identify youths at ultra-high risk of psychosis with significant accuracy[41,42]. This evidence base calls for a systemic integration of mental health literacy, accessible screening, and scalable interventions within educational and primary care systems to alter the debilitating trajectory of mental illness in early adulthood.

Adolescent Well-being: Psychological Distress, Bullying, and Self-Esteem

Adolescent psychological well-being is critically shaped by experiences of trauma, social victimization, and the development of personal resilience. Adverse Childhood Experiences (ACEs) are alarmingly common, with nearly half of Thai primary school children reporting at least one ACE, leading to a strong, graded association with both internalizing and externalizing behavioural problems[43]. In the digital sphere, cyberbullying victimization in Eastern Europe directly predicts depression and suicidal intention, with loneliness serving as a key mediator and bystander non-intervention exacerbating the harmful effects[44]. Concurrently, non-suicidal self-injury (NSSI) is a prevalent maladaptive coping mechanism, with a lifetime prevalence of 25% among Singaporean youths, significantly linked to depression, anxiety, and lower resilience[45].

Building resilience and fostering supportive environments are paramount for mitigating these adversities and promoting positive development. Resilience functions as a powerful mediator, negatively influencing how stress contributes to depression and reducing the impact of ACEs on mental health outcomes[46,47]. Interventions must therefore be multi-level, targeting individual coping skills, peer dynamics, and family systems. For instance, in Indonesian schools, high peer pressure is

the strongest predictor of bullying victimization, suggesting that peer-focused programs are essential[48], Furthermore, culturally attuned psychosocial support, such as meditation practices among Thai Buddhist students, can significantly moderate the stress-depression pathway[47]. These findings advocate for strength-based, ecological interventions that empower adolescents, build healthy peer cultures, and engage families as partners in fostering psychological safety and resilience.

CONCLUSION

This study presents a comprehensive bibliometric analysis of Generation Z health literature in ASEAN countries, focusing on mental health and well-being. The findings indicate a steady increase in scholarly activity in this area, with significant contributions from Malaysia, Singapore, and Thailand. Research topics such as mental health challenges (anxiety, depression, stress), the influence of social media, and the impact of the COVID-19 pandemic are prevalent, highlighting the growing recognition of Generation Z's unique health needs. Despite the progress made, gaps in the literature remain, particularly in the exploration of gender-specific health concerns and the role of digital health tools in promoting well-being. Moreover, while the COVID-19 pandemic's immediate impact on Generation Z's mental health has been studied, its long-term effects require further investigation.

Future research should address these gaps by exploring the intersection between digital health interventions, family and social support, and the long-term consequences of the pandemic on adolescent health behaviors. Interdisciplinary research that combines psychology, public health, and technology will be crucial for developing tailored health strategies for Generation Z. This study not only provides insights into current trends but also emphasizes the need for evidence-based public health policies that can address the specific challenges faced by Generation Z in ASEAN. By doing so, we can ensure that Generation Z receives the support needed for optimal mental and physical well-being in an increasingly digital and interconnected world.

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Competing Interests

The authors have no competing interests to declare.

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