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The Effect of Education on Fertility Rates in Asia: A Socioeconomic Bibliometric Analysis

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Abstract

Much empirical evidence has been reported on the impact of educational attainment on fertility rates. Women's higher education in the past several decades has emerged as a significant factor that determines fertility patterns and broader socioeconomic outcomes. Educational enrollment and attainment remain closely related to fertility timing, family size, union formation, partnership choices, labor force participation, and broad family behaviors in nations with highly educated populations. Higher education tends to promote late marriages and delayed childbearing for careers and self-improvement. This leads to smaller families and the delay of childbearing until later years of life. In addition, greater autonomy and financial independence through education enable women to make informed choices regarding reproductive health, family planning, and choice of partner.

The article reviews scholarly literature on the impact of education on fertility levels in Asia between 2000 and 2024 using bibliometric analysis. The research uses 578 papers drawn from the Web of Science Core Collection to analyze thematic evolution, co-authorship patterns, and the intellectual structure of this interdisciplinary field. Through VOSviewer, the analysis provides three main visualizations: keyword co-occurrence networks to identify broad research questions, co-authorship by country to identify international collaboration, and bibliographic coupling to illustrate the intersectionality of intellectual communities at a national level. This broader analysis shows how the debate has evolved over time in response to shifts in population trends, education policy, labor market participation, household decision-making, and socioeconomic development within Asian countries.

Keywords: fertility rate; education; socioeconomic development; labor force participation; household decision-making; bibliometric analysis; VOSviewer; Web of Science.

Introduction

Asian fertility rates have made dramatic shifts in recent decades due to a wide range of socioeconomic and demographic forces. Education, and in particular female education, has emerged as one of these, and one that is now widely seen as a key determinant of reproductive activity and population dynamics. As countries across Asia continue to invest in schooling and struggle with shifting patterns of fertility, understanding the scientific literature on this nexus is increasingly vital.

This study conducts a bibliometric analysis to examine systematically the body of scholarly work that explores the impact of education on fertility in Asia. By investigating publication patterns, citation patterns, collaboration between authors, and theme evolution, this study attempts to map the intellectual landscape and trajectory of the research field. The findings not only locate the most influential contributions and geographical research agendas but also uncover gaps and directions for future research.

The research analyses 578 Web of Science Core Collection articles published during the period of 2000-2024 to generate a bibliometric study. Using VOSviewer software, the research analyzes co-authorship, citation, and keyword co-occurrence networks in order to unveil and depict the intellectual structure of the topic. Combined with popular authors, their institutional affiliations, and their geographic locations of research, the research method is conceivable to uncover major themes.

The main goals of the research are (1) to report quantitative data on research articles that have analyzed the interrelation between fertility and education in Asia, (2) to ascertain thematic hotspots and time line trends in the literature, and (3) to identify research gaps that could be addressed by future multi-disciplinary

studies. This study enriches demographic and educational scholarship while demonstrating a bibliometric methodology to trace the path of how this issue has evolved in recent literature.

This study uses bibliometric methods to characterize the field of fertility studies over the last twenty years. Data illustrate a dynamic, rapidly evolving and academically acknowledged field influenced by technological developments and by growing interest of researchers from all over the world. So far, most studies on fertility preservation have dealt with the topic in general and especially with cancer patients. Other studies have mapped the field of infertility-related research regarding trends as well as thematic patterns over time (Makkizadeh and Sa'adat 2017; Yildirim and Demir 2019). The present study, however, focuses on the influence of economic as well as of technological developments on the quantity of publications, mainly from the USA and developed European countries. As already noted by Nagaratnam et al. (2016), the amount of publications on fertility issues has almost doubled since the 1980s, not only in terms of the absolute number of publications but also concerning the increased citation impact and the greater variety of themes that are discussed. Cebal-Loureda et al. (2022) also refer to the use of bibliometric approaches when studying issues of social and human development related to fertility. Most recently, there have been studies on current fertility-related research that apply bibliometric and knowledge-graph studies (Du et al. 2024). Zhang et al. (2016) and Baskaran et al. (2019) described a move away from basic reproductive biology to multidisciplinary and collaborative research with Asia, led by China and Japan, emerging as an increasingly significant contributor. Recent studies, such as Ahmad et al. (2025), indicated the growing complexity and centralization of female infertility research networks and credited advances in assisted reproductive technology to institutional and regional productivity. In the course of these studies, bibliometric techniques have been helpful in tracing thematic evolution, author collaboration, and the geopolitical spread of research, providing a helpful methodological precedent for exploration of the influence of education as a social determinant of fertility outcomes in the Asian setting.

The nexus between education and fertility has been a leading topic of demographic and social science research, and Asia has posed a challenging and dynamic context in which to study this. Bibliometric research has played a significant role in unveiling the structure and evolution of this knowledge domain. Work such as that of Yildirim and Demir (2019) and Nagaratnam et al. (2016) demonstrates how fertility research has expanded exponentially over the past two decades, driven by technological advancement, economic development, and increasing academic interest. Whereas the discipline used to be monopolized by medical and clinical concerns-fertility preservation and infertility treatments, for example-the research focus has gradually been broadened to include socio-demographic determinants such as education, gender, and reproductive behavior.

Research by Zhang et al. (2016) and Baskaran et al. (2019) illustrates a thematic shift towards interdisciplinary studies, with educational attainment, especially for women, increasingly being investigated as a cause of fertility decline. These analyses also bring to view the growing contribution of Asian countries-China, India, and Japan particularly-to global fertility research, supported by the expanding institutional networks and collaboration across countries. Ahmad et al. (2025) also refer to the growing complexity of scholarly debate, noting how education is embedded in such broad themes as women's empowerment, family planning, and demographic transition.

Across the literature, bibliometric tools have extracted main clusters of research covering female education, reproductive health, and policy interventions. Bibliometric study of gender gaps in school education has found that recently and even recently, there are still some structural constraints on the access to primary and lower secondary education for girls and girls' completion of same. However, recently, there has been significant increase in the respective research output even after SDG 4 (Quality Education) and SDG 5 (Gender Equality) goals have been set and are being implemented (Temirtayeva, Kovaleva, & Kudebayeva, 2025). Keyword co-occurrence and citation network analyses suggest that education is an omnipresent variable at the hub of research investigating fertility intentions, delayed childbearing, and low fertility. The Asian context, with regional variation in education access, urbanization, and cultural norms, is revealed as fertile ground for comparative and policy-relevant research.

Cumulatively, these bibliometric findings not only chart the intellectual evolution of the field but also confirm the salience of education as a key driver of fertility patterns across Asia. This evolution warrants the necessity of continued research that bridges demographic, economic, and sociological perspectives using quantitative and bibliometric approaches.

Materials and Methods

This study employed a bibliometric approach to examine scientific productions concerning the impact of education on fertility in Asian countries. A search in the Web of Science (WoS) Core Collection, one of the most globally recognized cross-disciplinary citation databases which contains numerous of scholarly arti-

cles, was conducted to identify relevant studies. The initial search yielded 2,293 documents, which were subsequently filtered by title-field geographic locations, languages, document types, and relevance to the thematic scope of this study. The applications of the mentioned filters resulted in 578 English-language documents, which were written by authors in various disciplines from around the world and were published in numerous countries over time.

An advanced search was conducted through a well-structured Boolean query to capture instances of papers. The used search term was: TS=(“education” OR “educational attainment” OR “female education” OR “education women” OR “schooling” OR “literacy rate” OR “access to education”) AND TS=(“fertility rate” OR “birth rate” OR “childbearing” OR “reproductive behavior” OR “total fertility rate” OR “population growth”) AND TI=(“Asia” OR “South Asia” OR “Southeast Asia” OR “East Asia” OR “Central Asia” OR “Asian countries” OR “developing Asia” OR India OR China OR Bangladesh OR Vietnam OR Pakistan OR Indonesia OR Philippines OR Nepal OR Sri Lanka OR Malaysia OR Thailand OR Myanmar OR Laos OR Cambodia). This search was restricted to the topic (TS) and title (TI) fields to offer topical similarity with breadth of coverage. In total, 578 documents were collected from diverse disciplines, regions, and years of publication. The dataset was exported in tab-delimited form (with full records and cited references) and imported into VOSviewer for bibliometric mapping and network analysis. Three analyses were carried out:

1. Co-authorship Analysis (by Country): This analysis was designed to reveal research collaboration patterns at the country level. A threshold of 2 documents per country was established. Countries that reached this level were plotted in terms of co-authorship links and total link strength, identifying central points of academic collaboration in the discipline.

2. Keyword Co-occurrence Map: To identify top research areas and conceptual themes, a co-occurrence map was established based on author keywords. The keywords appeared at least 6 times in the visualization, and it indicated top topics like “female education”, “fertility rate”, “population growth”, and “reproductive behavior”.

3. Citation Analysis (by Author): Here, the focus was on identifying influential authors in the topic. Authors with at least 2 papers were taken into account, and their influence on the number of citations was mapped to identify leading scholars and their share of the debate.

These bibliometric methods offer a detailed description of the research landscape, which can be used to identify leading trends, top contributors, and imminent themes. This method presents a foundation for gaining a perspective on how education and fertility have been investigated across Asia, and what research areas are bound to gain popularity in the future.

Results

During the initial 12 years (2000-2011), production was low and irregular, fluctuating between 1 and 10 documents per year, with only an average of around 5 publications annually (Fig. 1). This shows that the research topic of education’s effect on fertility was still in its early stages and likely addressed sporadically within the framework of more broad-ranging demographic or health research.

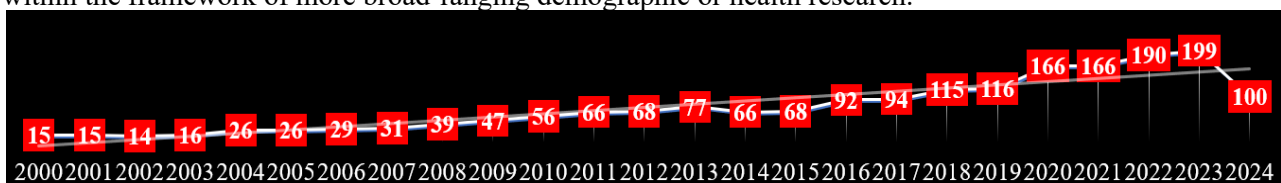


Figure 1. Publication Years

From 2012 onwards, one can see a definite increase in scholarly interest, with publications increasing more steadily. The output per year varied between 14 and 19, reflecting more continued interest in the subject and the start of a discernible growth trend. The growth in publications during these years aligns with mounting global policy attention to women’s education, family planning, and sustainable development, particularly after the launch of the UN’s Sustainable Development Goals (SDGs) in 2015. Starting in 2019, the field of research experienced a high rate of publication spike. From 35 publications in 2019, the numbers almost doubled in 2020 to 57, increased to 61 in 2022, and peaked at 71 in 2024. The years 2020-2024 alone account for over 50 % of all publications in the dataset—a clear indication of a research boom. This dramatic rise suggests that the topic has reached research maturity, driven by increasing awareness of gender and education issues, demographic change in Asia, as well as the increasingly common use of advanced analytical methods (e.g., econometrics, machine learning in demography).

Of the 578 indexed articles that relate to education and fertility rate studies, most are peer-reviewed journal articles. Journal articles account for approximately 88 % of all publications (Fig. 2), indicating scholarly journals have been the primary publication outlet for research in this subject area. This high concentration is a sign of a strong scholarly foundation and sustained academic interest.

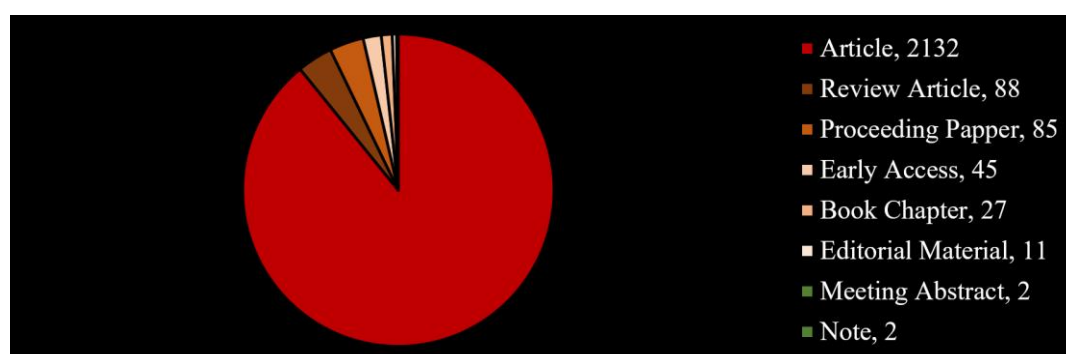


Figure 2. Document Types

The set includes a limited sample of other genres of documents that complete the bulk of journal-based scholarship. Proceedings papers (26) report early-stage findings and conference presentations, and constitute a limited share of total outputs. Review articles (22) give synthesized knowledge and critical syntheses of the literature, indicating thematic maturity. Early access documents (17) report the dynamic unfolding and adaptability of the field to new academic arguments. Book chapters (6) contribute additional richness, often in broader interdisciplinary or edited scholarly books. Document distribution shows high evidence of academic legitimacy, with no retracted or low-quality records evidence.

The analyses of the Asian studies on education and fertility rate during 2000-2024 illustrate the most productive authors according to the contribution of work, as indicated in Figure 3. The most productive authors have contributed between 4 and 6 articles during the study period, which indicates a stabilized and balanced contribution of the scholars. The top three authors-Marphatia A.A., Padmadas S., and Saville N.-have all released six pieces each, indicating their ongoing interest in this research area. Authors such as Manandhar D.S., Laksono A.D., and Wels J. are close by, while Dandona L., Swaminathan S., Bhutta Z., Varghese C., Bittles A., Dandona R., and Kumar A. also feature as frequent authors with four articles each.

Public, Environmental, and Occupational Health leads the literature on fertility and education in Asia with 154 indexed articles, indicating the significance of maternal and reproductive health, public health interventions, and social determinants of fertility outcomes (Fig. 4). Other fields are contributed by Sociology (23) and Education Educational Research (14), suggesting an emphasis on structural and cultural variables affecting educational access and reproductive decision-making. Disciplines such as Family Studies, Nutrition and Dietetics, and Health Policy Services further highlight how family functioning, nutrition, and health policy institutions intersect with fertility outcomes.

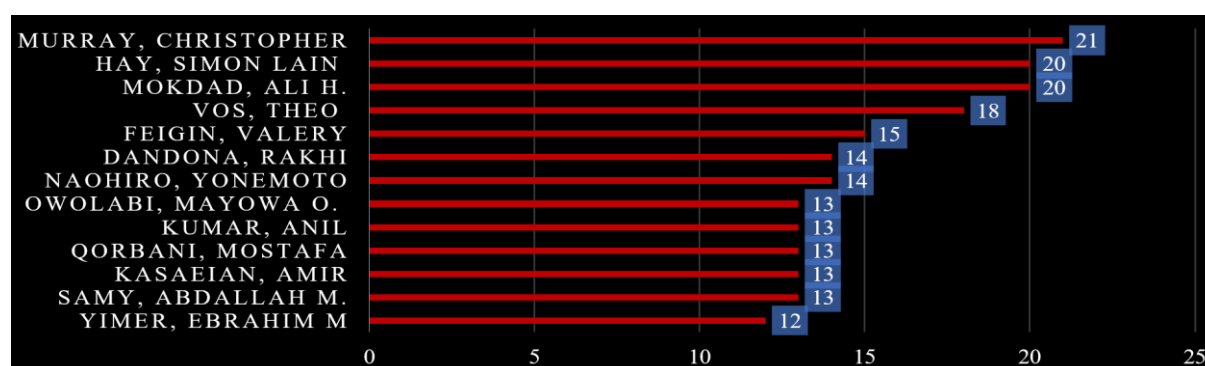


Figure 3. Most Prolific Authors

The addition of fields such as Environmental Studies, Green & Sustainable Science, Development Studies, and Geography attests to a growing interest in how environmental and spatial dimensions intersect with fertility and education-particularly in rapidly growing or climatologically exposed places in Asia.

Individually, these categories illustrate how very interdisciplinary the research field is, merging public health, economics, social sciences, education, and environmental research in order to study the contributions of education to fertility choice and outcomes. The extensive disciplinary engagement illustrates how this field engages with individual-level determinants (such as education and health) as well as broader policy and development agendas, making it more relevant to both academic and policy communities in Asia.

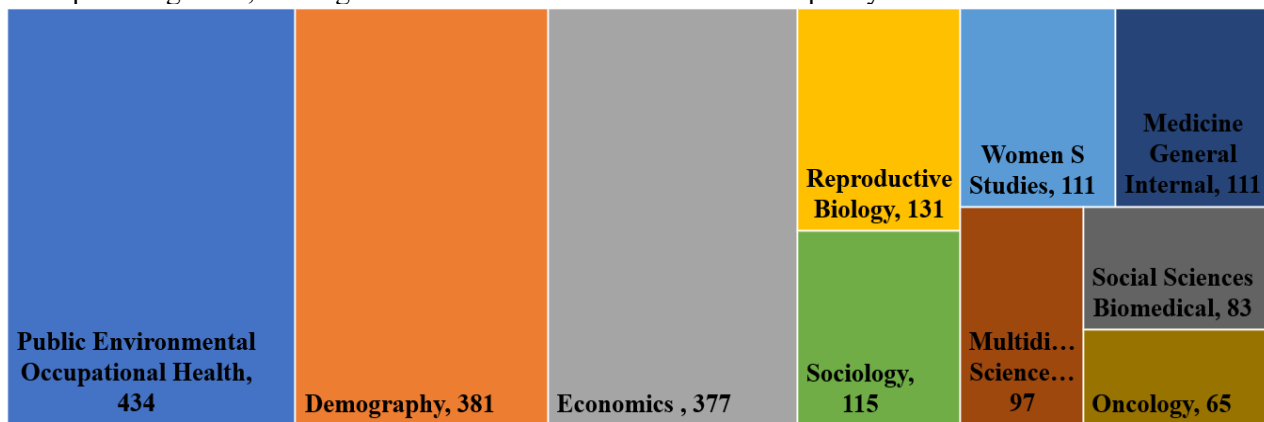


Figure 4. Top Web of Science Subject Categories

The meso-level citation topics, as seen from Figure 5, are a wide and often interdisciplinary set of scholarly linkages in education and Asian fertility studies. Gender & Sexuality Studies (6.178) is the most frequent topic, appearing in 223 records, an indication of the salience of gendered lenses such as women's empowerment, reproductive rights, and social-cultural norms that shape fertility conduct and access to education. This dominant theme succeeds in encapsulating the degree to which fertility experiences are connected to structural gender inequalities within various Asian contexts.

Health Policy (1.156) appears in 48 records, illustrating how fertility and education are entrenched in broader institutional and policy-based environments, such as national reproductive health strategies, family planning initiatives, and access to maternal care. Obstetrics & Gynecology (1.72) and Nutrition & Dietetics (1.44)-both of which have 19 and 29 citations, respectively-highlight the biomedical and nutritional basis of fertility, most notably in adolescent health, early marriage, and maternal health.

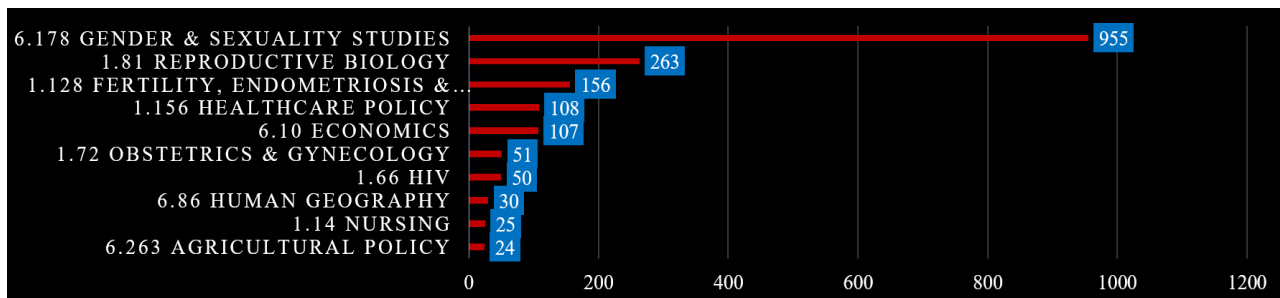


Figure 5. Most Frequent Meso-Level Citation Topics

Other frequently cited topics are Economics (6.10) with 18 citations, illustrating how fertility trends are commonly analyzed by education-based income mobility, work force participation, and childbearing opportunity cost. Sustainability Science (6.155) with 17 citations reflects growing attention to the long-term demographic and environmental impacts of fertility trends, especially in Asian regions with resource shortages or climatic exposure.

Niche topics such as Fertility, Endometriosis & Hysterectomy (1.128) and HIV (1.66) reflect the intersection of clinical fertility concerns and reproductive health risks, typically examined in regard to disadvantaged or risk groups. Asian Studies (6.227) with 9 citations, on the other hand, positions the research within its regional specificity, providing meaningful socio-political and cultural context to fertility processes in multi-diverse Asian societies. These findings show the interdisciplinary nature of fertility and education studies and its rooted linkages to public health, gender studies, economics, clinical medicine, and regional studies. The broad thematic range also suggests that researchers are increasingly conscious of macro-level policy is-

sues and micro-level social and health determinants, which shows how the subject is of greatest concern to academic research and pragmatic policy intervention.

Figure 6 illustrates the micro-level citation themes, providing a more nuanced overview of the thematic emphasis across the literature on Asian fertility and education. Not surprisingly, the topic “Family Fertility Dynamics” (6.178.516) is cited most frequently, appearing in 215 records. This reinforces the dataset’s primary interest in how family size, reproduction behavior, and fertility goals are influenced by educational and socioeconomic factors across different Asian settings.

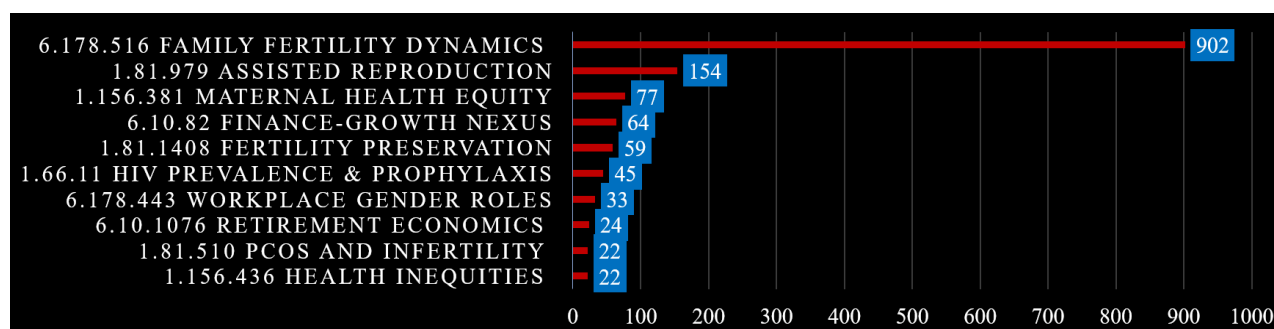


Figure 6. Micro-Level Citation Topics

The findings illustrate the rich thematic layering of the literature that currently spans demography, health equity, education, environmental sustainability, and economic development. Micro-level concerns confirm that the work is no longer reduced to fertility rates but encompasses multifactorial thinking that takes into account maternal health, policy environments, and local development paths-providing it with policy relevance and interdisciplinarity.

The literature reviewed demonstrates close alignment with the United Nations Sustainable Development Goals (SDGs), as revealed by Figure 7. The most prevalent SDG represented is Goal 3: Good Health and Well-Being, represented in 443 records and reflective of the field’s keen emphasis on maternal and child health, reproductive health, and overall well-being as it concerns fertility and educational attainment. The records for Goal 5 Gender Equality total 319 and look at the role of female education, gender roles and women’s empowerment in the fertility trends of Asia.

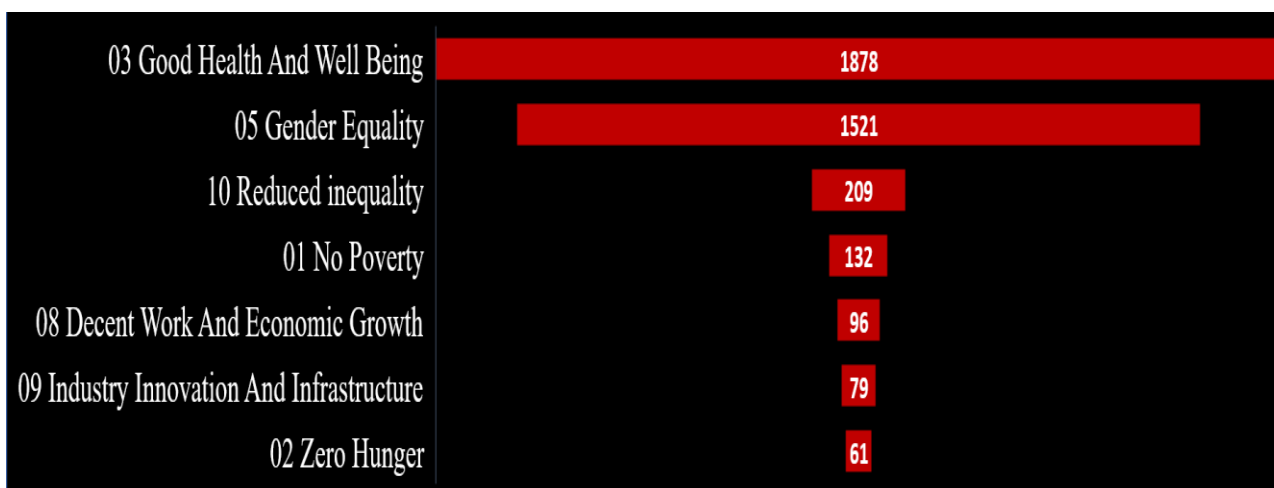


Figure 7. Alignment with Sustainable Development Goals (SDGs)

The overwhelming portrayal of health and gender-related goals indicates the field is firmly in the social dimension of sustainable development, and particularly in decreasing inequities in health systems and education for women and girls. The portrayal of economic and environmental goals, however, indicates an emerging multidisciplinary interest in linking fertility and education to long-term sustainability, development planning, and resilience in the face of climate and economic hardship.

Figure 8 illustrates the distribution of the studied publications according to several Web of Science (WoS) citation indexes. The majority of the papers, 346 out of 578, are indexed by the Social Sciences Cita-

tion Index (SSCI), indicating that education and fertility research in Asia is based primarily on social sciences such as sociology, demography, public health, and education.

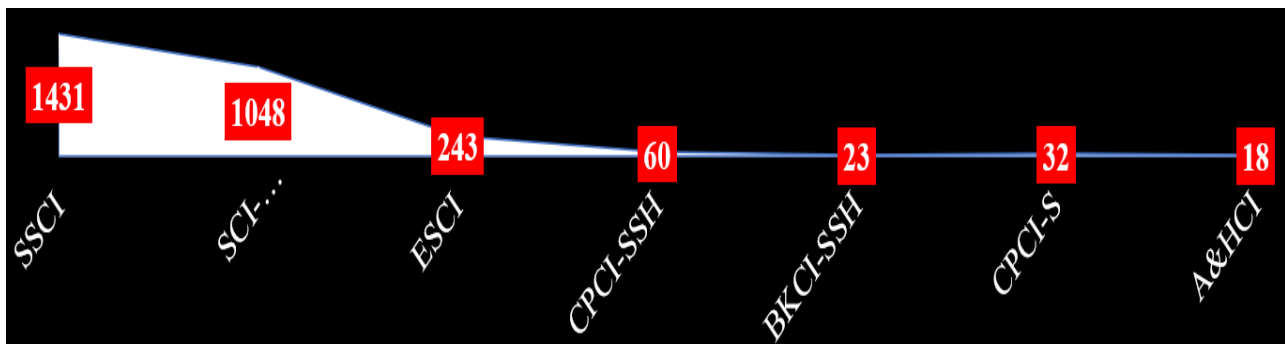


Figure 8. Web of Science Index Coverage of Publications

The Science Citation Index Expanded (SCI-EXPANDED) is the second closest, having 289 publications, reflecting the field's strong connection to medical, epidemiological, and environmental science studies, particularly maternal health, reproductive care, and clinical outcomes of fertility studies. The Emerging Sources Citation Index (ESCI) has 86 records, which suggest that most of newer and potentially impactful research is still in the process of securing citation visibility within the core WoS indexes.

Figure 9 illustrates the highest activity institutions on research of education and fertility in Asia for the period 2000-2024. From the figure above it is clear that the highest activity is held by Peking University from China with 20 publications. The Peking University is holding the highest position not only on research of education and fertility in Asia, but also on research of education and fertility in China. Other highest active institutions on research of education and fertility in Asia are the International Institute for Population Sciences (IIPS) from India with 18 publications. The IIPS has published various publications in the recent years on the trends and determinants of fertility, on reproductive health and on population studies in South Asian countries.

UC System has 17 publications on fertility and maternal health with the majority of the North American publications on global health, migration and education development for development, ranking third in volume of publications for this topic. In addition, the University of London is publishing 15 articles on similar topics most likely from public health, gender studies, and economics development studies. Aga Khan University and the International Centre for Diarrhoeal Disease Research (ICDDR) in Bangladesh each have 12 publications which tallies with their role in public health and in studying issues related to fertility and maternal health. Additionally, universities in China-Wuhan University, Xi'an Jiaotong University, and Renmin University of China-as well as Airlangga University in Indonesia, have each contributed 10 or more publications, confirming the active engagement of regional academic institutions in Asia.

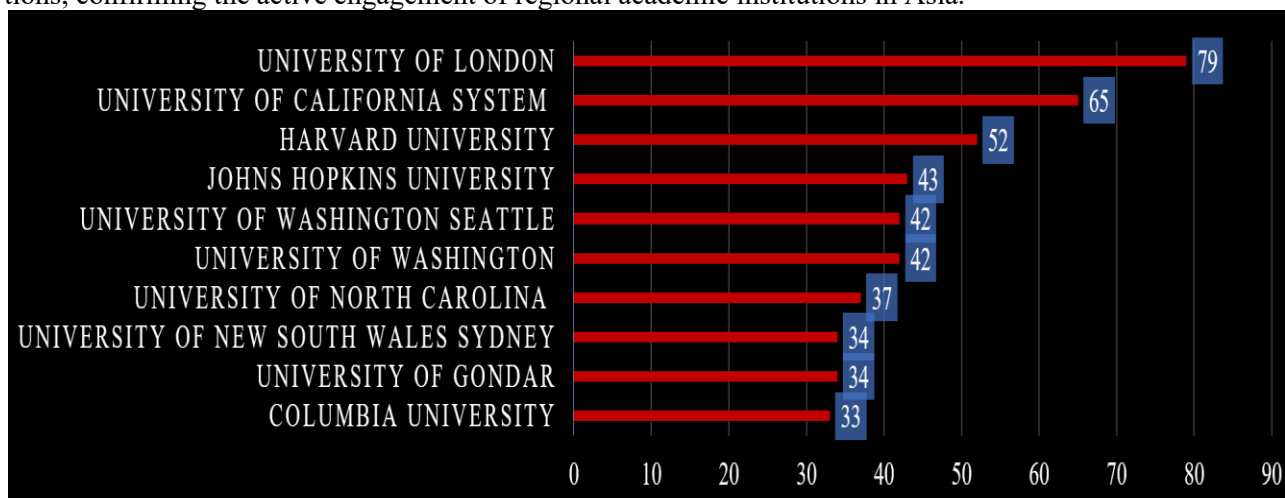


Figure 9. Most Productive Institutional Affiliations

Institutions such as Indian Council of Medical Research (ICMR) and Monash University (Australia), both with 9 publications, bear witness once again to internationalization and collaboration in the discipline. University College London's presence once again with 9 publications bears witness to the contribution made by interdisciplinary educational, demographical, and public policy research institutes.

These findings show that education and fertility research in Asia is supported by a broad and diverse institutional web, stretching across Asia, North America, Europe, and Australia. Affiliation distribution mirrors the interdisciplinarity of the field by adding demography, sociology, education, public health, and development studies, and demonstrates growing global collaboration to deal with fertility issues through education and health actions.

Around 580 education and fertility research articles have been authored for Asia as a whole across a wide range of countries, as shown in Figure 10.

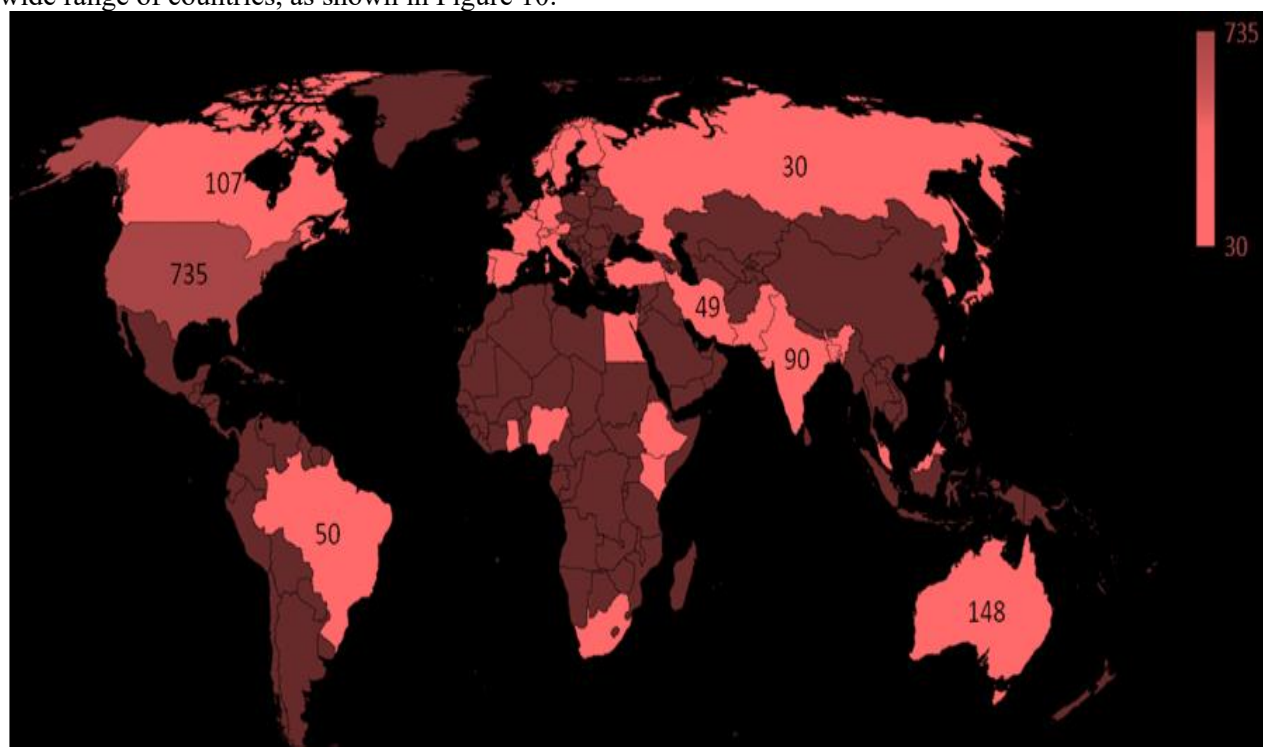


Figure 10. Geographic Distribution by countries

The People's Republic of China leads the list with 204 articles, reflecting its large academic community, population concern with fertility policy (historic one-child policy and ongoing population-recovery strategies), and large literature on maternal schooling and population health. The United States follows with 114 publications, driven by the country's strong research centers, funding of global development problems, and collaboration on collaborative projects on gender, education, and reproductive health in Asia.

India (87 articles) captures high local scholarly enthusiasm regarding issues of fertility transition, women's education, and socio-economic inequalities-often from leading demographic research centers such as the International Institute for Population Sciences. Bangladesh (54) and Pakistan (47) similarly evidence high visibility, perhaps due to the priority attached to maternal health, gender empowerment, and family planning programs within national development strategies.

England (50) and Australia (45) document extensive academic output from Western sources, specifically in development, global health, and gender research. Southeast Asian countries such as Indonesia (31), Malaysia (21), Thailand (20), and Nepal (19) contribute significantly, demonstrating growth in regional scholarly contribution on education and fertility studies by developing economies.

Canada (18), Vietnam (15), Japan (10), and Singapore (9) also reflect steady engagement in comparative and cross-country research, particularly in public health and population education. Sweden, Switzerland, the Netherlands, and Spain (6-9 each) add to European academic interest in fertility research at the global and regional levels.

The broad geographical scope of publication output-ranging from mainstream academic titans to new regional entrants-demonstrates the global importance and collaborative nature of education and fertility re-

search. The contribution of smaller but notable ones from Sri Lanka, the Philippines, Saudi Arabia, and South Korea confirms the presence of multi-country networks and South-South collaboration.

Such widespread involvement from across Asia, North America, Europe, and beyond underscores the interdisciplinary and international nature of the topic. It maps how work on fertility and education is increasingly situated within global health, sustainable development, and gender equality agendas, supported by a range of academic systems working toward similar developmental objectives.

The co-author network in Figure 11 illustrates the collaborative culture between research countries examining the relationship between education and fertility rates in Asia from 2014 to 2022. People's Republic of China is the focal point of scholarly collaboration, forming extensive networks with countries like India, Bangladesh, Pakistan, Australia, and England. The focal role signifies the increased investments and leadership of China in population as well as research into education across the continent.

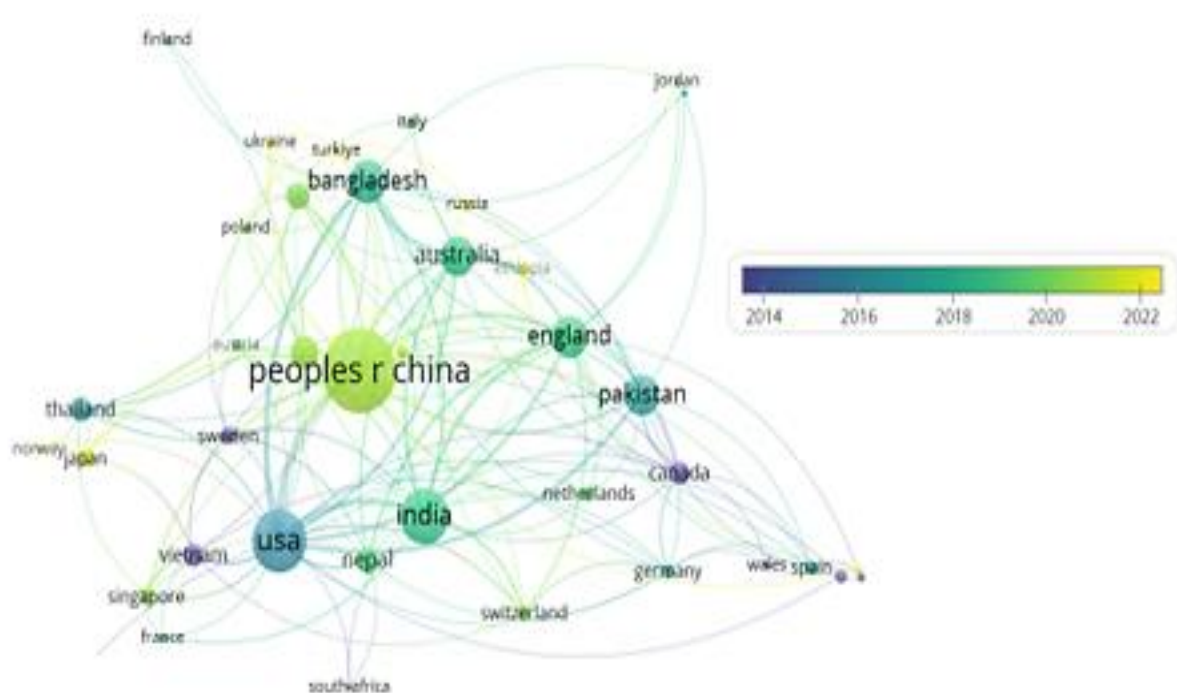


Figure 11. Co-authorship Overlay Visualization

The United States also is highly active, co-authoring internationally in numerous occasions, particularly with India, Vietnam, Nepal, and the Philippines, evidencing its continued global presence of social science research and interest in transnational scholarly interconnectedness. The network shows a regional cluster model: e.g., South Asian countries (India, Pakistan, Nepal, Bangladesh) are equally linked with each other and with foreign academic centers like China and the U.S., showing a shared regional interest in demographic patterns based on education. Such countries as England, Germany, Canada, and Australia serve as crucial bridging points, linking Asian-focused research with institutions in the West and therefore integrating regional population studies into global debates. Active but marginal participants like Jordan, Ethiopia, Switzerland, and Norway have more limited bilateral cooperation, typically overlapping with limited case studies or comparative international education studies. Application of overlaid colors (blue to yellow) marks the median year of publication, with a host of recent cooperation in the last couple of years (2018-2022) reflecting increased global concern with the implications of education policy on fertility patterns. In most cases, the visualization depicts the increasingly international and interdisciplinary nature of this research field, in which countries with varying academic capabilities and regional interests cooperate to address socio-demographic issues.

VOSviewer network visualization in Figure 12 depicts 134 keywords across six thematic clusters, each symbolizing an overarching conceptual domain within academic literature addressing education and fertility in Asia. The map represents how often keywords co-occurred to identify the intellectual structure and dominant themes of the literature.

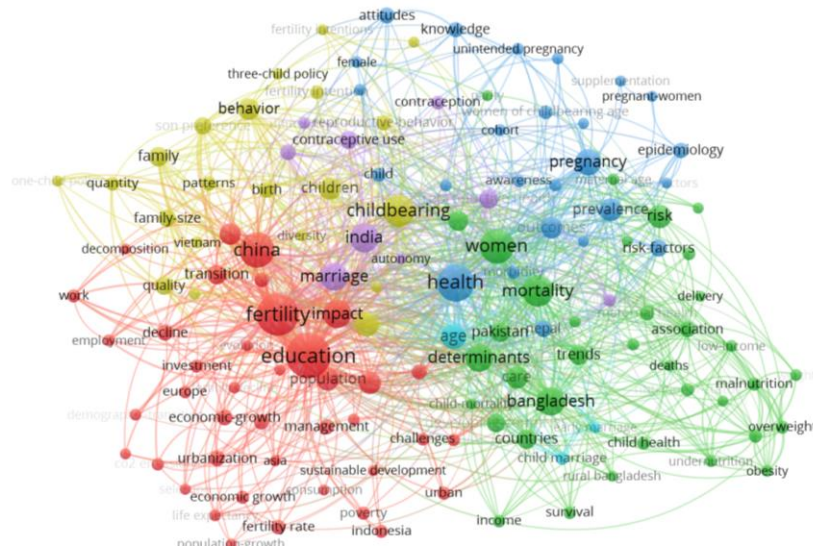


Figure 12. Keyword Co-occurrence Network Map

The most prominent words—“fertility”, “education”, “women”, “health”, “childbearing”, and “China”—are focal nodes, connecting subtopics across demographic, health, social, and economic contexts.

- Cluster 1 - Fertility, Education, and Developmental Policy. The red cluster is located in the center of the map. This cluster contains words related to the issues of fertility, education, population, economic development, employment, urbanization, poverty and policy. The words in this cluster are relevant to a wide range of socio-economic indicators and how they are affected by changes in fertility. The discussion on the transition to lower levels of fertility, its decline and management of fertility is relevant to this cluster of demographic variables and their inter-relationship with other developmental indicators in Asian economies. The words that particularly characterize China are those that are related to its fertility control policy and its education system.

- Cluster 2 - Child Health, Nutrition, and Socioeconomic Context. This green cluster deals with child health, mortality, malnutrition, overweight, undernutrition, deaths, care, and determinants, linking fertility to public health outcomes. Bangladesh and Pakistan are repeated, showing an emphasis on low- and middle-income Asian countries where fertility trends are directly related to child and maternal health. Survival and delivery keywords identify the life-course impacts of fertility and socioeconomic vulnerability decisions.

- Cluster 3 - Pregnancy, Risk, and Reproductive Health. The blue cluster contains words like pregnancy, prevalence, risk factors, supplementation, unintended pregnancy, and epidemiology with a focus on maternal and reproductive health. It is biomedical and public health research-oriented that focuses on education, awareness, and accessibility to services as the determinants of fertility behavior. It differs from the economic and sociological orientations in Cluster 1 by drawing attention to the biological and risk factors of childbearing.

- Cluster 4 - Women, Agency, and Social Determinants. This purple cluster is all about keywords such as women, agency, knowledge, awareness, attitudes, cohort, and female that represent gendered perspectives when it comes to fertility. It highlights how education, empowerment of women, and decision-making are fertility determinants. Frequency-of-childbearing-and-marriage also suggests looking into social norms as well as reproductive agency in the context of patriarchal or transitional societies.

- Cluster 5 - Family Systems, Behavior, and Cultural Patterns. The yellow cluster contains terms like family, behavior, patterns, family-size, one-child policy, and three-child policy, focusing on cultural and behavioral drivers of fertility. This includes state-imposed policies (mainly in China and Vietnam), family planning desires, and household structure's effect on fertility choice. It also reflects longitudinal interest in shifting fertility intentions and family building over time.

- Cluster 6 - Antenatal Care and Fertility Intentions. The small orange cluster includes the words like antenatal care, fertility intentions, and intimate partner violence. It deals with access to pre-natal care and the reproductive desires of women, for instance, the obstacles to fulfilling fertility intentions. This suggests an interest in policy and health care delivery services, most notably for under-represented or vulnerable groups. That the clusters overlap demonstrates the interdisciplinary character of Asian fertility studies through their

convergence of demography, economics, public health, gender studies, and policy science. That country names like China, India, Bangladesh, and Vietnam are present reflects the regional emphasis of the literature. This ideational map provides a point of departure to distinguish the fundamental arguments and empirical foci in the area and shapes lines of future research, particularly as regards the interface of education with demographic action and health.

Figure 13's VOSviewer citation network visualization represents the citation relationships among 37 authors in the literature regarding education's relationship to fertility. The authors are grouped in six clusters, represented by colors corresponding to citation-based subfields or study groups.

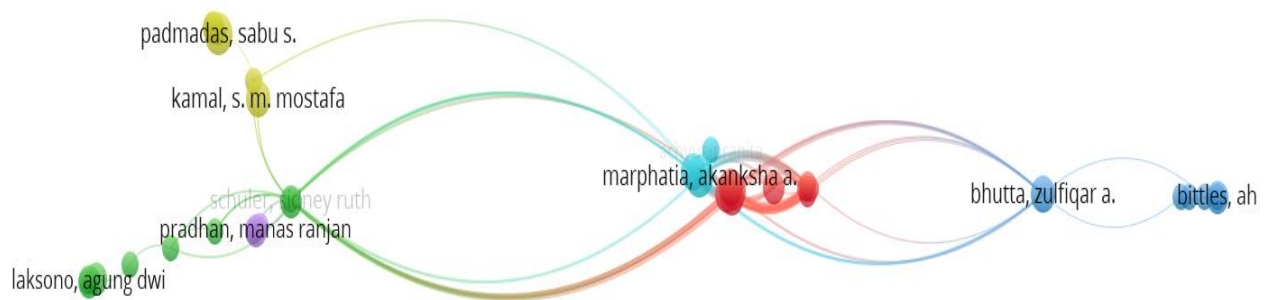


Figure 13. Author Citation Network

Author Marphatia, Akanksha A., principal author in the middle of the citation cluster. Her work serves as an intellectual hub which connects other citation clusters and consolidates research streams in gender, education and reproductive health outcomes for low- and middle- income countries.

- Cluster 1 - Gender, Education, and Reproductive Health. The Extremely Well-Cited Cluster 1 is headed by Marphatia, Akanksha A. Note that this principal author is a key intellectual bridge for this cluster of highly cited references and other citation clusters. This cluster consists of references by authors who have conducted research on gender, education and reproductive health in South Asia. The Extremely High Centrality of this Cluster indicates that it contains the core theoretical and empirical work of the field. The research by authors in this cluster is often jointly cited to support investigation of the relationship of female education and gender empowerment and reproductive health in South Asia.

- Cluster 2 - Global Public Health and Child Outcomes. This cluster includes Bhutta, Zulfiqar A. and Bittles, A. H., both of whom are high-quality cited authors in the context of making contributions to research in maternal and child health. Their work is particularly valuable for fertility and public health perspectives regarding risk factors and early childhood development, typically in the form of education or socioeconomic determinants.

- Cluster 3 - Indonesian and South Asian Demographic Studies. Laksono, Agung Dwi anchors this cluster, which deals with fertility, health systems access, and Indonesian and regional educational policies. It is more country- or region-oriented and employs regional application of global demographic models.

- Cluster 4 - Sociodemographic Transitions and Gender Dynamics. This cluster has Padmadas, Sabu S. and Kamal, S.M. Mostafa, who look at fertility decline, reproductive behavior, and demographic transitions focused on Bangladesh, Nepal, and India in some parts. Their citation referring to other clusters indicates that their research integrates policy, public health, and sociological work.

- Cluster 5 - Structural Drivers and Policy-Oriented Work. Centered on Pradhan, Nanas Ranjan, this cluster is marked by an interest in macro-level policy, structural drivers of fertility, and inequality in education. Similar to the rest but compact in nature, this cluster is highly interlinked with others through mutual citation, i.e., a supportive role in overall policy-relevant discourse.

- Cluster 6 - Cross-Cutting Theoretical Contributions. With authors like Achyut, Pratik and Marphatia, this team denotes concept and interdisciplinary work and is often quoted for building theoretical frameworks that interlink gender, education systems, and fertility decisions.

The visualization illustrates the citation flow between authors and how specific researchers (e.g., Marphatia and Bhutta) act as conceptual hubs, cited across the disciplines. Curved lines indicate that academic conversation is not compartmentalized but instead networked highly, bringing to light the interdisciplinary nature of education and fertility research. Clusters are connected by interests in gender equality, child well-being, reproductive behavior, and demographic transition in the Asian context.

Discussion

This bibliometric review provides a systematic overview of scholarly research on education and fertility in Asia between 2000 and 2024. Several key findings are based on keyword co-occurrence network analysis, co-authorship visualization, and citation analysis, all of which together chart the intellectual landscape, thematic density, and geographic dispersion of the discipline.

The keyword co-occurrence map revealed six general thematic clusters: (1) fertility, education, and development policy; (2) socioeconomic status, child health, and nutrition; (3) reproductive health and pregnancy risks; (4) women's autonomy and gendered social determinants; (5) family systems and cultural behavior; and (6) antenatal care and fertility intentions. These clusters reflect the field's vast interdisciplinary synthesis, in which demography models, public health paradigms, gender theories, and economic analysis intersect. Cross-regional coverage of themes such as reproductive risk, labor force participation, contraception, and child malnutrition reflects an empathetic understanding of how educational attainment-especially women's-shapes fertility-linked choices, behaviors, and outcomes across various sociocultural contexts across Asia.

The network of country-level co-authorship revealed strong collaborative patterns among countries such as China, India, Bangladesh, and Pakistan working regularly with researchers from the United States, England, and Australia. China's central location parallels its policy-relevance across demographics and rising academic dominance, whereas the United States and England act as global anchors linking Asian scholarship to international scholarly institutions. The South Asian countries evince close regional collaboration, which is in line with shared academic interest in fertility transition, family planning, and education access. These findings accentuate how universal development agendas and regional policy imperatives drive transnational coordination of research in the subject matter.

Together, these findings suggest that Asian educational and fertility studies have become a sophisticated multidimensional and policy-focused field. New evidence for Central Asia on how reproductive choices translate into or fail to translate into women's economic empowerment has recently emerged. Specifically, the linkages between fertility-related choices and gender differences in income are found to be influenced by a set of institutional and labor market structures, Kovaleva, Taylor, Korosteleva, & Kudebayeva (2025). This field not only responds to issues of population control or school access but also issues of gender equity, health inequity, sustainable development, and structural inequity. The increase in academic interest and collaboration patterns is a manifestation of the field's shift from traditional demographic modeling to more contextualized and interdisciplinary science, responsive to local diversity and global policy concerns.

Conclusion

This bibliometric review presents a broad overview of the effects of education on fertility in Asia, from 578 articles between 2000 and 2024. It identifies influential areas of research-anything from health to gender, policy, and socioeconomics-and top authors, institutions, and emerging themes such as environmental sustainability, reproductive health, gender equality, and socioeconomic development. While the study provides valuable insights into gaps and trends in research, it is marred by the application of the Web of Science and quantitative methods. The studies should apply more local and qualitative perspectives, investigate causal influences, and evaluate the long-term effects of education policy on fertility behavior in future research. More broadly, this research adds to the understanding of the education-fertility nexus and offers a blueprint for researchers and policymakers looking to address demographic change through inclusive evidence-based policy.

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References

- Ahmad, T., Baig, M., Othman, S. S., & Abuhamael, S. A. (2025). Global research trends and developments in female infertility: a systematic bibliometric analysis and network visualization of 9288 studies. *Middle East Fertility Society Journal*, 30(1), 1-14. <https://doi.org/10.1186/s43043-025-00222-z>
- Baskaran, S., Agarwal, A., Leisegang, K., Pushparaj, P. N., Selvam, M. K. P., & Henkel, R. (2019). An in-depth bibliometric analysis and current perspective on male infertility research. *The world journal of men's health*, 39(2), 302. <https://doi.org/10.5534/wjmh.180114>
- Cebral-Loureda, M., Tamés-Muñoz, E., & Hernández-Baqueiro, A. (2022). The fertility of a concept: A bibliometric review of human flourishing. *International journal of environmental research and public health*, 19(5), 2586. <https://doi.org/10.3390/ijerph19052586>

Du, C., Yu, Y., & Fan, X. (2024). Analysis of research trends (2014-2023) on oxidative stress and male fertility based on bibliometrics and knowledge graphs. *Frontiers in Endocrinology*, 15, 1326402. <https://doi.org/10.3389/fendo.2024.1326402>

Kovaleva, I., Taylor, L., Korosteleva, A., & Kudebayeva, A. (2025). More freedom, less equality: The unexpected economics of abortion in Central Asia. *Eurasian Journal of Economic and Business Studies*, 69(3), 125-139. <https://doi.org/10.47703/ejeb.v69i3.547>

Makkizadeh, F., & Sa'adat, F. (2017). Bibliometric and thematic analysis of articles in the field of infertility (2011-2015). *International Journal of Reproductive BioMedicine*, 15(11), 719. Bibliometric and thematic analysis of articles in the field of infertility (2011-2015) - PMC

Nagaratnam, S., Ale Ebrahim, N., & Habibullah, M. S. (2016). A bibliometric analysis on “fertility rate” Research trends. *International Journal of Professional Business Review*, 1(1), 1-14. Retrieved from <https://ssrn.com/abstract=2811543>

Temirtayeva, M. M., Kovaleva, I. V., & Kudebayeva, A. K. (2025). Gender gaps in school education: A two-decade bibliometric analysis. *Qainar Journal of Social Science*, 4 (1), 53-76. <https://doi.org/10.58732/2958-7212-2025-1-53-76>

Yildirim, E., & Demir, E. (2019). Comparative bibliometric analysis of fertility preservation. *Annals of Medical Research*. Retrieved from [1622-1628-libre.pdf](https://doi.org/10.1622/1628-libre.pdf)

Zhang, Y., Xiao, F., Lu, S., Song, J., Zhang, C., Li, J.,... & Yang, X. (2016). Research trends and perspectives of male infertility: a bibliometric analysis of 20 years of scientific literature. *Andrology*, 4(6), 990-1001. <https://doi.org/10.1111/andr.12204>

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Білімнің Азиядағы туу деңгейіне әсері: әлеуметтік-экономикалық библиометриялық талдау

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Аңдатпа

Білім деңгейінің туу көрсеткіштеріне әсері туралы едәуір эмпирикалық дәлелдер бар. Соңғы онжылдықтарда әйелдердің жоғары білімі туу үлгілерін және кеңірек әлеуметтік-экономикалық нәтижелерді айқындайтын маңызды факторға айналды. Біліммен қамтылу және білім деңгейі бала туу уақытымен, отбасы көлемімен, некелік одақтардың қалыптасуымен, серіктес таңдаумен, еңбек күшіне қатысумен және білім деңгейі жоғары елдердегі кеңірек отбасылық мінез-құлық үлгілерімен тығыз байланысты. Жоғары білім, әдетте, әйелдердің кешірек тұрмыс құруына және мансап пен өзін-өзі дамыту мақсатында бала тууды кейінге қалдыруына ықпал етеді. Бұл отбасы көлемінің кішіреюіне және бала туудың өмірдің кейінгі кезеңдеріне жылжуына әкеледі. Сонымен қатар білім арқылы қалыптасатын үлкен дербестік пен қаржылық тәуелсіздік әйелдерге репродуктивті денсаулық, отбасын жоспарлау және серіктес таңдау мәселелері бойынша саналы шешімдер қабылдауға мүмкіндік береді. Мақалада 2000-2024 жылдар аралығында Азиядағы білімнің туу деңгейіне әсері туралы ғылыми әдебиеттер библиометриялық талдау арқылы қарастырылады. Зерттеуде Web of Science Core Collection дерекқорынан алынған 578 жарияланым пайдаланылып, осы пәнаралық саланың тақырыптық эволюциясы, бірлескен авторлық үлгілері және интеллектуалдық құрылымы талданды. VOSviewer арқылы талдау үш негізгі визуализацияны қамтиды: кең зерттеу сұрақтарын анықтау үшін кілт сөздердің бірлесіп кездесу желілері, халықаралық ынтымақтастықты анықтау үшін

елдер бойынша бірлескен авторлық, сондай-ақ ұлттық деңгейдегі интеллектуалдық қауымдастықтардың қиылысын көрсету үшін библиографиялық байланыс. Бұл кеңейтілген талдау Азия елдеріндегі халық саны үрдістерінің, білім беру саясатының, еңбек күшіне қатысудың, үй шаруашылықтарындағы шешім қабылдаудың және әлеуметтік-экономикалық дамудың өзгерістеріне жауап ретінде ғылыми пікірталастың уақыт өте қалай дамығанын көрсетеді.

Кілт сөздер: туу деңгейі, білім, әлеуметтік-экономикалық даму, еңбек күшіне қатысу, үй шаруашылықтарында шешім қабылдау, библиометриялық талдау, VOSviewer, Web of Science.

Влияние образования на уровень рождаемости в Азии: социально-экономический библиометрический анализ

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Аннотация

Существует значительный объем эмпирических данных о влиянии уровня образования на показатели рождаемости. За последние десятилетия высшее образование женщин стало значимым фактором, определяющим модели рождаемости и более широкие социально-экономические результаты. Уровень охвата образованием и образовательные достижения тесно связаны со временем рождения детей, размером семьи, формированием брачных союзов, выбором партнера, участием в рабочей силе и более широкими семейными практиками в странах с высоким уровнем образования населения. Высшее образование, как правило, способствует более позднему вступлению в брак и откладыванию рождения детей ради карьеры и саморазвития. Это ведет к меньшему размеру семьи и переносу рождения детей на более поздние годы жизни. Кроме того, большая самостоятельность и финансовая независимость, полученные благодаря образованию, позволяют женщинам принимать более осознанные решения в отношении репродуктивного здоровья, планирования семьи и выбора партнера.

В статье представлен обзор научной литературы о влиянии образования на уровень рождаемости в Азии за период с 2000 по 2024 год с использованием библиометрического анализа. В исследовании используются 578 публикаций, полученных из Web of Science Core Collection, для анализа тематической эволюции, моделей соавторства и интеллектуальной структуры данной междисциплинарной области. С помощью VOSviewer анализ включает три основные визуализации: сети совместной встречаемости ключевых слов для выявления широких исследовательских вопросов, соавторство по странам для определения международного сотрудничества и библиографическое сочетание для иллюстрации пересечения интеллектуальных сообществ на национальном уровне. Более широкий анализ показывает, как научная дискуссия развивалась со временем в ответ на изменения демографических тенденций, образовательной политики, участия в рабочей силе, принятия решений домохозяйствами и социально-экономического развития в странах Азии.

Ключевые слова: уровень рождаемости, образование, социально-экономическое развитие, участие в рабочей силе, принятие решений домохозяйствами, библиометрический анализ, VOSviewer, Web of Science.

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Conflict of Interest

The authors declare no conflict of interest.