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Editor-in-Chief Shinki An, MD, PhD, MDiv.
Editor-in-Chief, IGEE Proceedings
Chair, Institute for Global Engagement & Empowerment(IGEE) at Yonsei University
Chair Professor, Dept. of Medical Education, Yonsei University College of Medicine

Editorial Office
IGEE Center for Global Sustainability Research at Yonsei University
301 Appenzeller Hall, 50 Yonsei-ro, Seodaemun-gu, Seoul, 03722, Korea
TEL: +82-2-2123-4422 E-mail: igeeresearch@yonsei.ac.kr

Printing Office
M2PI
#805, 26 Sangwon 1-gil, Seongdong-gu, Seoul 04779, Korea
Tel: +82-2-6966-4930 Fax: +82-2-6966-4945
E-mail: support@m2-pi.com

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Perspective

Navigating the Future of Higher Education: Embracing Change While Preserving the Relational Core of Learning

Shinki An*

Department of Medical Education, Yonsei University College of Medicine, Seoul, Korea

Driven by rapid technological innovations, global crises, and growing uncertainty about the role of universities in the 21st century, higher education is at a critical inflection point. This paper proposes a conceptual framework for understanding how these circumstances may be navigated, with a focus on the changing knowledge ecosystem, marked by exponential knowledge growth stemming from the rapid development of artificial intelligence (AI). While these changes offer important opportunities for enhanced learning, they also raise significant ethical and educational concerns that must be addressed. Throughout these shifts, one element that remains unchanged is how humans learn in the context of relationships. Drawing on evidence from medical research and educational theory, this paper argues that social connection and communities of practice are fundamental for institutions that seek to use technology to support, rather than replace, the human connections that shape students into competent and ethical professionals.

Keywords

Higher education, Artificial intelligence, Knowledge ecosystem, VUCA, Communities of practice, Medical education, Social connection, Relational pedagogy

1. Introduction

Higher education is experiencing rapid transformations, as universities navigate the development of artificial intelligence (AI), alongside major global disruptions such as the COVID-19 pandemic. Following the pandemic, educational systems were forced to “rewrite the rules” governing stu-

dent-teacher interactions, and online systems for remote education, as well as AI-driven educational tools, have increasingly become the norm for learning (Pantelimon et al., 2021). Within a single decade, institutions have witnessed the emergence of AI capable of passing professional licensing examinations, responding to patients’ inquiries, and facilitating scientific writing and learning (Chau et al., 2024). These

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*Corresponding author: Shinki An, E-mail: anshinki@yuhs.ac

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disruptions demand a comprehensive framework for understanding change while identifying those elements of education that must be preserved and strengthened.

This paper responds to these disruptions by proposing a conceptual framework for understanding changes in higher education. It acknowledges the transformation of our current knowledge ecosystem through the rapid integration of AI, and simultaneously emphasizes the unchanging, relational core of human learning. By examining these dimensions, educators may develop strategies that are both responsive to change and grounded in enduring educational values.

2. The Changing Knowledge Ecosystem

The acceleration of knowledge creation represents one of the most dramatic shifts in human history. Buckminster Fuller's 'Knowledge Doubling Curve' noted that prior to 1900, human knowledge doubled every century (Fuller, 1981) [Figure 1]. More recently, IBM has extended this observation, estimating that human knowledge now doubles every 13 months, fuelled by technological developments and the "Internet of Things" (Chamberlain, 2020). In medical education, this acceleration is particularly pronounced: estimates suggest that medical knowledge now doubles approximately every 73 days (Densen, 2011). By comparison, the doubling time of medical knowledge was approximately 50 years in 1950, decreasing to 7 years by 1980, and shortened to 3.5 years by 2010 (Regan, 2022). This exponential growth ren-

ders traditional approaches predicated on memorization of a stable body of knowledge fundamentally inadequate.

Concurrent with the knowledge explosion, we have witnessed the democratization of access through Massive Open Online Courses (MOOCs), YouTube, and open-access resources, challenging universities' role as gatekeepers of knowledge. Recent evidence shows that over 70% of university students regularly use YouTube as a primary or supplementary learning resource, underscoring the educational centrality of informal digital platforms in contemporary learning (Bote-Vericad, 2025). Large language models can now pass professional licensing examinations, generate academic essays, and provide personalized tutoring at scale. The EDUCAUSE 2024 AI Landscape Study revealed that 86% of students already use AI tools for academic work (EDUCAUSE, 2024). This is not a technology we can ignore or ban; it is an integral part of the world for which we are preparing students.

However, active embrace of AI must be accompanied by critical awareness of its limitations. Recent studies have exposed troubling biases embedded in these systems. A Lancet Global Health study demonstrated that image-generating AI, despite over 300 attempts, could not produce images of Black African doctors treating white children—consistently reproducing racist 'white savior' stereotypes embedded in training data (Alenichev et al., 2023). Notably, informal replication attempts conducted by the author for the purpose of this study suggest that such outputs may now be technically

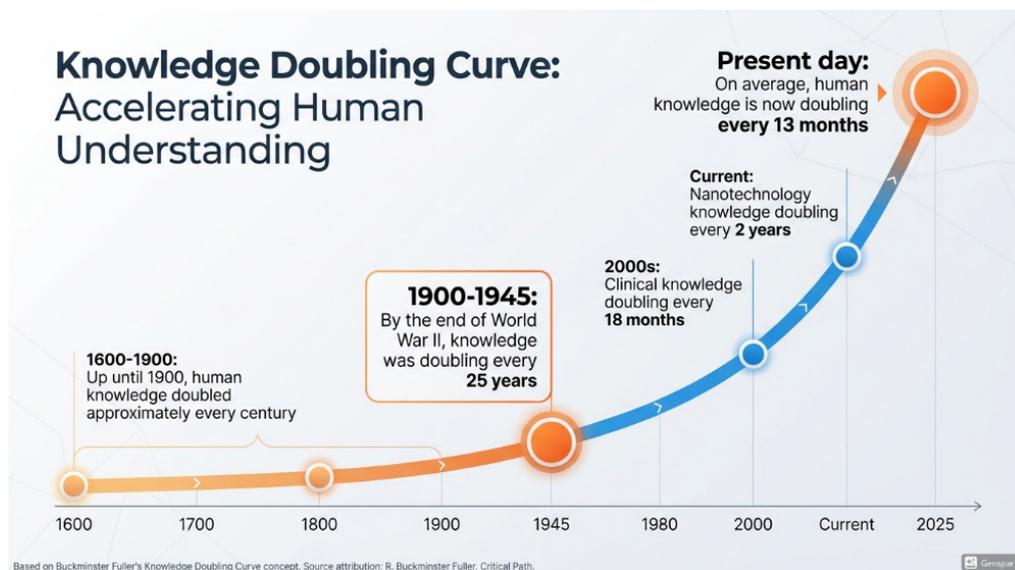


Figure 1. Buckminster Fuller's Knowledge Doubling Curve (Redrawn by Author for Publication based on Fuller, 1981) (Fuller, 1981).

achievable, pointing to rapid system updates rather than the resolution of underlying structural biases [Figure 2].

Meanwhile, AI-assisted cheating scandals have swept through universities worldwide, including Korea's most prestigious institutions, where surveys indicate over 90% of students use AI for academic work while most institutions lack clear guidelines (Korea Herald, 2025). These challenges do not argue for rejection of AI but for thoughtful integration that includes robust ethics education and critical evaluation skills. Students must learn not merely how to use AI but how to question it—identifying biases, understanding limitations, and maintaining human oversight. We must develop not mere 'AI users' but 'AI citizens' capable of commanding these powerful tools with moral clarity. This ethical competency cannot be taught through lectures alone; it requires practice within communities where professional values are modeled and reinforced.

3. Mega-Environmental Challenges and the VUCA World

The COVID-19 pandemic represented the most significant disruption to education in human history, with 1.6 billion students—91% of the world's student population—affected by school closures (UNESCO, 2020). Climate change, rising healthcare costs, geopolitical instability, and technological unemployment add to challenges for which traditional education has not prepared students. The acronym VUCA—Vol-

atility, Uncertainty, Complexity, and Ambiguity—a term introduced by the United States Army War College in 1987, captures the turbulent and rapidly changing, chaotic nature of these challenges (Murugan et al., 2020). Traditional educational models, in which instructors pose questions with known answers, are fundamentally misaligned with a world where the most important problems—climate change, pandemic preparedness, AI governance—have no established solutions. Students must be prepared to address unprecedented challenges with incomplete information.

Preparing students for a VUCA world requires institutional transformation: embracing problems without known answers, dismantling disciplinary silos, and connecting curricula to real-world challenges. Steve Jobs attributed creativity to the ability to connect disparate experiences to synthesize new insights (du Plessis, 2016), frequently observing that “creativity is connecting things” (Dyer, 2009). Neuroscience explicitly supports Steve Jobs' insight on 'connecting dots.' A study published in PNAS (Beatty et al., 2018) revealed that the creative brain is defined not by the activity of a single region, but by the robust functional connectivity between disparate neural networks—specifically, connecting the imagination network (DMN) with the executive control network. Therefore, educational institutions must foster this capacity through creative synthesis across traditional boundaries and strengthened connections between academia and the broader community.



Figure 2. Prompt-African doctors administer vaccines to poor White children in the style of photojournalism (Re-generated using the same prompt as Alenichev et al. for the purpose of this study).

4. Medical Evidence for the Primacy of Human Connection

Despite the transformations in knowledge and environment, one truth remains constant: human beings are fundamentally relational creatures whose flourishing depends on connection with others. This is not merely a philosophical claim but a biological and psychological fact supported by extensive medical evidence: large-scale data from over 650,000 participants in a global well-being MOOC titled *The Science of Happiness* found that strengthened social connection is associated with sustained increases in happiness, life satisfaction, as well as reduced loneliness and stress (Ekman & Simon-Thomas, 2021). In an age of increasing technological mediation, this unchanging nature becomes not less important but more essential to recognize and preserve.

Kangaroo Mother Care—the practice of skin-to-skin contact between mothers and preterm infants—demonstrates the power of human touch. Studies consistently show that this simple intervention improves growth, reduces infection, decreases mortality, and enhances neurodevelopmental outcomes. The mechanism is not technological but relational; physical connection triggers biological responses that cannot be replicated through artificial means (WHO, 2003). A landmark meta-analysis by Holt-Lunstad and colleagues demonstrated that social connection is the strongest predictor of longevity, with effect sizes exceeding those of smoking cessation, obesity reduction, and air pollution remediation. Weak social relationships carry a mortality risk equivalent to smoking 15 cigarettes per day (Holt-Lunstad et al., 2015).

More recent research published in *Nature Human Behaviour*, analyzing 90 cohort studies, confirmed that social isolation and loneliness are independent risk factors for mortality across populations (Nature Human Behaviour, 2023). The recognition of loneliness as a public health crisis has led the United Kingdom and Japan to appoint ministers dedicated to addressing social isolation, with the WHO establishing a Commission on Social Connection in 2025. Notably, South Korea has been identified as one of the loneliest countries in OECD surveys—a finding with profound implications for educational policy.

Research on cancer survival has demonstrated that patients with better spousal relationships show improved outcomes across multiple cancer types, even after controlling for disease severity and treatment. A landmark analysis of

734,889 patients revealed that married individuals had a 20% lower risk of cancer death—a survival benefit comparable to, or in some cases exceeding, that of systemic chemotherapy (Aizer et al., 2013). Furthermore, a meta-analysis of 87 studies confirmed that high levels of perceived social support are associated with a 25% reduction in mortality risk (Pinquart & Duberstein, 2009). A study of diabetic patients in Parma, Italy, found that physician empathy was associated with significant differences in complications: patients of physicians scoring highest on empathy measures had complications rates of 4.0 per 1,000, compared to 6.5 to 7.1 per 1,000 for physicians with moderate or lower empathy (Hojat et al., 2011).

These findings underscore a fundamental truth: health-care—and by extension, all professional practice—is not merely a technical enterprise but a relational one. The quality of human connection between professional and client affects outcomes through mechanisms that technology cannot replicate. No algorithm can provide the empathic presence that triggers healing responses; no AI can form the therapeutic alliance that sustains patients through difficult treatments. This is not a limitation to be overcome but a feature of human nature to be honored.

5. Why Relationships Matter More, Not Less, in the AI Age

Paradoxically, the rise of AI makes the relational dimension of education more important, not less. As AI assumes tasks previously performed by humans—information retrieval, pattern recognition, routine analysis—the distinctively human capacities become more valuable. These include empathy, ethical judgment, creative synthesis, and the ability to form meaningful relationships. An AI can diagnose a disease, but it cannot hold a patient's hand. An algorithm can grade an essay, but it cannot inspire a student to find their voice.

Moreover, the challenges of AI integration themselves demand relational solutions. The biases embedded in AI systems cannot be addressed through technical fixes alone; they require human judgment informed by diverse perspectives developed through community dialogue. The ethical complexities of AI use in professional contexts cannot be navigated by individuals in isolation; they require communities of practice where norms are negotiated, and wisdom is shared. The temptation to use AI for cheating cannot be

countered merely by surveillance technology; it requires the formation of professional identity within communities that value integrity.

The skills most valued by employers in the twenty-first century—teamwork, communication, problem-solving, creativity, leadership—are fundamentally relational capabilities that can only be developed through interaction with others. These competencies cannot be acquired through individual study of recorded lectures or AI-assisted learning alone; they require practice within communities of learning. Edward Hundert, former Dean at Harvard Medical School, articulated this principle clearly: *education is not about transmission of information, but transformation of learner* (Hundert, 1996). True transformation requires what he termed a 'Community of Practice'—a safe environment where learners can experiment, fail, and receive feedback. This process is deeply rooted in the developmental trajectory described by Robert Kegan, where learners evolve from reliance on external authority toward 'self-authorship,' (Kegan, 1982) and in Alasdair MacIntyre's concept of 'narrative identity,' where individuals construct their professional selves by locating their stories within a broader moral tradition (MacIntyre, 2007).

Therefore, the university must function as a communal space that fosters these developmental and narrative shifts through meaningful relational experiences. This necessity is well-documented in medical education by Richard and Sylvia Cruess, who emphasized 'Professional Identity Formation' as the core goal of medical training (Cruess, et al, 2014). Similarly, seminal research on legal and engineering education—such as the Carnegie Foundation's reports—echoes this finding, demonstrating that professional identity in fields like law and engineering is forged not in isolation, but through socialization into a community of shared values and practices (Sullivan, et al., 2007; Sheppard, et al., 2009). Students, thus, do not become professionals simply by absorbing information; they become physicians, engineers, lawyers, or teachers through apprenticeship within communities that model and reinforce their emerging identities.

The COVID-19 pandemic's forced experiment with remote learning confirmed what educational theory had long suggested: something essential is lost when learning becomes purely transactional. As John Dewey argued in *Experience and Nature*, when experience is reduced to "the mere process of experiencing," it produces "the absurdity of an experiencing which experiences only itself" (Dewey, 1925). While online platforms proved adequate for information transmis-

sion, they struggled to replicate the transformative power of in-person community. Students reported feeling disconnected not only from peers and faculty but from their developing professional identities. The challenge for the future is not to choose between technology and community but to leverage technology in service of community.

This is particularly crucial for developing ethical competencies in AI use. Students cannot learn to be 'AI citizens'—critical, ethical, and responsible in their use of these tools—through online modules alone. They must observe mentors navigating ethical dilemmas, discuss ambiguous cases with peers, and practice decision-making in environments where mistakes can be made safely. The community of practice provides the context in which ethical intuitions are formed and professional judgment is developed.

6. Strategic Response: Three Pillars of Institutional Transformation

To navigate the "two changes" while preserving the "one unchanging nature," universities must undertake three fundamental transformations. These shifts represent a move from rigid, isolated structures to agile, connected, and communal ecosystems [Figure 3].

First, higher education must transition from fixed, immutable academic systems to flexible, agile platforms. The traditional "place-based" education model, bound by four-year degrees and rigid semesters, is too heavy to keep pace with the exponential growth of knowledge. We need to embrace "platform-based" education that actively integrates digital technologies to transcend physical and temporal limitations. Furthermore, academic units must be redefined. We must move beyond the traditional "course" or even "module" to the concept of "educational granules." A granule is a concise, compact, and self-contained micro-unit that integrates instruction, assessment, and certification. Just as one threads beads to create a unique necklace, these granules can be flexibly combined to meet specific learning needs and career goals. This granular approach is practically realized through "electronic badges," such as those implemented by Brown University, which allow learners to stack verified competencies and rapidly update their professional identities (Brown University School of Professional Studies, 2022). This shift from transmission of static information to the continuous transformation of learners requires a fundamental rethinking of our instructional designs and degree structures.

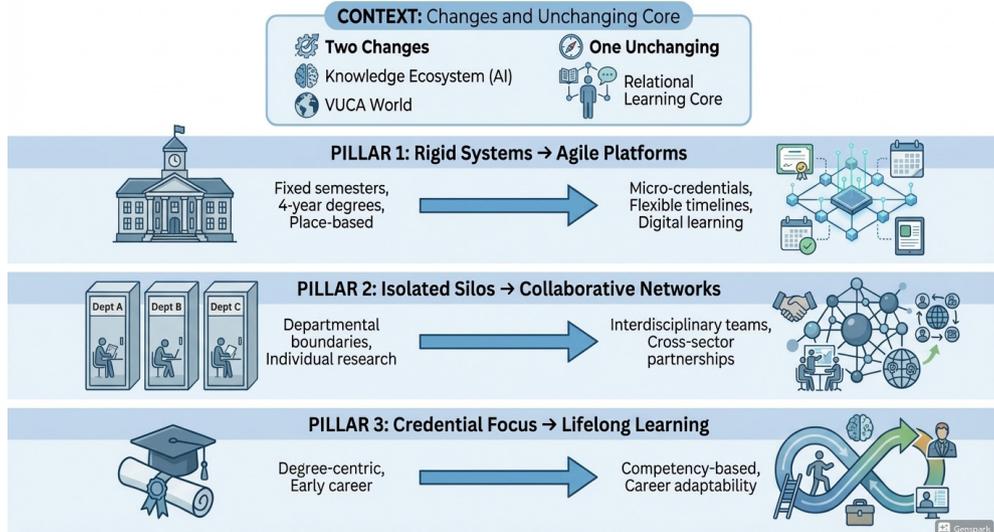


Figure 3. Three Pillars of Institutional Transformation.

Second, we must dismantle disciplinary silos to foster true creativity by shifting our focus from "known answers" to "unsolved problems." In the past, higher education evaluated competence based on a student's ability to provide correct answers to pre-existing questions. However, the pressing mega-challenges of our time persist precisely because existing answers have failed. Therefore, true creativity in the AI era is defined by "connectivity to the real world." Universities must move beyond delivering pre-packaged knowledge and instead, expose students to "problems without answers." By connecting academia directly to the business sector and local communities, and by dissolving the barriers between departments, we create an environment where students learn to connect disparate dots—bridging the gap between theory and the complex, unsolved challenges of reality.

Third, and most critically, the university must redefine itself as a "Community of Practice" that provides the necessary time and safety for professional identity formation. While knowledge can be acquired instantly via platforms, the team-based competencies and relational skills demanded by modern enterprises cannot be rapidly "downloaded"; they must be cultivated over time. This formation requires a safe environment where learners are encouraged to challenge existing norms, experiment, and fail without fear of irreversible consequences. Drawing on Robert Kegan's developmental theory and Alasdair MacIntyre's narrative identity, the university must function as a molding cast—a protective frame—where students experience the "deconstruction" of their pre-existing selves and "reconstruction" into professionals.

This deep internal shift happens through meaningful relational experiences with mentors and peers—a human-centric process that requires the specific "spacetime" of a community that mere technology can never replace.

Conclusion

Higher education stands at a crossroads. The forces of technological disruption, environmental change, and social transformation demand fundamental adaptation. However, the central challenge is not simply whether universities change, but how they change, and which educational values are preserved in the process. The evidence is clear: human beings are relational creatures whose flourishing depends on connection with others. AI is not a threat to be feared but a powerful tool to be embraced—critically, ethically, and in service of human flourishing. The biases embedded in AI systems, the challenges of academic integrity, and the ethical complexities of AI-augmented professional practice all demand not less human judgment but more. The path forward requires institutions to be both adaptive and principled: adaptive in embracing new technologies, new delivery models, and new partnerships; principled in maintaining commitment to the communities of practice that transform students into competent, ethical professionals. The universities that successfully navigate this balance will not only survive but flourish, producing graduates equipped to address the challenges of an uncertain future while maintaining the human connections that give life meaning.

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Perspective

Collaborative Strategies for Raising Human Capital[†]

Reinard Primulando, Thomas Kristiatmo, Tri Basuki Joewono*

Universitas Katolik Parahyangan, Bandung, Indonesia

Christian higher education is rooted in fundamental and axiomatic human values that are open to transcendence and orient toward the fullness of humanity. Christian universities are increasingly challenged to remain faithful to their true identity while responding creatively to new social, cultural, and global realities. Drawing on the experiences of the Universitas Katolik Parahyangan (UNPAR), whose Spirituality and Basic Values emphasize charity in truth, living in diversity, and integral humanity, this paper discusses how collaboration across institutions, disciplines, cultures, and regions, becomes a process of mutual transformation rather than mere resource sharing. Particular attention is given to interdisciplinary initiatives, with the Erasmus+ EcoGreen Project presented as a case study that demonstrates how Christian universities can lead interdisciplinary and global collaboration while remaining firmly rooted in faith-based values. The study suggests that Christian higher education institutions should prioritize wider, value-based collaboration across institutions, nations, and disciplines.

Keywords

Christian higher education, Collaborative strategies, Human capital development, Interdisciplinary education, Faith-based values

1. Spirituality and Basic Values

Universitas Katolik Parahyangan (UNPAR) was established in 1955 by two founders, Bishop of the diocese of Bandung, Mgr. Petrus Marinus Arntz, OSC and Bishop of the diocese of Bogor, Mgr. Nicolaus Johannes Cornelis Geise, OFM (Universitas Katolik Parahyangan, 2026). The key to the thoughts of the founders can be stated as “UNPAR is based upon fundamental and axiomatic human values, which are born of

certain judgments of values”. These thoughts were inspired by the anthropology of Thomas Aquinas, which later on was developed by Bernard Lonergan. Lonergan’s anthropological vision is integral, emphasizing that whatever is natural is open and even directed toward what is super-natural.[++][**] Therefore, the idea of human basic values, upon which UNPAR was established is open to transcendence, to what is divine, to God. The very final end is, of course, *visio beatifica*, beatific vision: when one sees God in heaven.

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*Corresponding author: Tri Basuki Joewono, E-mail: vftribas@unpar.ac.id

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At the beginning, the motto of our vision, or *sesanti* in Javanese, *Bakuning Hyang Mrih Guna Santyaya Bhakti*, was not yet formulated in a coherent writing. In other words, the *sesanti* remained a-thematic^{##}. In the years 2011-2014, the long process of moving from a-thematic to thematic occurred and this resulted in SINDU (Spiritualitas dan Nilai Dasar UNPAR), which means the Spirituality and Basic Values of UNPAR. SINDU has three basic values, namely charity in truth, living in diversity, and humanity[‡]. Out of the three, there are seven basic principles,[§] viz. openness (open to diversity, to differences, to otherness), transformative attitude, honesty, preferential option for the poor, common good (*bonum commune*), subsidiarity, and non-profit orientation.

With those values, UNPAR actively participates in history, characterized by progress, decline, and redemption. In Lonergan's thought, these three are the amplification of human anthropology since human beings are protagonists in history. When human beings are true to their genuine self, they will follow the transcendental precepts of being attentive to experience, being intelligent in understanding reality, being reasonable in judging what is true, and being responsible in making decisions. As one is doing the precepts, one is transcending oneself: from the natural to the supernatural. Consequently, following the precepts will create progress in history. Decline is when human beings do not follow the precepts due to biases. Human history has shown that the two—progress and decline—are always intertwined. Big events in history are often the amplifications of either of the two. Nevertheless, when decline has become too strong that it overpowers progress, attempts to redeem history have to begin. It goes without saying, therefore, that the dynamics of history

are full of the three processes.^[%] Since this very dynamic in history is enacted by human beings in their relations to one another, the only way to promote progress, to reverse decline, and—when needed—to make significant efforts in redeeming history must necessarily involve collaboration which is transformative for the participants.

2. Challenges of Christian Universities

Now, against the theoretical framework laid out above, challenges faced by Christian universities are spelled out. As the demographic of Christianity starts to shift from the Western world to the Global South and East Asia, Christian higher education institutions need to adapt to the challenges and opportunities faced in the new places. These new places provide tremendous potential, while at the same time stores embers in husks. The pressing task is not only to empower young people from these emerging regions through faith, knowledge, and innovation, but also to nurture them as future leaders who will serve the society with integrity and compassion. The existence of Christian higher education institutions in this region was challenged to serve the community with common values within the context, and at the same time to keep and grow in Christian identity and values. To that end, collaboration that transcends cultural, disciplinary, and institutional boundaries is a *sine qua non*.

In an era where Christian higher education faces both the opportunities of global growth and the challenges of rapid change, collaborative strategies emerge as vital catalysts for raising human capital. This sharing puts particular emphasis on the role of UNPAR whose engagement in international

^{**}This kind of anthropology is universal since all human beings have within themselves the unrestricted, pure desire to know, which will always keep them asking questions. At one point, one is aware that one's capacity to question is way higher than one's capacity to answer. Hence, one is transcending oneself. As one keeps doing that, one moves toward transcendence. Due to this very capacity, every human being is NOT "already-out-there-now -real", BUT "unity-identity-whole: material & immaterial."

^{**}Lonergan penned his studies of Aquinas's thought especially in his two fundamental works, now published in a series of Collected Works of Bernard Lonergan edited by experts in his philosophy and theology: a) Lonergan, Bernard, *Insight: A Study of Human Understanding* in Crowe, Frederick E. & Doran, Robert M. (eds.), *Collected Works of Bernard Lonergan Vol. 3*, University of Toronto Press, Toronto - Buffalo - London 2005 (1993); and b) Lonergan, Bernard, *Method in Theology*, in Doran, Robert M. & Dadosky, John D. (eds.), *Collected Works of Bernard Lonergan Vol. 14*, University of Toronto Press, Toronto - Buffalo - London 2017.

^{##}The process of the judgment of values is not always explicit. Philosophically speaking, when it is not explicit, the judgment of values is a-thematic; while when it is explicit, then it is thematic. More often than not, in the beginning it is a-thematic, and when needs arise, a group of persons would make it explicit and hence thematic.

[‡]This humanity is open to transcendence.

[§]Philosophically speaking these seven principles are values as well.

[%]Note: For more, see Lonergan, Bernard, *Method in Theology*, pp. 51-54, Cf. Lonergan, Bernard, *Insight*, pp. 242-267.

^{##}Encyclical Letter *Laudato Si'* of The Holy Father Francis On Care For Our Common Home.

initiatives, such as the Erasmus+ ECOGREEN project demonstrates how Christian universities can lead interdisciplinary and global collaboration while remaining firmly rooted in faith-based values (Lembaga Penjaminan Mutu, Parahyangan Catholic University, 2024). By examining the dimension of collaboration, curriculum design, and societal impact, we assert that Christian higher education can nurture leaders, who embody both academic excellence and Christian integrity, ensuring its continued relevance and transformative power in the 21st century. Furthermore, Christian higher education institutions contribute to societal transformation by translating service-oriented education into tangible impacts that advance a more humane and just society.

3. Collaboration as the Core of Christian Higher Education

Collaboration has been at the heart of Christianity since the earliest church communities, where faith was sustained through fellowship, solidarity, and mutual support. Emphasizing community, solidarity, and mutual support, Christianity provides a fertile ground for building academic partnerships that extend beyond geographical and cultural divides. In the context of higher education, collaboration is not only about resource sharing but also about mutual transformation. For the case of UNPAR, collaboration is rooted in its spirituality and basic values, especially living in diversity and *bonum commune* (the common good).

Collaboration is essential in sharing resources, expanding opportunities, and ensuring that every joint effort remains firmly rooted in Christian values. Collaboration without values runs the risk of being transactional, but collaboration shaped by faith is transformative: nurturing leaders who serve with integrity, justice, and compassion. At the same time, collaboration has long been a defining element of higher education, providing a pathway for institutions to share resources, exchange ideas, expand opportunities for students and faculty alike. In today's interconnected world, collaboration also allows universities to transcend geographical and cultural boundaries, creating spaces where knowledge is co-created and enriched through diverse perspectives.

This is particularly important in the Global South, where many institutions face constraints in resources, technology, and access to global academic networks (Vallee & Prinsloo, 2023). Collaboration then becomes not only to close the gaps but also to highlight the unique strengths of the Global

South, such as contextual knowledge, community-based wisdom, resilience in the face of social and environmental challenges. Partnership between Global South and Global North institutions creates more pathways for more inclusive and equitable knowledge exchange.

4. Interdisciplinary for Global Challenges

The complexity of today's global challenges requires more than isolated expertise; it demands an integrated vision. Poverty, health crises, inequality, technological gaps, and climate change cannot be addressed by a single field of study, since they are deeply interconnected and rooted in structural, cultural, and ethical dimensions. In Christian higher education, interdisciplinarity means more than combining technical solutions across fields. It calls for the integration of theology, ethics, and the social sciences with natural sciences and engineering, ensuring that responses are not only effective but also grounded in justice, compassion, and respect for human dignity. More than merely a mechanism of efficiency, collaboration should indeed be a process of mutual transformation. When universities work together, they do not only strengthen their own capacities but also nurture future leaders who embody integrity, creativity and commitment to serving society (Fowler & Musgrave, 2024).

This interdisciplinary vision resonates with the Christian understanding of the body of Christ, in which many members bring different gifts yet work together for the common good (1 Corinthians 12). Each discipline contributes its unique strength, but their true transformative potential is realized only when united by shared values and a higher purpose. Christian universities, therefore, have a distinctive role: to form leaders capable of bridging disciplinary divides, translating knowledge into service, and guiding innovation with moral clarity. No single discipline, no single institution, and no single community could solve the myriad of problems of humanity. What is required is an interdisciplinary approach, a coming together of diverse fields of knowledge, united by a shared commitment to serve humanity and to honor God's creation.

5. Interdisciplinary Approaches and the ECOGREEN Case

This conviction is at the heart of the Erasmus+ EcoGreen Project, a partnership led by UNPAR together with seven



Figure 1. 2024 Sustainability Report - Lembaga Penjaminan Mutu [Source: Lembaga Penjaminan Mutu, Parahyangan Catholic University (UNPAR). (2024). Sustainability report 2024. Parahyangan Catholic University].

other universities across Europe and Asia ([Lembaga Penjaminan Mutu, Parahyangan Catholic University, 2024](#)) [Figure 1]. This initiative is a living example of how interdisciplinary and intercultural collaboration can respond to pressing societal needs while still carrying the values of the Christian faith. EcoGreen brings together environmental science, economics, social studies, and engineering to build holistic solutions for sustainability. At the same time, it embodies Christian values of stewardship, justice, and care for creation. As the book of Genesis reminds us, humanity is given dominion over the earth, but not for domination. We are entrusted with stewardship to cultivate and care for God's creation for ourselves and Him. This spirit resonates deeply with the *Laudato Si'* movement [##], which invites us to care for our common home and to work toward climate justice. To this we may add that EcoGreen reflects our value of integral humanity, *i.e.*, by continuing the process of self-transcendence, human beings move from self-centeredness to caring about others, including mother earth.

Furthermore, through EcoGreen, we could as well envision the importance of curriculum development and capacity building. The project equips students with technical expertise

and ethical responsibility by integrating sustainability and environmental awareness into education across disciplines. It enhances teaching, research, and knowledge-sharing among participating universities, ensuring academic knowledge translates into societal impact. Graduates are thus prepared to solve problems and serve their communities with wisdom and compassion.

Finally, EcoGreen reminds us of the power of networks and exchanges. With eight universities spanning different continents, the project bridges the Global South and the Global North, fostering mutual learning and contextualized knowledge exchange. It demonstrates that faith-based universities can collaborate fruitfully with secular institutions, creating an inclusive platform that remains faithful to Christian mission. More than just a project, EcoGreen is a platform that inspires further partnerships, proving that education, when rooted in values, remains a source of hope for a just and sustainable world. This conviction is not merely theoretical; it is embodied in initiatives such as the Erasmus+ EcoGreen Project, where interdisciplinarity and collaboration converge to create tangible solutions for the pressing challenges of our time.

6. Call for Collaboration

These findings suggest that Christian higher education institutions should prioritize broader, value-based collaboration across institutions, nations, and disciplines. Expanding networks of cooperation will strengthen the capacity of universities to translate knowledge into service and social impact. Such collaboration is essential to ensuring that Christian higher education remains faithful to its mission of forming leaders and innovators who serve church and society with integrity, justice, and compassion. More broadly, the integration of faith, knowledge, and innovation remains a defining strength of Christian higher education. When aligned with collaborative practices, this integration enables institutions to respond more effectively to complex social, ethical, and global challenges. Looking ahead, sustained partnerships and shared learning among Christian universities will be critical in addressing the demands of a rapidly changing world. Strengthening collaborative frameworks based on ethically and theologically informed integral anthropology from which values are formulated will support the cultivation of human capital equipped with ethical grounding, professional competence, and visionary capacity.

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Editorial

Scholarship at “Machine” Speed

Sarah Soyeon Oh

Institute for Global Engagement & Empowerment, Yonsei University, Seoul, Korea

Artificial intelligence (AI) is not waiting for academia to catch up. Journal writing no longer unfolds as it did only a few years ago. Figures are generated in seconds. Statistical platforms such as R, SAS, and SPSS now draft Cox proportional hazards regression code and publication-ready tables almost instantly. Literature reviews and meta-analyses are synthesized accurately at scale, and grammar, tone, and structural flow are refined before our morning coffee cools.

The bottleneck is no longer production but judgment. For journals, this shift demands operational clarity. This month, *IGEE Proceedings* updated its *Author Guidelines* to state explicitly:

“Authors who use artificial intelligence (AI)-assisted technologies in writing, data analysis, or figure preparation must acknowledge their use transparently in the manuscript.”

If AI assists in drafting, visualizing, analyzing, or refining scholarly output, disclosure must become part of methodological integrity. (Disclosure: The present editorial has been lightly refined using AI-assisted tools to improve clarity and flow; the ideas remain human, though the polish may not be.) The more consequential question is not whether AI is accelerating scholarship, but how we choose to direct that acceleration.

A landmark analysis in *Nature Communications* found that AI could potentially enable 134 of the 169 Sustainable Development Goal (SDG) targets (79%), while also posing risks to 59 targets (35%) if poorly governed (Vinueza et al., 2020). AI was identified as a potential enabler for 93% of environmental targets, yet concerns were raised about energy consumption, inequality, and algorithmic bias. Acceleration therefore depends not on speed alone, but on direction and stewardship.

The papers in this issue were selected with that stewardship in mind. In the invited perspective *Navigating the Future of Higher Education: Embracing Change While Preserving the Relational Core of Learning*, An (2026) argues that even within an exponentially expanding “knowledge ecosystem,” universities must remain sites of professional identity formation rather than mere information distribution. In *Collaborative Strategies for Raising Human Capital*, Primulando, Kristiatmo, and Joewono (2026) extend this reflection to institutional collaboration, contending that interdisciplinarity must function as ethical integration grounded in shared commitments rather than technical coordination alone.

The empirical contributions reinforce how structural conditions shape health and sustainability outcomes across the

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SDGs. *Non-Prescription Antibiotic Use and Unsafe Household Medicine Disposal in Indonesia: Implications for Antimicrobial Stewardship* demonstrates that antibiotic literacy and household medicine management are intertwined challenges for SDG-aligned health governance (Prasiska & Jang, 2026). *Social Isolation and Socioeconomic Determinants Among Ghanaian Older Adults (2019–2024)* shows that social disconnection is strongly patterned by socioeconomic disadvantage rather than merely individual psychology (Azoya & Oh, 2026). *Individual and Socioeconomic Determinants of Antenatal Care Access for Disadvantaged Pregnant Women: A Systematic Review and Empirical Analysis* illustrates that maternal healthcare utilization cannot be understood through individual variables alone, but must be examined through broader structural and system-level determinants (Wulandari, 2026).

Across these domains, sustainability emerges not as a matter of individual virtue but of collective action. The conditions under which people learn, seek care, age, or manage healthcare resources are shaped by broader frameworks of policy, infrastructure, and accountability. AI intensifies this dynamic because it amplifies the consequences of those frameworks.

Discussions about the need for such collective action will

take concrete, visible form at Yonsei University's upcoming 2026 Global Engagement & Empowerment Forum on Sustainable Development (GEEF), convened March 12–13, 2026, under the theme "Time for Action: Emerging Technology & Global Solidarity" (Figure 1). The Forum will not treat AI governance, digital equity, or sustainable technological integration lightly. Instead, these themes will be positioned at the center of global engagement, alongside climate resilience, public health, institutional trust, and cross-sector collaboration. GEEF 2026 will be a safe space where policymakers, researchers, industry leaders, and students collectively examine how emerging technologies can be aligned with the 17 Sustainable Development Goals (SDGs) through accountable frameworks and shared ethical standards. Our readership at *IGEE Proceedings* is warmly invited to join these conversations in person. The questions raised in our journal's pages will be debated, tested, and refined across multiple disciplines and sectors. Registration and program updates are available at: <https://geef-sd.org>

To conclude, scholarship at "machine" speed is now a technical reality. What remains unsettled is whether that speed will translate into global solidarity or merely into... volume. AI has expanded our capacity to produce, but it has not determined the purposes toward which that knowledge is directed. That responsibility rests with us, beginning with academia's commitment to transparency and accountability. If 2026 is to be defined by machine speed, it must also be defined by deliberate alignment, ensuring that the acceleration of scholarship advances equity, strengthens governance, and helps those in need. As Scripture counsels, "From everyone who has been given much, much will be demanded; and from the one who has been entrusted with much, much more will be asked" (Luke 12:48).

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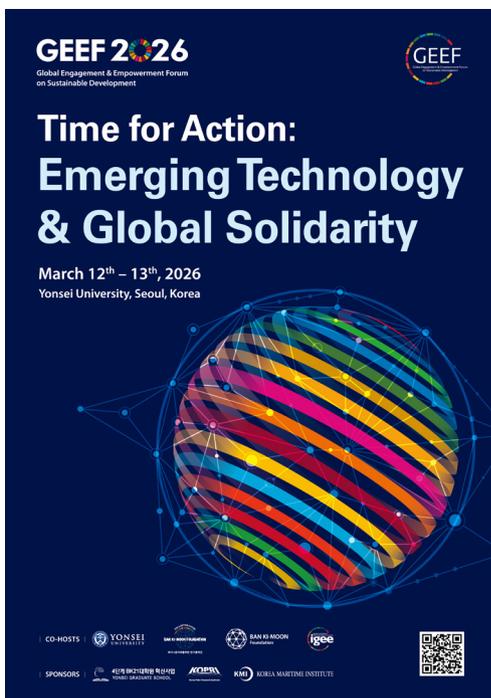


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Article

Non-Prescription Antibiotic Use and Unsafe Household Medicine Disposal in Indonesia: Implications for Antimicrobial Stewardship

Danik Iga Prasiska^{1,2,*}, Suk-Yong Jang³

¹Department of Public Health, Graduate School, Yonsei University, Seoul, Korea

²Department of Public Health, Regional Health Office, Nganjuk, Indonesia

³Department of Health Policy and Management, Graduate School of Public Health, Yonsei University, Seoul, Korea

Non-prescription access to antibiotics remains widespread in low and middle-income countries and is a major contributor to antimicrobial resistance. Unsafe household storage and disposal of medicines further reinforce inappropriate antibiotic use and environmental contamination. Yet, national evidence integrating antibiotic knowledge, medicine safety awareness, and household practices remains limited. This study examined associations between antibiotic-related knowledge, awareness of damaged medicines, and non-prescription antibiotic purchase among adults in Indonesia using nationally representative survey data. A cross-sectional analysis was conducted using the 2023 Indonesian Health Survey, including 430,204 adults with complete outcome data. The primary outcome was self-reported purchase of antibiotics without a prescription. Survey-weighted modified Poisson regression models were used to estimate adjusted relative risks accounting for individual and household characteristics. Overall, 19.7% of adults reported purchasing antibiotics without a prescription. Higher risk was observed among adults aged 26 to 44 years, females, rural residents, individuals with chronic conditions or physical disabilities, and those from poorer households. Each 10-pp increase in antibiotic-specific knowledge was associated with a lower risk of non-prescription antibiotic purchase (adjusted RR 0.97, 95% CI 0.97 - 0.98). In contrast, awareness related to damaged or expired medicines was associated with a higher risk (adjusted RR 1.04, 95% CI 1.03 - 1.04). Household medicine disposal practices were dominated by discarding medicines in household trash, while formal return to pharmacies or health facilities was rare. These findings indicate that antimicrobial stewardship requires integrated strategies addressing both rational antibiotic use and safe household medicine management to support progress toward Sustainable Development Goals related to health and responsible consumption.

Keywords

Antibiotic misuse, Non-prescription antibiotics, Antimicrobial resistance, Medicine disposal, Indonesia

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*Corresponding author: Danik Iga Prasiska

E-mail: digaprasiska@yonsei.ac.kr

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1. Introduction

Antimicrobial resistance (AMR) is a major global health threat that undermines the effectiveness of essential medicines and jeopardizes progress toward health-related Sustainable Development Goals (SDGs) (Aslam et al., 2024). In low and middle-income countries (LMICs), non-prescription access to antibiotics remains widespread and is a key driver of AMR, reflecting weak regulatory enforcement, limited access to affordable healthcare, and high patient demand (Dixon et al.; Zewdie et al., 2024). Recent reviews suggest that between half and nearly all adults in some LMIC settings have used antibiotics without a prescription, with community pharmacies and informal medicine retailers serving as the dominant sources (Torres et al., 2021).

Beyond access to antibiotics, household-level medicine practices represent an underrecognized pathway contributing to inappropriate antibiotic use. Antibiotics are frequently stored in households, often as leftovers from prior treatments, expired products, or medicines kept under suboptimal conditions (Gebeyehu & Ararsie, 2023). Poor knowledge of appropriate storage and disposal may prolong the availability of unsafe medicines in the home, increase opportunities for reuse without medical supervision, and contribute to environmental contamination through unsafe disposal routes (Khan et al., 2022; Rogowska & Zimmermann, 2022). These practices link individual antibiotic misuse to broader concerns about environmental sustainability and responsible consumption, aligning antibiotic stewardship not only with Sustainable Development Goal 3 but also with Sustainable Development Goal 12 on responsible consumption and waste management.

Knowledge, attitudes, and practices related to antibiotics play a central role in shaping both self-medication and household storage behaviors. Prior studies from Indonesia and other LMICs consistently show that lower antibiotic-specific knowledge is associated with a higher likelihood of self-medication, while misconceptions regarding indications, dosing, and treatment duration remain common (Green et al., 2023; Pitaloka et al., 2025; Yunita et al., 2022). At the same time, patterns of antibiotic misuse appear socially patterned by education, household wealth, and chronic health needs. However, existing evidence is fragmented. Few nationally representative studies simultaneously integrate antibiotic knowledge, medicine safety awareness, sociodemographic characteristics, chronic disease and disability status,

and household context to identify populations at the highest risk of non-prescription antibiotic purchase (Green et al., 2023; Mallah et al., 2022).

Indonesia represents a policy-relevant setting for addressing these gaps. Despite prescription-only regulations for antibiotics (MOH of Republic Indonesia, 2021), over-the-counter sales persist in community settings. Nationally representative survey data provide a critical opportunity to examine community antibiotic behaviors at scale and to generate evidence directly relevant to stewardship policies and public education strategies.

The primary objective of this study was to examine the association between antibiotic-related knowledge, awareness of damaged or expired medicines, and non-prescription antibiotic purchase among adults in Indonesia using nationally representative survey data. A secondary objective was to assess how these associations vary across sociodemographic, health-related, and household characteristics. It was hypothesized that higher antibiotic-specific knowledge would be associated with a lower risk of non-prescription antibiotic purchase, whereas awareness related to damaged or expired medicines would show a distinct association. Non-prescription antibiotic purchase was expected to be socially patterned across sociodemographic and health characteristics.

2. Materials and Methods

Study Design and Data Source

This study used data from the 2023 Indonesian Health Survey (*Survei Kesehatan Indonesia*, SKI), a nationally representative cross-sectional household survey conducted by the Ministry of Health in collaboration with Statistics Indonesia. Survey weights were provided to account for unequal probabilities of selection and non-response, enabling valid population-level inference at national and provincial levels. All analyses incorporated survey weights, clustering, and stratification variables.

Methods

1) Participants

The study population consisted of adult respondents (aged ≥ 18 years old) interviewed using the individual questionnaire of the 2023 Indonesian Health Survey. Participants were eligible for inclusion if they had a non-missing response

to the outcome item assessing antibiotic purchase without a prescription in the past year. Individual respondents were linked to household-level data derived from the household questionnaire.

As illustrated in Figure 1, the analytic sample was restricted to respondents with complete information on the outcome and core characteristics included in the multivariable models. The final analytic sample included 430,204 adults, corresponding to an estimated population of 140,299,718 adults after application of survey weights.

2) Measures

(1) Outcome

The primary outcome was non-prescription antibiotic purchase, assessed using a single self-reported item asking whether the respondent had purchased antibiotics without a doctor's prescription in the past year to treat common conditions such as diarrhea, fever, skin infection, sore throat, body aches, cough, headache, or influenza-like symptoms. Responses were coded as a binary variable.

(2) Exposures

The primary exposures were antibiotic-specific knowledge and awareness related to damaged or expired medicines. These variables captured respondents' understanding of appropriate antibiotic use and their recognition of medicine safety issues related to expiration or damage.

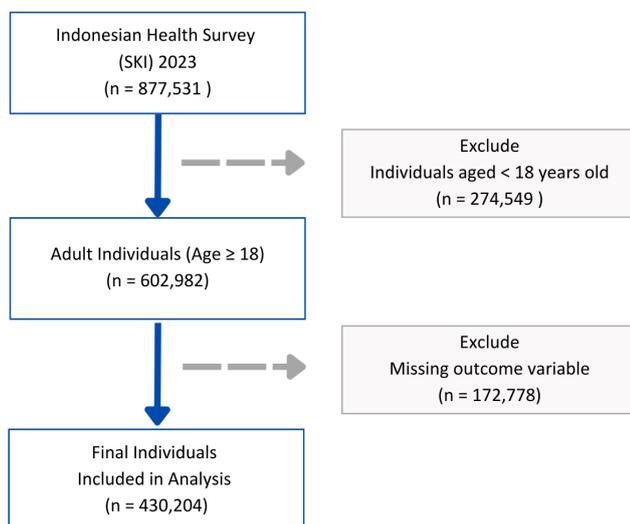


Figure 1. Study Population Selection Process.

Individual & Household Characteristics

Individual-level characteristics included sex, age group, marital status, educational attainment, and employment status. Health-related variables included indicators of chronic conditions (diabetes, cardiovascular disease, hypertension, kidney disease, or cancer) and physical disability, defined as reported difficulty with vision, hearing, or mobility.

Household-level characteristics included urban or rural residence and household wealth quintile. Household wealth was derived using principal components analysis of household assets, housing characteristics, and access to utilities, consistent with standard survey methods. Missing values in the wealth variable primarily arose from incomplete information on one or more asset components required for the principal components analysis. Given the large sample size and to avoid unnecessary loss of information, respondents with missing wealth data were retained by coding wealth as a separate missing category.

Statistical Analysis

Descriptive distributions of non-prescription antibiotic purchase across individual and household characteristics were summarized using frequencies and survey-weighted percentages. Differences across groups were assessed using Rao–Scott design-adjusted tests, which account for survey weights, clustering, and stratification. Corresponding design-adjusted p-values ($Pr > F$) were reported for descriptive comparisons.

Associations between antibiotic-related knowledge, medicine safety awareness, and non-prescription antibiotic purchase were estimated using survey-weighted generalized linear models with a log link and quasi-Poisson variance to allow direct estimation of adjusted relative risks and 95 percent confidence intervals. Categorical variables were modeled using indicator variables with prespecified reference categories. Knowledge variables were scaled to represent a 10-percentage-point increase to improve interpretability.

All models accounted for the complex survey design, including weights, clustering at the primary sampling unit level, and stratification.

Model Validation

Internal validation of the regression model was conducted

using 10-fold cross-validation at the primary sampling unit level to preserve the clustered survey structure. Model discrimination was modest, with a mean cross-validated area under the receiver operating characteristic curve of approximately 0.57, indicating limited ability to distinguish between individuals with and without non-prescription antibiotic purchase. Overall prediction accuracy was acceptable, with a cross-validated Brier score of approximately 0.16. Calibration performance was strong, with a calibration intercept close to zero and a slope near one, indicating good agreement between predicted and observed risks across deciles of predicted risk under the survey-weighted design. All analyses were conducted using R statistical software (version 4.2.2) (Posit team, 2025).

3. Results

Distribution of Non-Prescription Antibiotic Purchase

The distribution of non-prescription antibiotic purchases across individual and household characteristics is shown in Table 1. Overall, 19.7 percent of respondents reported purchasing antibiotics without a doctor's prescription in the past year for common conditions, including diarrhea, fever, skin infection, sore throat, body aches, cough, headache, or common cold.

Non-prescription antibiotic purchase was slightly more prevalent among females (20.1 percent) than males (19.1 percent). By age group, adults aged 26–44 years exhibited the highest prevalence (21.1 percent), whereas those aged 65 years or older had the lowest prevalence (16.0 percent). Differences by educational attainment were modest, with respondents with higher education reporting a slightly higher prevalence (20.5 percent) than those with no formal education (18.8 percent).

Across occupational categories, manual laborers and entrepreneurs reported higher prevalences of non-prescription antibiotic purchase than individuals employed in the formal sector. Married respondents had a higher prevalence compared with those who were single. Respondents reporting chronic conditions or physical disability also exhibited higher prevalences (21.2 percent and 21.5 percent, respectively) compared with those without these conditions.

A clear socioeconomic gradient was observed across household wealth quintiles, with prevalence declining from

22.0 percent in the poorest quintile to 18.2 percent in the richest quintile. In addition, rural residents reported more frequent non-prescription antibiotic purchase (21.1 percent) than urban residents (18.8 percent).

Factors Associated with Non-Prescription Antibiotic Purchase

Adjusted associations from survey-weighted modified Poisson regression models are presented in Figure 2. Relative to adults aged 26 to 44 years, all other age groups exhibited a significantly lower risk of non-prescription antibiotic purchase. Females had a slightly higher adjusted risk compared with males. Educational attainment below higher education was associated with lower adjusted risk, including among respondents with no education (aRR 0.84, 95% CI 0.80 to 0.86) and those with mandatory education (aRR 0.90, 95% CI 0.87 to 0.93). Compared with formal sector employment, all non-formal occupational categories were associated with a higher risk. Single, widowed, and divorced respondents had a lower adjusted risk relative to married individuals.

Household wealth displayed a gradient relative to the middle quintile, with higher risk observed among the poorest quintile (aRR 1.12, 95% CI 1.08 to 1.17) and lower risk among the richest quintile (aRR 0.92, 95% CI 0.89 to 0.96). Rural residence was associated with increased risk, as were the presence of chronic conditions (aRR 1.16, 95% CI 1.12 to 1.20) and physical disability (aRR 1.17, 95% CI 1.09 to 1.25).

Knowledge-related variables showed contrasting associations. Each 10-percentage point increase in antibiotic-specific knowledge was associated with a 2 to 3 percent relative reduction in the risk of non-prescription antibiotic purchase (aRR 0.97, 95% CI 0.97 to 0.98). In contrast, greater awareness of damaged or expired medicines was associated with a 3 to 4 percent relative increase in risk (aRR 1.04, 95% CI 1.03 to 1.04).

Household Disposal of Unusable, Damaged, or Expired Medicines

Survey weighted patterns of household disposal practices are presented in Figure 3. Disposing of medicines by throwing them directly into household trash was the most frequently reported practice, cited by 86.9 percent of respon-

Table 1. Distribution of Non-Prescription Antibiotic Purchases

Variable	Criteria	Ever purchased antibiotics without a doctor's prescription to treat diarrhea, fever, skin infection, sore throat, body aches, cough, headache, or common cold				p-value
		Total (n = 430,204)	Yes n	%	No n	
Individual Characteristics						
Sex	Male	189,554	43,142	19.1	146,412	< .0001
	Female	240,650	57,696	20.1	182,954	
Age Group	18 - 25	50,508	10,537	17.4	39,971	< .0001
	26 - 44	191,562	47,082	21.1	144,480	
	45 - 64	155,381	36,834	19.6	118,547	
	65+	32,753	6,385	16.0	26,368	
Education	No Education	43,586	9,996	18.8	33,590	0.0007
	Mandatory Education	324,247	76,104	19.6	248,143	
	Higher Education	62,371	14,738	20.5	47,633	
Job	Unemployed & Student	146,721	33,783	19.3	112,938	< .0001
	Formal Sector	68,232	14,813	18.6	53,419	
	Entrepreneur	64,509	14,445	19.7	50,064	
	Manual Labor	150,742	37,797	20.6	112,945	
Marital	Single	54,895	10,992	16.7	43,903	< .0001
	Married	339,991	82,215	20.5	257,776	
	Widow / Divorced	35,318	7,631	18.4	27,687	
Chronic Condition	No	381,366	88,829	19.4	292,537	< .0001
	Yes	48,838	12,009	21.2	36,829	
Physical Disability	No	421,474	98,549	19.6	322,925	0.0068
	Yes	8,730	2,289	21.5	6,441	
Household Characteristics						
Household Wealth Quintile	Poorest	66,411	18,371	22.0	48,040	< .0001
	Poor	74,164	18,065	20.3	56,099	
	Middle	80,007	18,701	19.6	61,306	
	Rich	87,640	19,396	19.3	68,244	
	Richest	98,940	20,297	18.2	78,643	
	Missing	23,042	6,008	22.0	17,034	
Residence	Urban	243,806	51,043	18.8	192,763	0.0008
	Rural	186,398	49,795	21.1	136,603	

Percentages are survey-weighted to account for the complex sampling design of the 2023 Indonesian Health Survey. Counts are unweighted. p-values are based on Rao-Scott design-adjusted tests ($P > F$) and are reported for de-scriptive purposes only.

Characteristic	Adjusted RR (95% CI)
Age Group	
26 to 44	1.00 (Ref)
18 to 25	0.94 (0.90 to 0.99)*
45 to 64	0.90 (0.87 to 0.92)*
65+	0.71 (0.68 to 0.75)*
Sex	
Male	1.00 (Ref)
Female	1.04 (1.02 to 1.07)*
Education	
Higher Education	1.00 (Ref)
No Education	0.84 (0.80 to 0.88)*
Mandatory Education	0.90 (0.87 to 0.93)*
Job	
Formal Sector	1.00 (Ref)
Unemployed and Student	1.04 (1.00 to 1.08)*
Entrepreneur	1.05 (1.01 to 1.10)*
Manual Labor	1.08 (1.04 to 1.13)*
Marital Status	
Married	1.00 (Ref)
Single	0.82 (0.78 to 0.86)*
Widowed or Divorced	0.95 (0.92 to 0.99)*
Household Wealth Quintile	
Middle	1.00 (Ref)
Poorest	1.12 (1.08 to 1.17)*
Poor	1.03 (0.99 to 1.07)
Rich	0.99 (0.95 to 1.03)
Richest	0.92 (0.89 to 0.96)*
Missing	1.07 (0.98 to 1.17)
Residence	
Urban	1.00 (Ref)
Rural	1.05 (1.02 to 1.09)*
Chronic Condition	
No	1.00 (Ref)
Yes	1.16 (1.12 to 1.20)*
Physical Disability	
No	1.00 (Ref)
Yes	1.17 (1.09 to 1.25)*
Knowledge	
Antibiotic knowledge score (per 10 percentage points)	0.97 (0.97 to 0.98)*
Awareness of damaged or expired medicines (per 10 percentage points)	1.04 (1.03 to 1.04)*

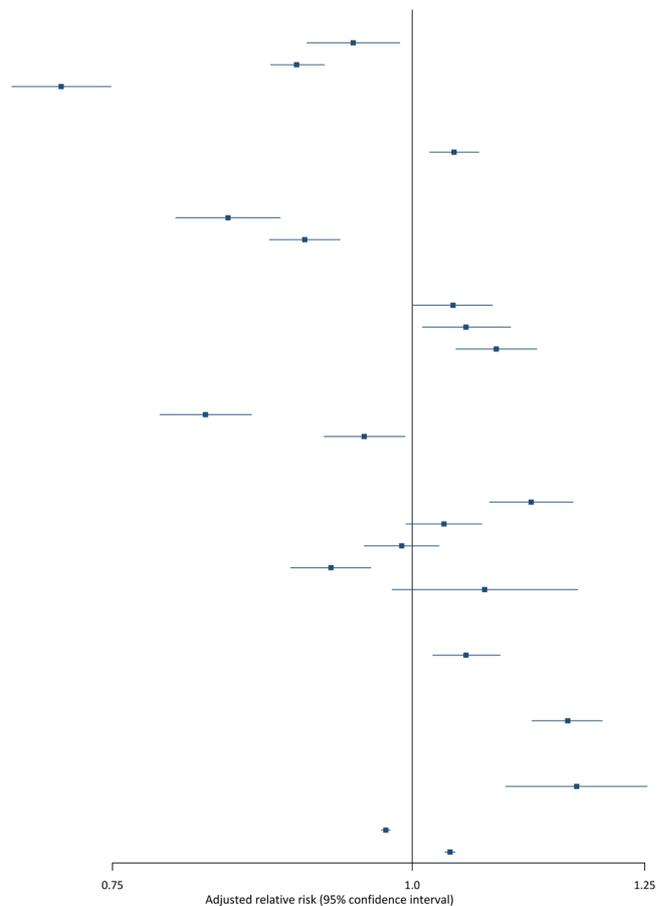


Figure 2. Forest Plot of Adjusted Risk Ratio for Purchased Antibiotics Without a Prescription.

Forest plot showing adjusted relative risks (aRRs) and 95 percent confidence intervals from survey-weighted modified Poisson regression models examining associations between sociodemographic characteristics, health-related factors, and knowledge variables and the likelihood of purchasing antibiotics without a doctor’s prescription. Estimates are adjusted for all characteristics shown and account for survey weights, clustering, and stratification. Values marked with an asterisk (*) indicate 95 percent confidence intervals that do not include 1.00.

dents. In contrast, formal return of medicines to pharmacies or health facilities was rare, reported by only 1.6 percent.

Other disposal practices were reported by substantially smaller proportions of respondents. These included burning or burying medicines (13.4 percent), separating medicines from packaging prior to disposal (9.3 percent), keeping unused medicines (7.3 percent), and crushing medicines before disposal (5.7 percent). Because respondents were allowed to report multiple disposal actions, percentages do not sum to 100 percent. Overall, these patterns indicate a predominance of informal and potentially unsafe household disposal practices, with very limited utilization of formal or recommended medicine take back options.

4. Discussion and Conclusions

Discussion

This study demonstrates that non-prescription antibiotic purchase remains common in Indonesia, with nearly one in five adults reporting such use in the past year. The observed prevalence is consistent with estimates from Southeast Asia and other lower-middle-income settings, indicating that informal antibiotic access remains a routine response to common illnesses rather than an exceptional behavior (Al Masud et al., 2024; Holloway et al., 2017; Mendelson et al., 2025). Persistent non-prescription use continues to undermine anti-

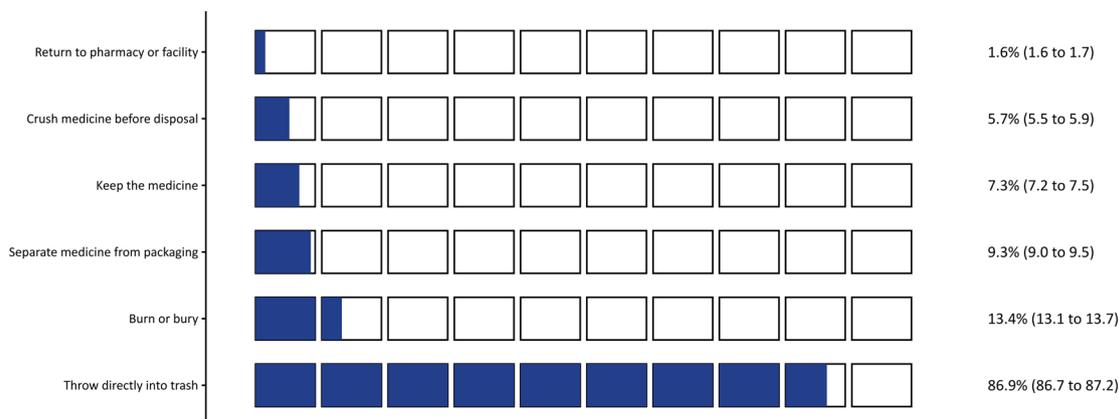


Figure 3. Reported Actions for Disposal of Unusable, Damaged, or Expired Medicines. Survey weighted distribution of reported actions for the disposal of unusable, damaged, or expired medicines. Respondents could report more than one action; therefore, percentages do not sum to 100 percent.

microbial stewardship efforts and threatens progress toward Sustainable Development Goal 3 by accelerating antimicrobial resistance, delaying appropriate care, and increasing avoidable healthcare costs.

The findings support the hypothesized association between antibiotic-specific knowledge and non-prescription antibiotic purchase. Higher levels of antibiotic-specific knowledge were associated with a lower risk of purchasing antibiotics without a prescription, in line with established patterns reported in prior studies demonstrating that understanding antimicrobial resistance, appropriate indications, and treatment duration discourages informal antibiotic use. This pattern suggests that stewardship-relevant knowledge functions as a protective cognitive framework guiding care-seeking behavior (Cabral et al., 2024; Mostafa et al., 2021).

In contrast, awareness related to damaged or expired medicines showed a distinct association with non-prescription antibiotic purchase and was not protective. This finding aligns with the hypothesis that medicine-related knowledge is multidimensional and that not all forms of awareness translate into appropriate use. Operational familiarity with medicine handling may increase perceived self-efficacy and confidence in self-treatment without improving the ability to assess clinical appropriateness (Bonna et al., 2024). In settings where antibiotics remain easily accessible outside formal care, this confidence may inadvertently legitimize informal antibiotic purchasing (Alyafei A, 2024; Cabral et al., 2024; Insani et al., 2020; Wang et al., 2022).

Clear social patterning of non-prescription antibiotic pur-

chase was observed across age, sex, socioeconomic position, health status, and place of residence, consistent with expectations based on prior literature. Lower risk among older adults may reflect greater integration into primary care services through community-based elderly health posts and chronic disease management programs (Nappoe et al., 2023; Yamada et al., 2020), which promote continuity of care and reduce reliance on informal treatment pathways. In contrast, adults aged 26 to 44 years exhibited the highest prevalence and adjusted risk, likely reflecting time constraints, work responsibilities, and greater economic autonomy that favor convenience-driven care seeking (Cabral et al., 2024; Chautrakarn et al., 2021).

Females showed a modestly higher risk of non-prescription antibiotic purchase, consistent with evidence that women frequently serve as primary health managers within households and engage in proxy care for family members (Cabral et al., 2024; Ocan et al., 2015). Socioeconomic gradients were also evident, with higher risk among poorer households and rural residents, reflecting financial barriers, opportunity costs of clinic visits, and persistent geographic inequities in access to primary healthcare services (Cabral et al., 2024; Malik et al., 2022). These patterns indicate that universal health coverage does not translate uniformly into effective access across population subgroups.

Household disposal practices further revealed substantial gaps in pharmaceutical governance. Disposal of unused or expired medicines was overwhelmingly conducted through household trash, while formal return to pharmacies or health

facilities was rare. These practices raise environmental concerns and directly intersect with Sustainable Development Goal 12 on responsible consumption and waste management. Retention of leftover medicines within households may also reinforce cycles of informal reuse and non-prescription antibiotic purchase.

Limitations

Several limitations should be noted. The cross-sectional design precludes causal inference regarding the observed associations. Non-prescription antibiotic purchase was self-reported and may be subject to recall or social desirability bias. The survey did not capture clinical appropriateness, antibiotic class, or dosage, limiting assessment of misuse severity. Residual confounding may persist despite adjustment for a wide range of individual and household characteristics. Although nationally representative, the data may not fully capture informal acquisition pathways occurring outside household reporting.

Overall, the findings confirm that antibiotic-specific knowledge is protective against non-prescription antibiotic purchase, while other forms of medicine-related awareness do not necessarily confer similar protection. From a stewardship perspective, interventions should move beyond general awareness raising toward education that explicitly addresses diagnostic uncertainty, indications for antibiotic use, and resistance risks. Policy responses should integrate stewardship-focused education, improved access to primary care, stronger regulation of antibiotic sales, pharmacy engagement, and accessible medicine take-back systems.

Future research should examine how different dimensions of medicine-related knowledge influence care-seeking and decision-making pathways over time. Longitudinal and mixed-methods studies are needed to clarify causal mechanisms and to evaluate the effectiveness of integrated stewardship and household medicine management interventions.

Conclusions

Non-prescription antibiotic purchase remains common in Indonesia and coexists with unsafe household medicine disposal practices. Antibiotic-specific knowledge was associated with a lower risk of non-prescription purchase, whereas awareness related to damaged or expired medicines was associated with a higher risk. These findings highlight that

effective antimicrobial stewardship requires integrated strategies that address both antibiotic use and household medicine management, reinforcing the need for coordinated approaches to support progress toward health and environmental sustainability goals.

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Article

Systematic Review and Meta-Analysis: Socioeconomic Determinants of Social Isolation Among Ghanaian Older Adults (2019–2024)

Patrick Atanga Azoya^{1,2,*}, Sarah Soyeon Oh^{1,3}

¹Global Health Security, Graduate School of Public Health, Yonsei University, Seoul, Korea

²North East Regional Health Directorate, Ministry of Health, Ghana Health Service, Gambaga, Ghana

³Institute for Global Engagement & Empowerment, Yonsei University, Seoul, Korea

Background: Older adults in Ghana who experience socioeconomic disadvantage characterized by limited in-come, low educational attainment, inadequate housing, insecure or absent employment face obstacles to main-taining social connections, increasing their vulnerability to isolation and adverse health outcomes. Prolonged loneliness has been likened to the health impact of smoking 15 cigarettes per day (Shafiq et al., 2020). This review and meta-analysis examined cross-sectional studies showing differing relationships between social isolation/loneliness and low socioeconomic status (SES) among Ghanaian older adults. The objective was to synthesize quantitative evidence on associations between socioeconomic factors and social isolation or loneliness among older adult populations in Ghana.

Methods: We searched PubMed/MEDLINE, Embase and African Journals Online (AJOL) for peer-reviewed English-language studies published from 1 January 2019 to December 2024. Eligible studies were quantitative, included Ghanaian older adults, reported associations between social isolation or loneliness and at least one socioeconomic factor, and provided extractable effect measures (OR/PR or raw counts). Two reviewers independently screened titles/abstracts and full texts. Data extracted covered study characteristics, exposures, outcomes, and adjusted effect estimates. We pooled odds ratios using random-effects meta-analysis (DerSimonian–Laird) in R (meta/metafor); heterogeneity was quantified with I². Risk-of-bias visualizations were produced with robvis.

Results: Ten cross-sectional Ghanaian studies met inclusion criteria. All indicated that lower SES was associated with elevated odds of social isolation or loneliness (individual ORs 1.60–2.30). The pooled OR was 1.90 (95% CI: 1.69–2.14), indicating approximately a 90% higher likelihood of social isolation or loneliness among socio-economically disadvantaged older adults. The findings suggest that aside cultural enablers, rural-urban migration effects are more severe in low-SES groups, potentially explaining the heightened ORs compared to global estimates.

Conclusion: Socioeconomic disadvantage is a substantial correlate of social isolation and loneliness among Ghanaian older adults. Interventions and policies addressing poverty, food insecurity, and broader socio-cultural determinants are needed to support social connectedness and healthy aging.

Keywords

Social isolation/loneliness, Socioeconomic status, Older adults, Poverty

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*Corresponding author: Patrick Atanga Azoya, E-mail: pazzoya@gmail.com

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RESEARCH IN CONTEXT

Social isolation and loneliness are globally recognized public health concerns for older populations, linked to physical and mental health problems including frailty, cognitive decline, cardiovascular disease, and mortality (Adedeji et al., 2023; Madani et al., 2022). As the proportion of older adults rises in sub-Saharan Africa, clarifying how socioeconomic factors drive social disconnection in countries such as Ghana is increasingly important (Gyasi et al., 2023; Ran et al., 2024). Despite this recognized importance, research specifically examining the socio-economic determinants of social isolation and loneliness among Ghanaian older adults remains limited (Adedeji et al., 2023; Oduro, 2024).

EVIDENCE BEFORE THIS STUDY

Existing literature focusing specifically on socioeconomic drivers of isolation among older Ghanaians is limited; prior reviews have emphasized high-income settings or specific health outcomes but have not comprehensively pooled SES-related effects in Ghana contexts (Albasheer et al., 2024; Chawla et al., 2021; Dai et al., 2021). Studies have shown that health and well-being generally improve with greater access to social capital across various populations, yet social isolation remains a persistent issue, particularly in developing countries where extreme poverty can hinder social networking opportunities (Asiamah et al., 2023). Existing literature, though scarce, suggests that factors like unhealthy lifestyles, including sedentary behaviours and smoking, can exacerbate social isolation and loneliness in older adults, emphasizing the need for focused research in this demographic within Ghana with its unique cultural support systems and rapid urbanization (Gyasi et al., 2023).

This review fills a gap by aggregating cross-sectional effect estimates on SES and contextual analyses of predictors of social isolation among Ghanaian older adults to inform targeted public health actions.

ADDED VALUE OF THIS STUDY

This is a quantitative synthesis of cross-sectional studies conducted between 2019 and 2024 that report associations between socioeconomic indicators and social isolation or loneliness in Ghana. Using a random-effects meta-analysis and risk-of-bias visualization, the study demonstrates a con-

sistent, significant association between low SES and elevated odds of social isolation, with the pooled OR of 1.90. It also explored the unique cultural context including extended family support systems and rapid urbanization that could buffer isolation as against other LMICs and high-income settings.

The findings support policy attention to socioeconomic inequalities as upstream determinants of social disconnection and underscore the need for integrated, multisectoral strategies improving income security, food access, education, and social infrastructure to reduce isolation among older adults.

1. Introduction

Social isolation (an objective lack of social contacts) and loneliness (the subjective experience of unmet social needs) are distinct but related conditions that pose serious public health concerns for aging populations (Hajek et al., 2023). Both have been associated with a range of adverse outcomes higher morbidity and mortality, cognitive decline, cardiovascular disease, and mental health problems. Global estimates suggest substantial prevalence of social isolation among older adults (a pooled prevalence of 33% in one large synthesis), with higher rates among the very old, those living alone, and individuals with lower education (Ran et al., 2024; Hajek et al., 2023). Recent cross-country analyses indicate that social isolation levels have increased globally by approximately 13.4% from 2009 to 2024, with the sharpest rises occurring after 2019 and disproportionately affecting regions like sub-Saharan Africa (SSA), South Asia, and the Middle East and North Africa, where mean levels remain among the highest worldwide (Fuller-Rowell et al., 2025). In LMICs, including those in SSA, these trends are compounded by limited social safety nets, rapid demographic shifts, and structural vulnerabilities, placing older adults at heightened risk compared to high-income settings (Adedeji et al., 2023; Gyasi et al., 2023).

In Ghana, traditional family and intergenerational support systems have historically buffered older adults against social disconnection, but modernization, urban migration, and changes in household composition are straining these supports (Attafuah et al., 2023; Gyasi et al., 2021). Over 50% of Ghanaians now live in urban areas due to intensified rural-urban migration, often leaving older adults behind in rural settings with reduced family proximity and material support. This shift erodes extended kinship networks historically central to care in Ghanaian society and contributes to emerging

forms of isolation combined with limited digital connectivity in low-resource areas, which challenge Western frameworks that overlook such African dynamics (Gyasi et al., 2023; Adejebi et al., 2023). This context provides a unique lens to test and extend the convoy model of social relations (Kahn & Antonucci, 1980), where SES may interact with Ghana-specific cultural moderators like extended kinship networks, religious community structures, or rapid urbanization patterns, potentially buffering isolation in ways distinct from high income settings (Gyasi et al., 2023).

Socioeconomic inequalities in income, education, and resource access shape opportunities for social engagement and therefore are central to understanding isolation risks (Moormann et al., 2023). This shift necessitates a re-evaluation of public health approaches to address these challenges, moving towards comprehensive strategies that acknowledge both the objective and subjective dimensions of social disconnection (Wister et al., 2025).

The World Health Organization has recognized the profound impact of social isolation and loneliness, recommending interventions such as therapy, social skills training, and befriending, which can be supported by improved infrastructure and age-friendly community initiatives (Oppert et al., 2023). These recommendations are particularly pertinent in contexts like Ghana, where evolving societal dynamics necessitate innovative solutions to uphold the well-being of older adults. A targeted synthesis of evidence is warranted to clarify how socioeconomic conditions relate to social isolation and loneliness among Ghanaian older adults and to guide context-appropriate interventions.

2. Materials and Methods

Search Strategy and Selection Criteria

We searched PubMed/MEDLINE, Embase and African Journals Online (AJOL) for studies published from 1 January 2019 through December 2024 using comprehensive search and MeSH terms related to “social isolation,” “loneliness,” “older adults,” and socioeconomic indicators. Inclusion criteria: peer-reviewed, English-language quantitative studies of Ghanaian older adults reporting associations between social isolation or loneliness and at least one socioeconomic factor with extractable effect estimates (OR/PR) or raw counts enabling effect size calculation. Studies were excluded if they lacked quantitative measures of SES associations, were qualitative only, or not Ghana-inclusive.

Screening and Data Extraction

Two reviewers independently screened records at title/abstract and full-text stages. From each eligible study we extracted author/year, design, sample size, age range, SES exposures (e.g., income, education, food insecurity, area deprivation), measures of social isolation/loneliness, and adjusted effect estimates with confidence intervals. Discrepancies were resolved by consensus. Risk of bias was visually assessed using the robvis tool, based on domains adapted from the ROBINS-I and Cochrane ROB2 frameworks. The initial search yielded 72 unique records after deduplication across PubMed/MEDLINE (n=45), Embase (n=15), and AJOL (n=12).

Data Analysis

Random-effects meta-analyses were conducted using restricted maximum likelihood (REML) estimation in the metafor package (R). Pooled effects were expressed as relative percentage changes as absolute changes in social isolation. Between-study heterogeneity was quantified using τ^2 and I^2 . Small-study effects were assessed with Egger's regression test and funnel plots, and robustness was examined with leave-one-out diagnostics. Forest plots displayed individual study and pooled ORs with a secondary axis for percent change. The review followed PRISMA guidelines.

3. Results

Study Selection and Characteristics

The systematic review and meta-analysis, guided by the PRISMA 2020 framework (Page et al., 2021), From an initial pool of 72 records retrieved from PubMed, Embase and African Journals Online, 10 studies met the inclusion criteria after screening and full-text/abstract review, focusing on empirical, quantitative associations in adult populations (primarily those aged 50 years and older). All included studies were cross-sectional in design, drawing from large samples (ranging from 800 to 34,000 participants, with Ghana-specific subsamples of 1,000–4,000), and utilized data from sources like the Study on Global Ageing and Adult Health (SAGE). Socioeconomic exposures examined across studies included area-level deprivation, low wealth/income, low education, food insecurity, employment status, and rural residence. Outcomes were measures of social isolation, loneliness, or related constructs (social frailty).

Meta-Analysis Findings

Figure 2 represents forest plots synthesized effects demonstrate studies reported positive associations between socioeconomic disadvantage and social isolation/loneliness, with individual adjusted ORs ranging from 1.60 to 2.30. The pooled OR was 1.90 (95% CI: 1.69–2.14), indicating substantially higher odds of social disconnection among older adults with low SES. Heterogeneity likely reflected variation in SES indicators (e.g., wealth quintiles vs food insecurity), outcome definitions, and sample characteristics. The model suggests a moderate to strong association.

Study-Level Observations

Key findings from Table 1 reveal a pattern of elevated risk for social isolation and loneliness linked to adverse socioeconomic conditions. Across the studies, low socioeconomic conditions are characterised by factors such as area-level deprivation, low wealth, poverty, low education, food insecurity,

and rural residency, which consistently predicted higher odds of isolation or loneliness. For instance, Gyasi et al. (2019) reported an odds ratio (OR) of 2.2 (95% CI: 1.5–3.2) for isolation in deprived neighbourhoods, highlighting rural poverty as a critical driver. Similarly, Amegbor et al. (2021) found an OR of 2.1 (95% CI: 1.4–3.2) associating low income and rural residence with social frailty, a construct overlapping with isolation. Food insecurity emerged as a particularly strong correlate, with Gyasi et al. (2024a) indicating it was associated with up to 35% of the association between SES and isolation (OR = 1.8, 95% CI: 1.2–2.7) and Asamoah et al. (2022) linking it to poor sleep via isolation (OR = 1.75, 95% CI: 1.2–2.6). Given the cross-sectional design of all studies, these associations suggest potential pathways but do not establish causality (Hajek et al., 2023). Gender and age interactions were noted in some studies, such as Gyasi et al. (2024b), where low SES amplified loneliness in women (OR = 2.3, 95% CI: 1.5–3.5). Protective factors in-

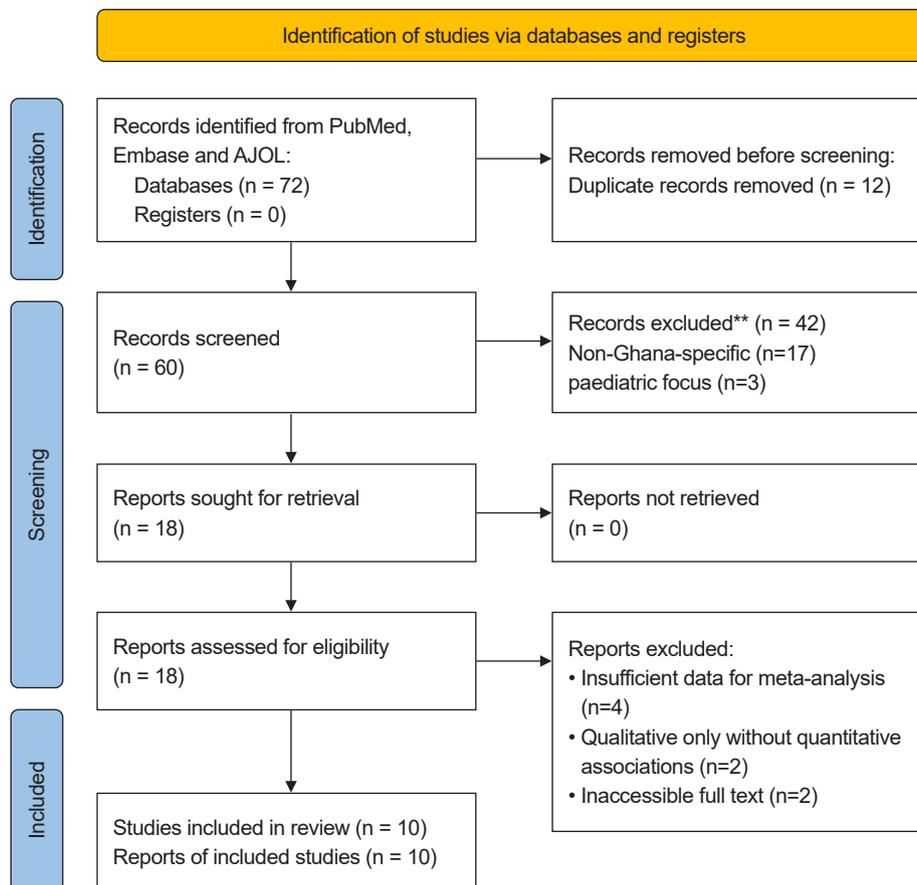


Figure 1. PRISMA 2020 Fow Diagram for Systematic Reviews Which Included Searches of Databases, African Journals Online and Registers Only. Source: Page MJ, et al. BMJ 2021;372:n71. doi: 10.1136/bmj.n71. This work is licensed under CC BY 4.0. To view a copy of this license, visit <https://creativecommons.org/licenses/by/4.0/>.

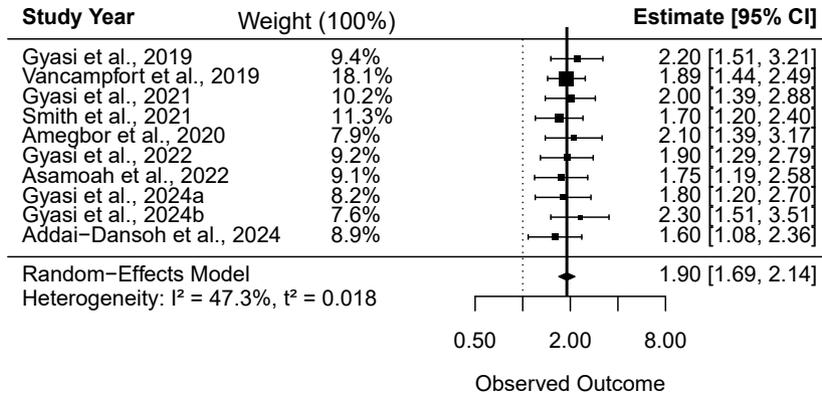


Figure 2. Effects of Socioeconomic Status (SES) Factors on Social Isolation/Loneliness (Meta-Analysis).

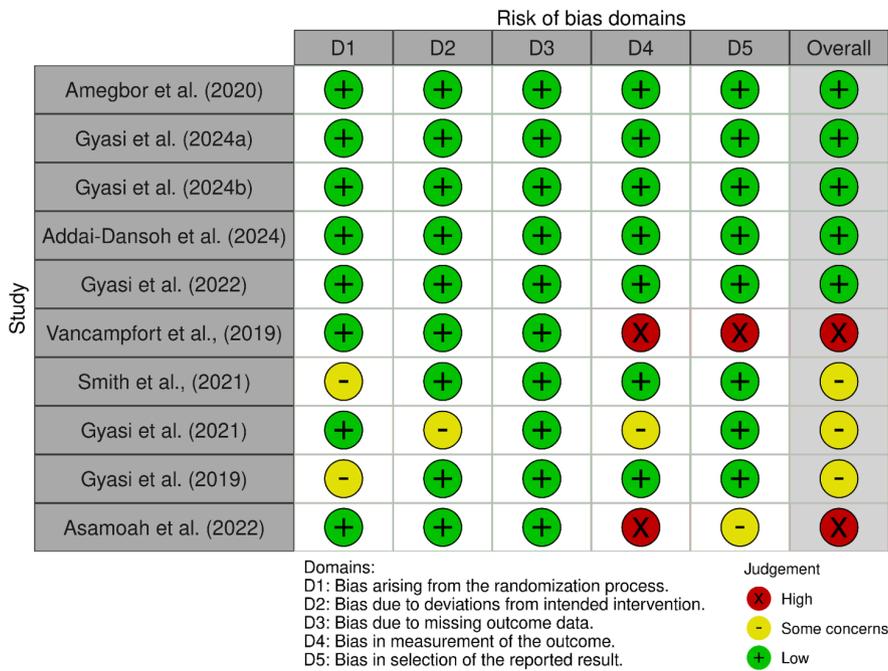


Figure 3. Risk of Bias Assessment for Included Studies (ROB2 domains).

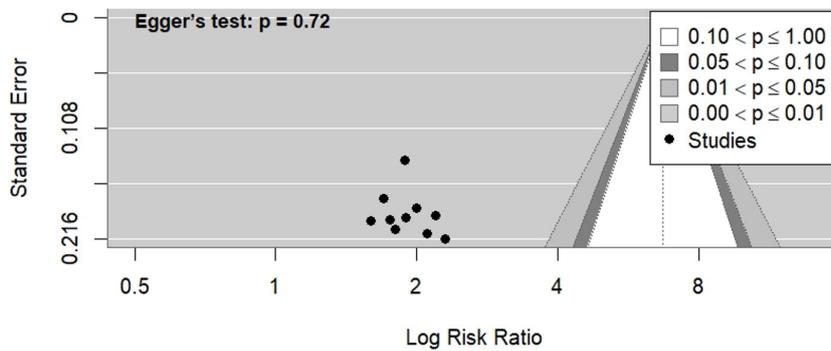


Figure 4. Funnel Plot with Egger's Test for Social Isolation/Loneliness Studies.

Table 1. Characteristics of Included Studies Evaluating Social Isolation (2019—2024)

Authors (Year)	Study	Design/Sample	Key Findings on Socioeconomic Factors	Effect Size (e.g., OR for Isolation)
(Gyasi et al., 2019)	Neighbourhood, social isolation and mental health outcome among older people in Ghana	Cross-sectional; n = 1,200 older adults	Area-level deprivation (SES proxy) increases isolation; rural poverty key.	OR = 2.2 (95% CI: 1.5-3.2)
(Vancampfort et al., 2019)	Physical activity and loneliness among adults aged 50 years or older in six LMICs	Cross-sectional; n = ~34,000 (includes Ghana n = 4,000)	Low wealth associated with loneliness; Ghana-specific OR adjusted for SES.	OR = 1.89 (95% CI: 1.44-2.49) for low SES subgroup
(Gyasi et al., 2021)	Physical activity and predictors of loneliness in community-dwelling older adults	Cross-sectional; n = 1,200 older adults	Low SES predicts loneliness; education and income protective.	OR = 2.0 (95% CI: 1.4-2.9)
(Smith et al., 2021)	Is loneliness associated with mild cognitive impairment in LMICs?	Cross-sectional; n = 32,715 (includes Ghana)	Loneliness linked to MCI; poverty and low education as risk factors in Ghana.	OR = 1.7 (95% CI: 1.2-2.4)
(Amegbor et al., 2020)	Social Frailty and Depression Among Older Adults in Ghana	Cross-sectional; n = 1,030 older adults (SAGE)	Low income and rural residence linked to higher social frailty; education buffers.	OR = 2.1 (95% CI: 1.4-3.2)
(Gyasi et al., 2022)	A two-mediator serial mediation chain of the association between social isolation and impaired sleep	Cross-sectional; n = 1,201 older adults (SAGE)	Social isolation linked to sleep issues via loneliness; low income exacerbates.	OR = 1.9 (95% CI: 1.3-2.8)
(Asamoah et al. 2022)	Food insecurity and sleep quality among older adults: Findings from a population-based study in Ghana	Cross-sectional; n = 1,000 older adults	Food insecurity linked to poor sleep via isolation; low income amplifies.	OR = 1.75 (95% CI: 1.2-2.6)
(Gyasi et al., 2024a)	Later Life Food Insecurity and Social Isolation in Ghana	Cross-sectional; n = 1,200 older adults	Food insecurity mediates 35% of isolation; poverty strongest predictor.	OR = 1.8 (95% CI: 1.2-2.7)
(Gyasi et al., 2024b)	Cross-sectional association of food insecurity with loneliness	Cross-sectional; n = 900 adults ≥ 50	Sex/age interactions; low SES amplifies loneliness in women.	OR = 2.3 (95% CI: 1.5-3.5)
(Addai-Dansoh et al., 2024)	The Effect of Social Determinants of Health on Psychological Health	Cross-sectional; n = 800 older adults	Education and employment reduce isolation by 25%; urban-rural disparity.	OR = 1.6 (95% CI: 1.1-2.4)

cluded higher education and employment, which reduced isolation by up to 25% (Addai-Dansoh et al., 2024; OR = 1.6, 95% CI: 1.1–2.4), and urban residency, which buffered against rural-urban disparities.

Weights vary from 7.6% (Gyasi et al., 2024b) to 18.1% (Vancampfort et al., 2019), reflecting greater influence from studies with narrower CIs (higher precision). No-table higher-weighted studies included Vancampfort et al. (2019; 18.1%) and Smith et al. (2021; 11.3%), likely due to larger samples or tighter estimates.

Overall, the results interpret low SES as a multifaceted risk

factor that exacerbates social disconnection through material deprivation, limited access to resources, and environmental constraints in Ghana’s aging population.

4. Discussion and Conclusions

Discussion

The results reveal a complex interaction between socioeconomic disadvantage and social isolation/loneliness in Ghana, a lower-middle-income country (LMIC) experiencing rapid demographic aging alongside enduring inequalities.

The consistent odds ratios (ORs) observed across studies, averaging at 1.9, suggest that older adults in low-socioeconomic status (SES) groups are nearly twice as likely to experience isolation, which can exacerbate health issues such as declines in mental health, mild cognitive impairment, and sleep disturbances (Gyasi et al., 2022; Asamoah et al., 2022). This finding is consistent with global data from LMICs, where significant socioeconomic disparities are prevalent due to insufficient social safety nets and pressures from urbanization (Stickley et al., 2020).

In Ghana, rural-urban divides contribute to elevated isolation risks for rural dwellers (Amegbor et al., 2021; Addai-Dansoh et al., 2024) with the effect of structural issues like limited infrastructure and migration patterns that erode traditional family support systems. Food insecurity, a proxy for extreme poverty, emerges as a pivotal correlate, associated with up to 35% of isolation effects in cross-sectional analyses (Gyasi et al., 2024a), which resonates with broader literature linking nutritional vulnerability to psychosocial stressors in aging populations (Gundersen & Ziliak, 2015). A recent population-based evidence further highlights the scale among Ghanaian older adults (aged ≥ 50), social isolation prevalence reaches 27.3% and loneliness 17.7%, with both independently linked to higher odds of probable depression (loneliness OR = 3.15, 95% CI 3.26–5.28; isolation OR = 1.24, 95% CI 1.10–1.41), and the loneliness-depression association amplified in rural areas (OR = 7.06 vs. 3.43 urban) (Gyasi et al., 2025).

Theoretically, these results support the convoy model of social relations (Kahn & Antonucci, 1980), suggesting that SES shapes the availability and quality of social networks over the life course. Low income and education may restrict opportunities for social engagement, such as community activities or physical mobility, leading to loneliness and health declines (Gyasi et al., 2022). However, in Ghana's context, this model may be extended to include cultural buffers such as inter-generational co-residence or community-based religious supports, which could moderate SES effects differently (Gyasi et al., 2023). For example, our findings suggest that rural-urban migration erodes these convoys more severely in low-SES groups, potentially explaining the heightened ORs compared to global estimates. Future studies could test competing mechanisms like whether limited digital connectivity in Ghana amplifies isolation beyond traditional factors, generating insight for sub-Saharan Africa's unique aging trajectories (Adedeji et al., 2023; United Nations, 2020).

Gender-specific amplifications (Gyasi et al., 2024b) suggest intersectional vulnerabilities, where women in low-SES contexts face compounded risks from widowhood, caregiving burdens, and economic dependence areas warranting further disaggregated analyses. Comparatively, similar associations have been observed in high-income countries (United States-focused reviews; Courtin & Knapp, 2017). However, the magnitude in Ghana appears heightened (pooled OR = 1.90) compared to global estimates from high-income settings (typically ranging from 1.2 to 1.5 in meta-analyses; Ran et al., 2024; Chawla et al., 2021), likely due to weaker welfare systems, higher multidimensional poverty, and precarious aging circumstances in sub-Saharan Africa (Owusu-Addo et al., 2018). Compared to other LMICs like South Africa or India from SAGE data, Ghana's rural-urban disparities may amplify SES effects, warranting cross-national analyses to identify context specific moderators (Smith et al., 2021).

Key limitations include the reliance on cross-sectional designs, which prevents causal inferences and establishment of temporality. Reverse causation such as isolation perpetuating poverty through reduced productivity cannot be ruled out. The exclusion of qualitative studies and those with insufficient data for meta-analysis limits depth, particularly on lived experiences. Moreover, the focus on older adults overlooks younger cohorts, and the absence of longitudinal data hinders understanding of trajectories. Heterogeneity in SES measurement (wealth quintiles vs. food insecurity scales) may introduce variability in the meta-analysis, though the PRIS-MA-compliant approach mitigates some biases.

Future research should prioritize prospective cohort studies to establish temporality and explore interventions, such as SES-targeted programs like the livelihood empowerment program in Ghana, which could disrupt the isolation-poverty cycle (Owusu-Addo et al., 2018). Additionally, longitudinal designs could test Ghana-specific moderators (kinship norms, migration effects, religious/community buffers, digital connectivity gaps) through comparative sub-Saharan African studies to generate novel theoretical insights for global aging research. Integrating mixed-methods approaches would enrich insights into cultural mediators.

Policymakers should leverage these findings to advocate for inclusive aging policies under frameworks like the UN Decade of Healthy Ageing (2021–2030), emphasizing equitable access to education, income support, and social infrastructure to foster resilience against isolation.

Conclusion

This review provides robust evidence that socioeconomic disadvantage is a significant and consistent predictor of social isolation and loneliness among older Ghanaian adults. Across the 10 included studies, low socioeconomic status manifested through poverty, low income, limited education, food insecurity, and rural residence was associated with substantially elevated odds of social isolation or loneliness, with effect sizes ranging from OR = 1.6 to 2.3 with a pooled effect 1.9. Food insecurity appeared as a particularly strong correlate, associated with up to 35% of the link between SES and isolation in key studies, while higher education and urban residence offered protective effects (Gyasi et al., 2024a; Addai-Dansoh et al., 2024).

These findings highlight the structural roots of social disconnection in Ghana's older population, where material deprivation meets with weakening traditional support systems amid rapid socioeconomic and demographic transitions. Recent evidence underscores the urgency: prevalence of social isolation reaches 27.3% and loneliness 17.7% among older adults in Ghana, with both independently linked to higher odds of probable depression (OR = 3.15 for loneliness; OR = 1.24 for isolation) and mediated by psychosocial factors like sleep problems and anxiety (Gyasi et al., 2025). Rural areas show amplified risks (loneliness-depression OR up to 7.06), reflecting migration patterns that erode intergenerational kinship networks and leave many older adults ageing in solitude or experiencing persistent loneliness (Conduah, 2025). Compared to global high-income and other LMICs, Ghana's associations appear heightened due to multidimensional poverty, limited welfare, and rapid urbanization (Ran et al., 2024; Chawla et al., 2021).

Social isolation and loneliness, in turn, are not merely individual experiences but outcomes of broader social determinants, with implications for mental health, cognitive function, sleep quality, and overall well-being in later life (Gyasi et al., 2022; Asamoah et al., 2022). The consistency of results, despite variations in SES measurement and sample characteristics, underscores the persistent influence of socioeconomic inequalities on social health in this lower-middle-income context.

From a public health and policy perspective, these results call for targeted interventions that address upstream socioeconomic drivers rather than solely downstream symptoms of isolation. Strengthening social protection programs such as expanding access to pensions, improving the current

Livelihood Empowerment Against Poverty (LEAP) program, investing in agricultural for food security, and promoting education opportunities could mitigate risks, particularly for rural dwellers, women, and those experiencing multidimensional poverty. Community-based strategies should leverage Ghana's cultural strengths (religious and family networks, potential for intergenerational engagement) while tackling emerging challenges like digital gaps. Interventions targeting psychosocial mediators such as sleep hygiene, depression screening and promoting social participation (age-friendly community activities) are promising, as recent studies show they can buffer isolation's health impacts (Oduro, 2024).

These recommendations align with the United Nations Sustainable Development Goals, particularly SDG 1 (No Poverty) and SDG 3 (Good Health and Wellbeing) and the UN Decade of Healthy Ageing (2021–2030), emphasizing equitable access to resources and social infrastructure to foster resilience against disconnection.

In summary, reducing socioeconomic disparities is essential to preventing social isolation and loneliness among older Ghanaians. The evidence though cross-sectional, points to a clear pathway: upstream SES-focused policies can disrupt the deprivation and disconnection cycle. Future longitudinal and intervention research is needed to confirm causality and evaluate the effectiveness of SES-sensitive policies through comparative studies across sub-Saharan Africa and whether Ghana's cultural support system uniquely moderates SES-isolation links, generating new theoretical insights for global aging research.

Data Availability

All data analyzed in this systematic review and meta-analysis were extracted from published studies. No new datasets were generated.

Code Availability

Analyses were conducted in R (metafor package). Example code for effect size harmonization, meta-analysis, and visualization is available from the first author upon reasonable request.

Author Contributions

P.A.A. designed the review and conducted the statistical analysis, screened the studies and drafted the manuscript. S.S.O. provided oversight, contributed to methodological

framing, and revised the manuscript for policy and institutional relevance, public health interpretation and provided critical revisions. All authors approved the final version of the manuscript.

Conflicts of Interest

The authors declare no competing interests.

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Article

Individual and Socioeconomic Determinants of Antenatal Care Access for Disadvantaged Pregnant Women: A Systematic Review and Empirical Analysis

Rani Wulandari*

Department of Global Health Security, Yonsei University, Seoul, Korea

Socioeconomic disadvantage has consistently been associated with reduced maternal healthcare utilization; however, the extent to which individual-level socioeconomic and demographic characteristics explain antenatal care (ANC) access remains uncertain. This study examined associations between socioeconomic status (SES), basic demographic factors, and ANC completion, while synthesizing global evidence on social vulnerability and maternal healthcare access among disadvantaged pregnant women. The analysis combined secondary data from 2,019 women obtained from the Institute for Health Metrics and Evaluation (IHME) dataset with a systematic review and meta-analysis conducted in accordance with the PRISMA 2020 guidelines. Multivariable logistic regression and exploratory machine learning approaches (K-Nearest Neighbors and XGBoost) were applied to assess the discriminative capacity of individual-level variables for ANC completion. A random-effects meta-analysis was used to synthesize adjusted odds ratios (aORs) from eligible observational studies. In the IHME dataset, SES was not significantly associated with ANC completion after adjustment (aOR = 0.97; 95% CI: 0.78–1.21), and individual-level models demonstrated limited discriminatory performance (AUC range: 0.49–0.50). In contrast, the meta-analysis of six studies showed that socioeconomic disadvantage was significantly associated with inadequate or delayed prenatal care (pooled aOR = 1.96; 95% CI: 1.26–3.07), with substantial heterogeneity across studies. Although conceptually distinct, indicators such as migrant status and neighborhood risk were synthesized as proxies of broader social vulnerability. Overall, these findings suggest that individual-level socioeconomic and demographic variables alone provide limited explanatory value for maternal healthcare utilization, highlighting the potential importance of broader structural and health system-level factors influencing access to antenatal care.

Keywords

Socioeconomic status, Antenatal care, Maternal health, Social vulnerability

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*Corresponding author: Rani Wulandari, E-mail: wulandarirani@yonsei.ac.kr

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1. Introduction

Access to routine maternal healthcare is strongly shaped by socioeconomic conditions, with disadvantaged populations consistently experiencing greater barriers to timely and adequate care. Previous studies have shown that pregnant women from lower socioeconomic status (SES) backgrounds face compounded challenges, including financial constraints, limited transportation options, and reduced access to social support networks, all of which may hinder engagement with antenatal care (ANC) services (Oh et al., 2021; Bellerose et al., 2022).

Beyond material deprivation, socioeconomic disadvantage is frequently associated with forms of social vulnerability that constrain access to both formal healthcare systems and informal support mechanisms. Financial insecurity may necessitate prioritization of basic needs such as food and housing, leaving limited capacity to sustain communication resources or engage with community-based services. In parallel, geographic and infrastructural barriers, including limited transportation availability, can restrict mobility and reduce opportunities for social connectedness, further complicating access to maternal healthcare.

These intersecting constraints contribute to conditions of social vulnerability, in which pregnant women may experience reduced informational, emotional, and logistical support. Understanding how such vulnerabilities relate to maternal healthcare utilization is critical for identifying populations at risk of inadequate ANC engagement. However, existing evidence has largely focused on establishing associations between socioeconomic disadvantage and maternal health outcomes, with less attention to the extent to which individual-level socioeconomic and demographic characteristics can account for observed differences in care utilization.

Moreover, while socioeconomic disadvantage is widely recognized as a determinant of maternal healthcare access, findings across settings remain heterogeneous, reflecting variations in health system organization, social protection mechanisms, and population characteristics. This heterogeneity complicates efforts to generalize individual-level determinants across contexts and underscores the need for evidence synthesis alongside empirical analysis of individual-level data.

Therefore, this study aimed to address two complementary objectives: (1) to examine associations between socioeconomic status, basic demographic characteristics, and ANC

completion using multivariable regression and exploratory modeling approaches applied to secondary survey data; and (2) to synthesize global evidence on socioeconomic disadvantage and social vulnerability in relation to maternal healthcare access through a systematic review and meta-analysis. By integrating individual-level analysis with systematic evidence synthesis, this study seeks to clarify the explanatory scope and limitations of individual-level determinants in understanding disparities in antenatal care access.

2. Materials and Methods

Material

This study utilized two primary data sources. First, secondary individual-level data were obtained from a global maternal health survey administered via the Premise platform and released on September 14, 2021, by the Institute for Health Metrics and Evaluation (IHME). The dataset contains standardized information on antenatal care utilization and selected demographic characteristics among pregnant women and recent mothers across multiple countries.

Second, evidence from published observational studies was identified and synthesized through a systematic review conducted in accordance with the PRISMA 2020 guidelines. Reference management and screening procedures were supported using Mendeley Reference Manager. All statistical analyses and evidence synthesis were performed using R statistical software (version 4.3.1).

Methods

Participants: For the secondary data analysis, the study included a global sample of 2,282 respondents from 51 countries. Data were collected between May and June 2021 using a smartphone-based survey platform. Eligible respondents were women who were currently pregnant or had given birth within the preceding six months at the time of data collection. Although the sampling strategy employed target quotas and does not yield a nationally representative sample, the dataset provides cross-sectional individual-level information relevant to maternal healthcare utilization across diverse settings.

For the systematic review, eligible studies comprised observational research involving pregnant women from socioeconomically disadvantaged populations and reporting out-

comes related to antenatal care utilization, access to maternal healthcare services, or related measures of social vulnerability. Studies were required to report adjusted effect estimates to be included in the quantitative synthesis.

3. Results

This section presents findings from the secondary individual-level data analysis, followed by classification model performance and the synthesis of evidence from the systematic review and meta-analysis. Results are reported sequentially from descriptive analyses to multivariable modeling and quantitative evidence synthesis.

Primary Data Analysis: Determinants and Predictive Modeling of ANC Completion (IHME Dataset)

Descriptive and Bivariate Analysis (IHME Dataset)

Among the 2,019 women included in the analysis, antenatal care (ANC) completion rates were similar across socioeconomic groups. The ANC completion rate was 80.0% among women in the high/middle socioeconomic status (SES) group and 79.6% among those in the low SES group (Table 1).

Chi-square analysis indicated no statistically significant association between SES and ANC completion ($p = 0.851$). Bivariate analyses further showed no significant associations between ANC completion and maternal age group or geographic indicators where available (Table 2).

Multivariate Logistic Regression

Multivariable logistic regression analysis did not identify statistically significant associations between individual-level demographic characteristics and ANC completion (Table 3). After adjustment, women in the low SES group had similar odds of ANC completion compared with those in the high/middle SES group (adjusted OR = 0.97; 95% CI: 0.78–1.21; $p = 0.785$). Maternal age group was likewise not significantly associated with ANC completion. Variance Inflation Factor (VIF) values for all predictors were below 2, indicating no evidence of multicollinearity.

K-Nearest Neighbors (KNN) Classification

A K-Nearest Neighbors (KNN) classification model was applied to distinguish between completed and incomplete ANC visits using SES and maternal age group as predictors.

Class imbalance was addressed through up-sampling during 10-fold cross-validation. The optimized KNN model ($k = 15$) achieved an accuracy of 54.4% and an area under the receiver operating characteristic curve (AUC) of 0.491, indicating limited discriminative capacity. Sensitivity for identifying completed ANC visits was 58.6%, while specificity for identifying incomplete ANC visits was 37.7% (Table 4). The ROC curve approximated the diagonal line, and the confusion matrix showed substantial misclassification of incomplete ANC visits (Figures 1 and 2).

Boosting (XGBoost) Classification

The gradient boosting model yielded an AUC of 0.503, indicating no meaningful improvement in classification performance relative to chance. The confusion matrix demonstrated high specificity (90.0%) but low sensitivity (10.3%), re-

Table 1. ANC Completion by Socioeconomic Status

SES	ANC Incomplete (n)	ANC Complete (n)	Total	Completion Rate (%)
High/Middle SES	211	844	1055	80.0
Low SES	197	767	964	79.6

Table 2. Bivariate associations between demographic factors and ANC/PNC completion

Variable	p-value
SES vs ANC	0.851
Age group vs ANC	0.708
Geography vs PNC	0.964

Table 3. Multivariate Logistic Regression Analysis of Factors Associated with ANC Completion

Predictor	Adjusted OR (95% CI)	p-value
Low SES	0.97 (0.78–1.21)	0.785
Age 16–25	0.89 (0.33–2.04)	0.798
Age 26–35	0.83 (0.31–1.91)	0.683

Table 4. Performance Metrics of the KNN Classification Model

Metric	Value	Interpretation
Accuracy	0.544	Overall correctly classified
Sensitivity	0.586	Correct identification of completed ANC
Specificity	0.377	Correct identification of incomplete ANC
AUC	0.491	Discriminative ability close to random

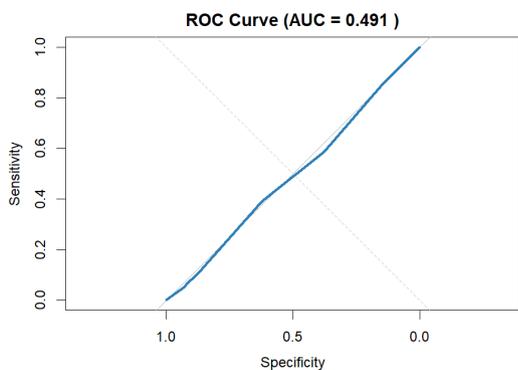


Figure 1. Receiver Operating Characteristic (ROC) Curve of the KNN Model for ANC Completion (AUC = 0.491).

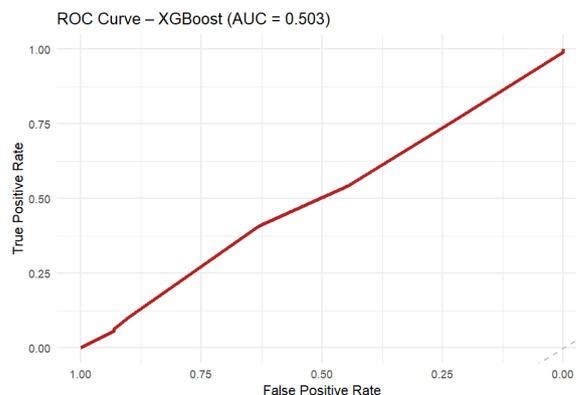


Figure 3. Receiver Operating Characteristic (ROC) Curve of the XGBoost Model for ANC Completion (AUC = 0.503).

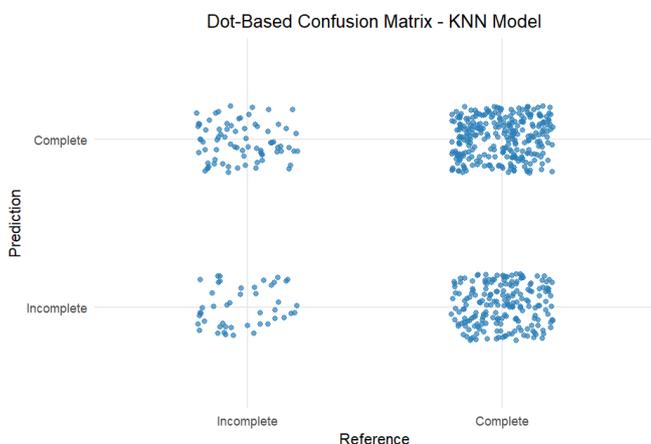


Figure 2. Confusion Matrix of the KNN Classification Model.

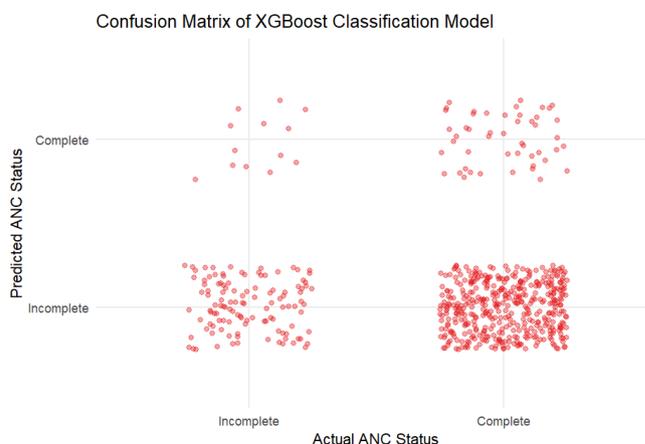


Figure 4. Confusion Matrix of the XGBoost Classification Model.

Table 5. Performance Metrics of the XGBoost Classification Model

Metric	Value
Accuracy	0.274
Sensitivity	0.103
Specificity	0.900

flecting pre-dominant classification into the majority outcome category (Table 5; Figures 3 and 4). The low overall accuracy observed in this model is attributable to the use of aggressive up-sampling strategies to address class imbalance, which altered class distributions during model training and evaluation and prioritized sensitivity to minority outcomes over raw classification accuracy.

Meta-Analysis of Global Evidence

The systematic literature search identified 133 records. After removal of duplicates and screening procedures, six studies met the eligibility criteria and were included in the final quantitative synthesis (Figure 5). The characteristics of the included studies are summarized in Table 6.

A random-effects meta-analysis was conducted using adjusted odds ratios (aORs) from the six included studies to examine the association between socioeconomic disadvantage and antenatal care utilization. The pooled analysis showed that socio-economic disadvantage was associated with a higher likelihood of inadequate or delayed antenatal care (pooled aOR = 1.96; 95% CI: 1.26–3.07; $p < 0.001$) (Figure 6). Study-specific adjusted odds ratios from the included studies are presented in Table 7. Substantial hetero-

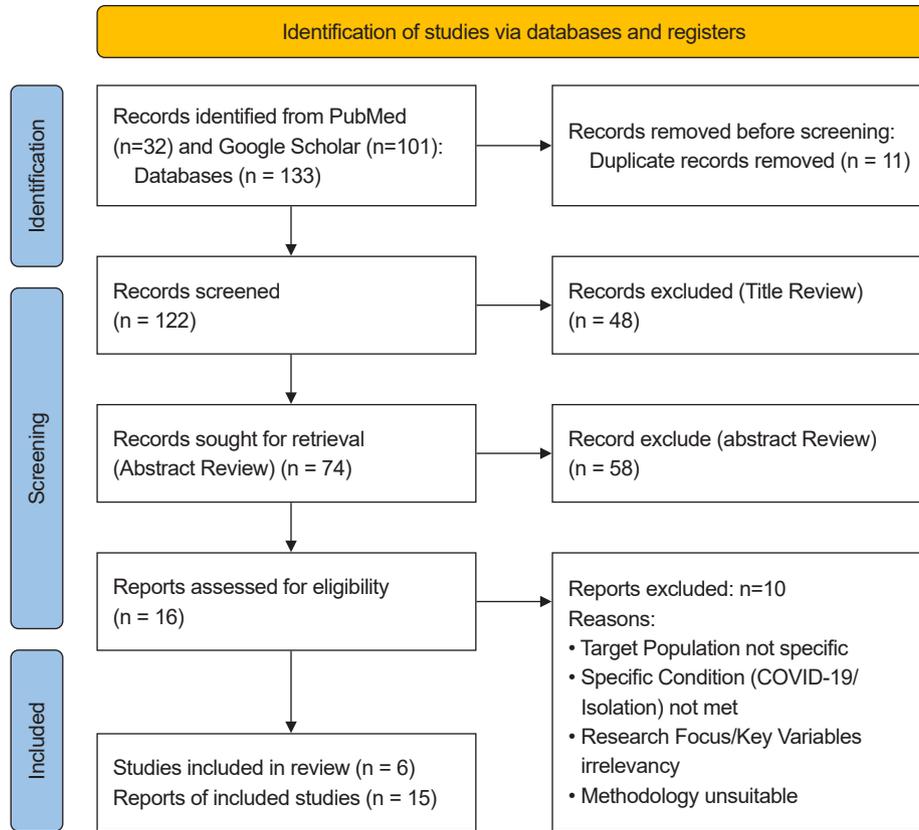


Figure 5. PRISMA 2020 Flow Diagram for the Study Selection.

Table 6. Characteristics of Included Studies Examining Socioeconomic Disadvantage and Antenatal Care Utilization

No	Author (Year)	Country / Region	Study Design	Data Source & Sample Size	Exposure (Social/Structural Disadvantage)	Outcome	Effect Size (Adjusted)
1	Gonthier et al. (2017)	France	Secondary analysis of a prospective cohort	PreCARE cohort; N = 9,770	High Social Deprivation (synthetic index)	Inadequate prenatal care utilization	3.10 (2.80 – 3.40)
2	Chiavarini et al. (2014)	Italy (Umbria)	Retrospective population-based study	Administrative births certificate (SCLB) (N ≈ 37.000)	Foreign-born status (Extra EU-27)	Late initiation and inadequate prenatal care	2.60 (2.25 – 3.05)
3	Eslier et al. (2020)	France	Prospective cohort	PreCARE prospective cohort; N = 9.599	Undocumented migrant status	Inadequate prenatal care utilization	2.58 (2.16 – 3.07)
4	Habtemariam et al. (2024)	USA (Rhode Island)	Population-based retrospective cohort	Vital Statistics birth certificates (2005-2014); N=97.249	High neighborhood risk (socioeconomic index)	Less than adequate prenatal care	1.14 (1.05 – 1.24)
5	Bromley et al. (2012)	USA (Rhode Island)	Retrospective cohort study	RI PRAMS surveillance data; N = 9,906	Hispanic ethnicity (vs Non-Hispanic White)	Delayed and inadequate prenatal care	2.01 (1.61 – 2.50)
6	Heaman et al. (2018)	Canada (Manitoba)	Population-based retrospective cohort	Administrative databases (N ≈ 68,132)	Social Isolation	Inadequate prenatal care utilization	1.21 (1.03 – 1.42)

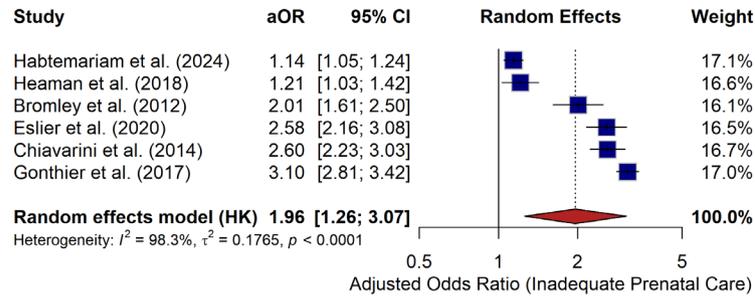


Figure 6. Forest Plot of Socioeconomic Disadvantage and Inadequate Prenatal Care.

Table 7. Summary of Adjusted Odds Ratios (aOR) for the Association Between Socioeconomic Disadvantage and Inadequate Prenatal Care

No	Study	Country	Exposure	Outcome	aOR (95% CI)
1	Gonthier et al. (2017)	France	High Social Deprivation (Q4 vs Q1)	Inadequate Care	3.10 (2.80 – 3.40)
2	Chiavarini et al. (2014)	Italy	Deprivation Index (High vs Low)	Late/Inadequate Care	2.60 (2.25 – 3.05)
3	Eslier et al. (2020)	France	Undocumented Migrant Status	Inadequate Care	2.58 (2.16 – 3.07)
4	Habtemariam et al. (2024)	USA	High Neighborhood Risk	Inadequate Care	1.14 (1.05 – 1.24)
5	Bromley et al. (2012)	USA	Hispanic (vs Non-Hispanic White)	Delayed/Inadequate	2.01 (1.61 – 2.50)
6	Heaman et al. (2018)	Canada	Social Isolation	Inadequate Care	1.21 (1.03 – 1.42)

geneity was observed across studies ($I^2 = 98.3\%$; $p < 0.0001$), reflecting differences in study populations, exposure definitions, and healthcare system contexts.

The included studies were conducted in diverse geographic settings, including Europe and North America, and employed heterogeneous indicators of socioeconomic disadvantage, such as area-level deprivation indices, migrant status, ethnicity, neighborhood risk, and social isolation. Although these exposures represent conceptually distinct constructs, they were synthesized as proxy indicators of broader socioeconomic vulnerability for the purpose of quantitative pooling. Across all included studies, the direction of association between socioeconomic disadvantage and inadequate antenatal care was consistent, despite considerable variability in effect size magnitude.

Differences in effect estimates were influenced by study design and population size. Large population-based studies, such as [Habtemariam et al. \(2024\)](#) and [Heaman et al. \(2018\)](#), reported more modest associations (aORs of 1.14 and 1.21, respectively), whereas smaller European cohort studies, including [Gonthier et al. \(2017\)](#), observed larger effect sizes (aOR = 3.10). This variability underscores the heterogeneity of contexts and measurement approaches across studies included in the synthesis. Overall risk of bias across the included studies was assessed using the ROBINS-I tool

([Figure 7](#)).

4. Discussion

This study examined the extent to which individual-level socioeconomic and demographic characteristics are associated with maternal healthcare utilization, while synthesizing global evidence on socioeconomic disadvantage and related forms of social vulnerability. The findings demonstrate a clear contrast between individual-level analyses and population-level evidence. While the meta-analysis identified a consistent association between socioeconomic disadvantage and inadequate ante-natal care across diverse settings, the analysis of the IHME dataset showed that basic demographic characteristics alone provided limited explanatory value for antenatal care (ANC) completion.

Multivariable regression analyses did not identify significant associations between individual demographic predictors and ANC completion, and exploratory classification models demonstrated limited discriminative capacity. These results suggest that, within the constraints of the available individual-level data, maternal healthcare utilization cannot be adequately explained by age or socioeconomic status alone. Rather than indicating the absence of socioeconomic influence, these findings highlight the limited ability of individu-

Study	Risk of bias domains							Overall
	D1	D2	D3	D4	D5	D6	D7	
Gonthier et al. (2017)	⊖	⊕	⊕	⊕	⊕	⊕	⊕	⊖
Chiavarini et al. (2014)	⊖	⊕	⊕	⊕	⊖	⊕	⊕	⊖
Eslier et al. (2020)	⊖	⊕	⊕	⊕	⊕	⊕	⊕	⊖
Habtemariam et al. (2024)	⊖	⊕	⊕	⊕	⊖	⊕	⊕	⊖
Bromley et al. (2012)	⊖	⊕	⊕	⊕	⊖	⊕	⊕	⊖
Heaman et al. (2018)	⊖	⊕	⊕	⊕	⊕	⊕	⊕	⊖

Domains:
 D1: Bias due to confounding.
 D2: Bias due to selection of participants.
 D3: Bias in classification of interventions.
 D4: Bias due to deviations from intended interventions.
 D5: Bias due to missing data.
 D6: Bias in measurement of outcomes.
 D7: Bias in selection of the reported result.

Judgement
 ⊖ Moderate
 ⊕ Low

Figure 7. Risk of Bias Traffic Light Plot.

al-level demographic variables to capture the complexity of healthcare access pathways.

The meta-analysis provides complementary context by demonstrating that indicators of socioeconomic disadvantage including area-level deprivation, migrant status, ethnicity, neighborhood risk, and social isolation are associated with inadequate antenatal care across multiple healthcare systems. Although these indicators represent conceptually distinct constructs, their consistent direction of association suggests that broader forms of social vulnerability are relevant to maternal healthcare utilization at the population level. Although operationalized differently, these indicators converge in representing systemic barriers to healthcare access, such as institutional exclusion, geographic marginalization, and limited social support. However, the substantial heterogeneity observed across studies underscores the importance of contextual factors, including differences in health system organization, social protection mechanisms, and measurement approaches. The extremely high heterogeneity likely reflects substantial differences in the operationalization of socioeconomic vulnerability across studies, such as individual migrant status in France, ethnicity-based classification in the United States, and area-level deprivation indices in population-based cohorts. These definitional inconsistencies highlight the absence of standardized measures for social vulnerability in maternal health research.

Importantly, the contrast between the weak explanatory performance of individual-level models and the stronger as-

sociations observed in population-based studies suggests that unmeasured structural and system-level factors may play a role in shaping access to maternal healthcare. Such factors may include healthcare availability, transportation barriers, indirect costs, and institutional accessibility, none of which were directly captured in the individual-level dataset used in this study. These interpretations should therefore be understood as plausible explanations rather than causal conclusions.

Several limitations should be acknowledged. The secondary data analysis relied on a limited set of individual-level demographic variables, which constrained the scope of explanatory modeling. Structural determinants were not directly measured, and residual confounding cannot be excluded. In addition, the meta-analysis incorporated studies conducted across different time periods and healthcare contexts, contributing to substantial heterogeneity. Despite these limitations, the integration of individual-level analysis with systematic evidence synthesis provides a nuanced perspective on the strengths and limitations of demographic predictors in understanding maternal healthcare utilization.

5. Conclusions

This study demonstrates that individual-level demographic characteristics alone provide limited explanatory value for antenatal and postnatal care completion. Analyses using multivariable regression and exploratory modeling approach-

es showed that age and basic socioeconomic indicators were insufficient to distinguish between completed and incomplete maternal healthcare utilization within the available individual-level data.

At the same time, the synthesis of global evidence indicates that socioeconomic disadvantage is consistently associated with inadequate antenatal care across diverse settings. Taken together, these findings suggest that disparities in maternal healthcare utilization cannot be fully understood through individual-level characteristics alone and may be shaped by broader social and health system contexts.

Future research should prioritize the integration of system-level and structural variables, including healthcare accessibility, transportation constraints, and indirect costs, to more comprehensively capture the determinants of maternal healthcare access and better bridge individual-level analyses with population-level evidence.

From a policy perspective, these findings underscore the need for maternal health interventions that extend beyond individual-level education and address structural barriers such as transportation access, institutional navigation, and service availability.

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Article

Beyond Shelter: A Comparative Study on the Right to Independent Living and De-institutionalization through the Lens of Fair Housing and the SDGs[†]

Hyunseung Lee*

Department of Public Policy and Management, Seoul, Korea

This study investigates how the right to housing choice facilitates de-institutionalization and social justice for persons with disabilities through the framework of the Sustainable Development Goals (SDGs). Within international human rights discourse, housing is defined not merely as physical shelter but as a fundamental right encompassing dignity, safety, and the ability to live in peace. The analysis identifies a critical paradigm shift from the medical model of disability toward a social model that emphasizes the removal of societal barriers. Using a comparative methodology, the research evaluates international norms and case studies from the United States and the European Union against South Korea's domestic policies. It specifically analyzes the United Nations Convention on the Rights of Persons with Disabilities (UN CRPD) to identify normative and fairness gaps within the current administrative framework. Analysis reveals a significant fair housing gap in South Korea, where a discretionary welfare model persists instead of a mandatory rights-based Housing First approach. Domestic structures often rely on a linear care model, whereas international precedents favor immediate community integration. Furthermore, spatial stratification and socio-spatial inequalities exacerbate the exclusion of disadvantaged groups from essential economic and service facilities. These barriers are complicated by the NIMBY phenomenon, where social connections among neighbors can paradoxically increase resistance to inclusive neighborhood planning. The paper advocates for a mandatory integration mandate and individualized funding to ensure substantive autonomy and community inclusion. It proposes developing multi-centric urban structures to decentralize services and improve accessibility across regions.

Keywords

Fair housing, De-institutionalization, UN CRPD, Housing first, SDGs

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*Corresponding author: Hyunseung Lee, E-mail: hsleestar@yonsei.ac.kr

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1. Introduction

Background of the Study

For decades, the global approach toward persons with disabilities and the elderly was characterized by protective isolation. Vulnerable populations were often relegated to large-scale residential institutions under the guise of specialized care and safety. However, this model frequently resulted in the systemic stripping of individual agency and spatial segregation of marginalized groups from the rest of society.

In the 21st century, a profound paradigm shift has emerged, moving away from institutionalization toward 'independent living' and 'community-based inclusion.' This transition is not merely a change in the physical location of care; it represents a fundamental recognition of the right to autonomy. In this context, housing is redefined – not as a passive site of clinical supervision, but as a vital platform for social, economic, and political participation.

Research Objectives

The primary objective of this study is to examine how the right to housing choice serves as a core indicator of social justice and substantive equality. While many nations have adopted policies for de-institutionalization, a significant 'fair housing gap' remains. Many individuals transitioning out of institutions find themselves limited by a lack of accessible housing or the absence of integrated support services, effectively resulting in trans-institutionalization rather than true independence.

By utilizing the framework of the Sustainable Development Goals (SDGs) – specifically SDG 10 (Reduced Inequalities) and SDG 11 (Sustainable Cities) – this paper aims to analyze the legal and systemic barriers that prevent housing the vulnerables from exercising their right to self-determination. The study will argue that fair housing must encompass the affirmative duty of the government to provide integrated environments where individuals can choose where, how, and with whom they live.

Methodology

This research employs a qualitative comparative methodology to evaluate international norms and case studies against the domestic administrative framework of South Ko-

rea. Taking national legislation, policy roadmaps, and international guidelines as the units of analysis, the study moves beyond a simple descriptive comparison to analyze how different legal and financial systems facilitate the right to housing choice and de-institutionalization.

The United States and the European Union were selected as primary comparative subjects due to their distinct yet complementary approaches to social inclusion. The United States was chosen specifically due to its extensive history with exclusionary zoning regulations and discriminatory practices like redlining, which were historically utilized as tools for institutionalized segregation. However, the U.S. now provides a vital model of how a judicial integration mandate, catalyzed by the Fair Housing Act and the landmark *Olmstead v. L.C.* decision, can be used to affirmatively dismantle these structures by defining unjustified institutionalization as a form of illegal discrimination.

In contrast, the European Union offers a comprehensive policy-driven framework centered on strategic funding and the availability of integrated community-based services rather than purely judicial intervention. The EU serves as a benchmark for its use of financial conditionality, specifically prohibiting the use of structural and investment funds for the construction or renovation of residential institutions while mandating their use for community-based living projects. By analyzing these cases, the research follows a systematic procedure beginning with a normative review of the United Nations Convention on the Rights of Persons with Disabilities (UN CRPD) and the SDGs to establish a global standard for autonomy. This is followed by a comparative case analysis of the transition from Treatment First to Housing First paradigms.

Finally, a gap analysis is conducted to identify discrepancies between these international benchmarks and the South Korean National Roadmap for De-institutionalization, ultimately proposing the Korean Integration policy model. The research acknowledges certain methodological limitations, primarily its reliance on macro-level policy documents and official reports, which may not fully capture the subjective lived experiences of individuals transitioning out of care. In this context, the proposed model functions as a governance framework that organizes policy instruments under a rights-based mandate, with an emphasis on institutional design rather than causal explanation. Furthermore, the study recognizes the challenges of legal transplanting, noting that differences in housing market structures and administrative tra-

ditions between Western nations and South Korea require a cautious, context-sensitive approach to ensure institutional compatibility.

2. Conceptual and Normative Frameworks

The Evolution of Fair Housing

The history of fair housing in the United States is a narrative of transition – moving from a state-sponsored system of racial segregation to a modern framework that seeks to affirmatively dismantle those very structures. This evolution is characterized by three distinct phases: the era of institutionalized segregation, the landmark legislative breakthrough of 1968, and the subsequent expansion toward a proactive integration mandate.

Throughout the early 20th century, the U.S. government played an active role in enforcing racial homogeneity in residential neighborhoods. The Wagner-Steagall Housing Act of 1937 established the public housing system but frequently reinforced patterns of concentrated poverty and segregation by locating developments solely in marginalized areas ([HUD exchange](#)). Concurrently, the Federal Housing Administration (FHA) utilized ‘Redlining’ – a discriminatory practice that systematically denied mortgages to residents in minority neighborhoods, labelling them as ‘hazardous’ for investment. These policies, coupled with racially restrictive covenants in property deeds, effectively barred non-White citizens from the suburban wealth-building boom following World War II ([Academy Bank, 2024](#)).

The tide began to turn with the Civil Rights Act of 1968, specifically Title VIII, commonly known as Fair Housing Act. Its passage was catalyzed by two major events: the release of the Kerner Commission Reports, which warned that the nation was moving toward two societies, one black, one white – separate and unequal, and the tragic assassination of Dr. Martin Luther King Jr ([walawlibrary, 2024](#)).

Signed by President Lyndon B. Johnson just seven days after King’s death, the 1968 Act initially prohibited discrimination based on race, color, religion, and national origin. Crucially, it did not merely forbid private discrimination; it introduced the Affirmatively Furthering Fair Housing (AFFH) mandate, requiring the government to take proactive steps to reverse segregation ([HUD Archives, 2022](#)).

The scope of fair housing protection grew as society rec-

ognized additional forms of exclusion. The Housing and Community Development Act of 1974 added sex as a protected class, addressing barriers faced by women in the credit and rental markets ([Haas, 2024](#)). The Fair Housing Amendments Act (FHAA) of 1988 was the most significant structural change, adding disability and familial status to the protected list. It also granted HUD significant enforcement powers, such as the ability to bring cases before Administrative Law Judges, which transformed FHA from a symbolic gesture into a powerful regulatory tool ([Schill & Friedman, 1999](#)).

In recent years, the evolution of fair housing has centered on the integration mandate. Landmark rulings such as *Olmstead v. L.C.* of 1999 interpreted the Americans with Disabilities Act (ADA) alongside the FHA to establish that unjustified institutionalization is a form of discrimination, reinforcing the right to live in the ‘most integrated setting’ ([PRRAC, 2020](#)).

Today, this evolution aligns with SDG 11 (Sustainable Cities and Communities), which emphasizes inclusive urbanization. Modern fair housing practice has shifted from a passive ‘right to be left alone’ to an active right to housing choice, ensuring that all individuals – regardless of disability, age, or background – have equal access to ‘areas of opportunity’ that provide better health, education, and economic outcomes ([Habitat for Humanity, 2021](#)).

This shift from a passive right to an active choice can be theoretically grounded in the Capabilities Approach. According to this framework, true freedom is not merely the absence of coercion but the presence of combined capabilities—the union of an individual’s internal abilities and the political, social, and economic environment that allows those abilities to be exercised ([Lee, 2023](#)). In the context of disability, housing functions as a critical external condition that transforms potential into actual functioning. Therefore, the right to housing choice is not just a secondary welfare benefit; it is a fundamental entitlement that ensures the substantive freedom necessary for individuals to lead a life they have reason to value.

UN Convention on the Rights of Persons with Disabilities

The CRPD, adopted by the UN General Assembly in December 2006 and entered into force on May 3, 2008, represents a historic milestone as the first comprehensive human rights treaty of the 21st century. Its significance was im-

mediate; upon opening for signature in 2007, it garnered the highest number of opening-day signatories in the history of UN conventions. Furthermore, its rapid negotiation – concluded in just four years – reflects a global urgency to address the long-standing systemic exclusion of individuals and disabilities.

The primary contribution of the CRPD is its fundamental redefinition of disability. It marks a decisive transition from a ‘medical and charity model’ to a ‘human rights-based model.’ For decades, persons with disabilities were viewed as passive objects requiring medical treatment, social protection, and charitable pity. The CRPD replaces this paternalistic view, recognizing them instead as subjects of rights. This shift empowers individuals as active agents of their own lives, capable of making free and informed decisions and participating as integral members of the community.

The CRPD serves as a dual-purpose instrument, blending traditional human rights with a social development dimension. It adopts an inclusive categorization of disability, reaffirming that all individuals – regardless of the type of impairment – must enjoy universal fundamental freedoms. Rather than creating new rights, the convention clarifies how existing rights apply specifically to the lived experiences of persons with disabilities. Crucially, it identifies where society must provide adaptations to ensure these rights can be effectively exercised, while mandating reinforced protection in areas where rights have been historically violated (UN DESA, 2006).

Building upon this transformative subject-based approach, Article 19 of the convention specifically translates these principles into a concrete right to live independently and be included in the community, directly challenging the legacy of institutional segregation. The CRPD Article 19 states:

States Parties to the present Convention recognize the equal right of all persons with disabilities to live in the community, with choices equal to others, and shall take effective and appropriate measures to facilitate full enjoyment by persons with disabilities of this right and their full inclusion and participation in the community, including by ensuring that:

a) Persons with disabilities have the opportunity to choose their place of residence and where and with whom they live on equal basis with others and are not obliged to live in a particular living arrangement;

b) Persons with disabilities have access to a range of in-home, residential and other community support services, including personal assistance necessary to support living and

inclusion in the community, and to prevent isolation or segregation from the community;

c) Community services and facilities for the general population are available on an equal basis to persons with disabilities and are responsive to their needs.

Article 19 is widely regarded by scholars as one of the most intersectional and transformative provisions of the treaty, as it defines independent living not as the ability to perform daily tasks alone, but as the exercise of freedom of choice and control over one’s own life (Quinn & Degener, 2002).

Sub-clause (a) of Article 19 is designed to end forced placement in institutions. Individuals must have the opportunity to choose their place of residence and with whom they live on an equal basis with others. Sub-clause (b) recognizes that housing alone is insufficient, the convention requires access to a range of community support services, including personal assistance. This facilitates social inclusions and prevents the trans-institutionalization that often occurs when individuals are moved from large wards to small-scale group homes that still maintain institutional characteristics. Sub-clause (c) ensures public services and facilities – from transportation to healthcare – must be responsive to the needs of persons with disabilities, and that they are not hidden or isolated within the community.

In 2007, the Committee on the Rights of Persons with Disabilities issued General Comment No.5, which remains the most authoritative interpretation of Article 19 (CRPD, 2017). The committee emphasizes that de-institutionalization requires more than just the closure of buildings; it necessitates a structural reform of social care systems. It explicitly links Article 19 to the broader 2030 Agenda for Sustainable Development, specifically SDG 10.2 (promoting social and political inclusion) and SDG 11.1 (ensuring access to safe and affordable housing).

From the perspective of Fair Housing, Article 19 transforms the right to a house into the right to an integrated life. It aligns with the ‘Integration Mandate’ found in progressive domestic laws, arguing that segregation, whether in a hospital or a segregated housing complex, is a form of discrimination (Quinn & Degener, 2002). By mandating that support services must be decoupled from housing, Article 19 ensures that a person’s need for assistance does not cost them their right to choose where they call home.

The SDG Nexus

The principles of fair housing – non-discrimination, spatial integration, and equal opportunity – are inherently woven into the 2030 Agenda for Sustainable Development. By aligning fair housing with the SDGs, the right to a home is elevated from a domestic legal issue to a global mandate for human dignity. This nexus ensures that housing policy is viewed not merely as a matter of infrastructure, but as a primary tool for leaving no one behind.

1) SDG 10 (Reduced Inequalities)

Fair housing is fundamentally a mechanism for achieving SDG 10, particularly target 10.2, which aims to empower and promote the social, economic, and political inclusion of all, irrespective of disability or status. In the context of disability rights, inequality is often spatial. When persons with disabilities are confined to institutions or segregated housing complexes, they are denied the social inclusion promised by SDG 10.

Achieving SDG 10 requires the affirmative dismantling of segregated living patterns. Fair Housing provides the legal framework to ensure that vulnerable populations are not just housed, but are included in the economic and social fabric of society. True equality is impossible as long as certain groups are geographically isolated from the rest of the community (UN, 2015).

2) SDG 11 (Sustainable Cities and Communities)

SDG 11 represents the most direct link to housing policy, specifically target 11.1, which calls for ‘universal access to adequate, safe, and affordable housing and basic services.’ Fair housing discourse expands the definition of adequacy in SDG 11 to include accessibility and integration.

For a city to be truly sustainable and inclusive under SDG 11, housing must be located in areas of opportunity – neighborhoods with access to transport, employment, and health-care. Fair housing laws ensure that the location of housing does not become a new form of inequality. A city cannot be considered sustainable if its housing stock is physically inaccessible to the elderly or if its zoning laws effectively exclude persons with disabilities from certain neighborhoods (Habitat for Humanity, 2021).

3) SDG 16 (Peace, Justice, and Strong Institutions)

SDG 16 focuses on effective, accountable, and inclusive

institutions and equal access to justice for all. The justice aspect of SDG 16 is crucial for the enforcement of the right to self-determination.

De-institutionalization is a direct application of SDG 16. Strong, just institutions are those that protect an individual’s right to make informed decisions about their own lives. Protecting the right to self-determination means that housing authorities and social care systems must be held accountable when they make residential decisions for individuals instead of with them. When fair housing laws are enforced by inclusive institutions, they protect the legal agency of the most vulnerable citizens (Tars, 2021).

Capabilities Approach

The realization of the right to independent living requires a shift from viewing housing as a mere resource to understanding it as a constituent of a combined capability. According to the capability approach, fundamental rights are not fully realized until an individual possesses both internal abilities and the external political, social, and economic environment necessary to exercise them (Lee, 2023). Institutionalization represents a structural failure of this environment, as it isolates the individual from the conditions required to transform their innate potential into lived experience. Therefore, the state’s duty to ensure independent living is not just a negative duty of non-interference but a positive obligation to provide the material substrate—specifically stable housing—that allows these combined capabilities to mature.

3. Global Policy Landscapes: Comparative Case Studies

The United States

The case of *Olmstead v. L.C.* (527 U.S. 581) originated with two women, Lois Curtis and Elaine Wilson, who were institutionalized in a Georgia state psychiatric hospital. Despite clinical assessments from state professionals confirming they were capable and ready to live in community-based settings, they remained confined in the institution for years due to a lack of available community ‘slots’ and funding. They sued the state under Title II of the ADA, alleging that their unnecessary segregation constituted a form of discrimination.

In a transformative opinion authored by Justice Ruth Bader

Ginsburg, the Supreme Court held that the "unjustified institutional isolation of people with disabilities is a form of discrimination" prohibited by the ADA (Justial, 1999). The Court's reasoning rested on two critical social judgments: first, the perpetuation of stigma and second, diminishment of life quality. The former is about institutional placement of those who can benefit from community life reinforces the unwarranted assumption that such persons are incapable or unworthy of participating in community life. The latter says that confinement severely restricts "everyday life activities," including social contacts, work options, and family relations, which are essential for economic independence and cultural enrichment (Law.Cornell.Edu, 2001).

The Court established a specific legal standard to determine when a state must provide community-based services. States are required to transfer individuals to integrated settings when the following three conditions are met (Olmstead-Rights, 2015). For the professional recommendation, the State's own treatment professionals determine that community placement is appropriate for the individual. Also, the affected individual does not oppose moving from institutional care to a less restrictive setting. Last but not least, there should be reasonable accommodation, taking into account the state's available resources and the needs of others with similar disabilities. The court recognized a 'fundamental alteration' defense, allowing states to resist immediate placement if it would inequitably deplete the mental health budget to the detriment of others.

The Olmstead decision is often described as the 'Brown v. Board of Education' for people with disabilities because it established the integration mandate – the requirement that services be provided in the 'most integrated setting appropriate (Harvard Law Review, 2025).

In the decades following the ruling, the U.S. Department of Justice (DOJ) has aggressively enforced Olmstead, requiring states to develop Olmstead Plans with concrete benchmarks for de-institutionalization (American Bar Association, 2025). However, implementation remains uneven. Recent scholarship highlights that the fair housing gap persists, as waiting lists for home- and community-based services (HCBS) remain long, and emerging crises like homelessness disproportionately affect individuals with disabilities, often leading to new forms of trans-institutionalization through the criminal justice system.

The European Union

While the United States relies heavily on judicial intervention to enforce disability rights, the European Union (EU) has developed a comprehensive policy-driven framework for de-institutionalization. This approach is rooted in the European Strategy for the Rights of Persons with Disabilities 2021-2030 and is legally underpinned by the EU's ratification of the UN CRPD as a regional organization.

The EU's commitment to de-institutionalization is centered on the principle that all persons with disabilities have the right to live independently and participate in their communities. The European Strategy emphasizes that independent living is not about self-reliance, but about having the same degree of self-determination and control over one's life as anyone else (European Commission, 2021).

Unlike the U.S. integration mandate, which focuses on the illegality of segregation, the EU framework focuses on the availability of community-based services. The Strategy mandates that member states must shift their social care budgets away from maintaining buildings toward funding Personal Assistance (PA) and individualized support (European Commission, 2021).

A landmark development in this framework was the publication of the UN Guidelines on Deinstitutionalization, including in Emergencies (2022), which the EU has adopted as a technical benchmark. These guidelines provide a road map for states to dismantle institutional systems. Key pillars include the prohibition of new institutions, individualized funding, and the right to redress. States are instructed to stop investing in new residential facilities, regardless of size, as even small group homes can maintain institutional cultures (Office of the United Nations High Commissioner for Human Rights, 2022). The EU promotes a shift toward money following the person, where funding is given directly to the individual to hire their own support staff, rather than being paid to an institution (European Network on Independent Living (ENIL), 2022). The guidelines emphasize that survivors of institutionalization have a right to reparations and support for their transition back into society (Inclusion Europe, 2023).

One of the most powerful tools in the EU's arsenal is its financial conditionality. The EU prohibits the use of EU Structural and Investment Funds (ESIF) for the construction or renovation of long-stay residential institutions. Instead, these funds must be used for community-based living projects, such as accessible social housing and community health

centers. This provides a direct financial incentive for member states – particularly in Central and Eastern Europe – to overhaul their legacy social care systems.

Despite these robust guidelines, the EU faces significant challenges. Advocacy groups such as ENIL point out that many member states continue to use EU funds for "mini-institutions"—group homes that house 6 to 12 people but still restrict residents' freedom of choice regarding food, schedules, and visitors (ENIL, 2022). This phenomenon of hidden institutionalization remains a primary hurdle in achieving the full spirit of fair housing within the European context.

Key Takeaways

The analytical synthesis of the United States' judicial approach and the European Union's strategic framework reveals a fundamental administrative evolution: the transition from the traditional treatment first model to the housing first paradigm. From the perspective of fair housing, this transition represents the structural decoupling of an individual's right to a home from their compliance with social or medical services. Historically, social care systems operated on a linear or staircase model, which functioned under the paternalistic assumption that individuals must prove their housing readiness before being granted permanent residence (OECD, 2020).

The fundamental flaw of the linear treatment first model lies in its systematic erosion of individual agency. From a capabilities perspective, a human being is an active subject capable of setting goals and making choices, rather than a passive object of clinical care (Lee, 2023). By conditioning housing on medical compliance, the linear model treats residents as immature entities whose agency is suspended until they reach arbitrary clinical benchmarks. This administrative trap fails to recognize that agency is not a fixed trait but a dynamic capacity developed through the very act of making choices in a stable environment. Consequently, the Housing First approach is not merely an efficiency-driven policy; it is a necessary restoration of the individual as a self-determining agent.

In this archaic framework, persons with disabilities were required to achieve specific clinical benchmarks, such as sobriety or psychiatric stabilization, within the confines of an institution. This created an administrative trap where the most vulnerable populations remained indefinitely segregated because they could not meet the very benchmarks that the sta-

bility of a home is designed to facilitate (Tsemberis, 2010). By making housing conditional upon medical compliance, the linear model effectively violates the Liberty of Choice enshrined in UN CRPD Article 19 and contradicts the core non-discrimination principles of Fair Housing.

In contrast, the housing first model operates on the inverse logic that permanent housing is a fundamental human right and a necessary prerequisite for any successful social or medical intervention (National Alliance to End Homelessness (NAEH), 2022). The primary fair housing breakthrough of this model is the legal separation of tenancy from treatment. Under this framework, an individual enters into a standard lease agreement, thereby gaining the full legal rights and responsibilities of any other tenant in the community. While intensive support services, such as case management and healthcare, are offered proactively, the individual retains the right to refuse these services without the threat of eviction or loss of their home. This decoupled structure ensures that a person's need for assistance does not cost them their right to choose where they call home, thereby fulfilling the Integration Mandate by promoting scattered-site housing throughout regular residential neighborhoods.

The administrative significance of the housing first model for fair housing and the SDGs cannot be overstated. By removing the readiness test, the model shifts administrative resources from the surveillance and evaluation of the individual to the modification of the environment through the provision of personal assistance and physical adaptations. This shift aligns closely with SDG 11 by creating more sustainable and cost-effective urban social systems, as evidence consistently demonstrates that providing permanent housing first is far more efficient than the "revolving door" of emergency rooms, shelters, and long-term institutions (NAEH, 2022).

Furthermore, by empowering individuals as tenants and citizens rather than patients or inmates, the model protects the right to self-determination emphasized in SDG 16 and reinforced through the disability rights framework of the CRPD. This paradigm provides a vital benchmark for evaluating contemporary social policies, raising the critical question of whether emerging national roadmaps genuinely prioritize individual autonomy or continue to reproduce institutional control under new nomenclature.

From a rights-based policy perspective, the central requirement of CRPD Article 19 is not the provision of housing per se, but the institutional guarantee of choice. Alternative autonomy-respecting models may preserve individual agen-

cy in principle; however, many continue to condition access to housing on compliance, readiness, or professional assessment. From a capability-oriented understanding of autonomy, such conditionality undermines substantive choice by withholding the stable material conditions necessary for exercising agency. Because treatment administered in the absence of housing stability paralyzes individual autonomy, the Housing First paradigm must be recognized as an indispensable 'material substrate' for the substantive realization of rights. Housing First therefore emerges not merely as a normatively preferable option, but as an institutionally necessary design to operationalize the right to choice under conditions of administrative discretion and resource constraint.

4. Analysis of the South Korean Context

Legislative Framework

The formal administrative commitment to de-institutionalization in South Korea was established with the announcement of the National Roadmap for De-institutionalization and Community Support in 2021. This transition is governed by a hierarchical structure of administrative laws that increasingly incorporate the language of rights and social inclusion.

The Framework Act on Residence serves as the constitutional foundation for housing policy, explicitly stating in Article 2 that all citizens possess the right to a decent residential life in a stable dwelling environment protected against physical or social danger (Framework Act on Residence). For vulnerable populations, this right is further specialized under the Act on the Support for Housing Disadvantaged Persons, Including Persons with Disabilities and Aged. This statute creates a mandatory obligation for the state to provide housing tailored to the safety and convenience of these populations, establishing the legal basis for physical adaptations and preferential supply in public housing programs.

The administrative delivery of welfare services for those transitioning from institutions is primarily rooted in the Act on Welfare of Persons with Disabilities. Article 9 of this Act holds the state and local governments responsible for supporting the self-reliance of persons with disabilities, which serves as the statutory hook for de-institutionalization funding and personal assistance programs (Act on Welfare of Persons with Disabilities). Furthermore, the Act on Guarantee of Rights and Support for People with Development Disabilities rep-

resents a significant normative advancement in South Korean law. This Act explicitly recognizes the right of individuals with developmental disabilities to independently determine their dwelling, directly echoing the autonomy principles of UN CRPD Article 19 and SDG 16.

Despite these legislative pillars, the Korean administrative framework faces challenges regarding the enforceability of housing as a substantive right. The Act on Support for Homeless Persons and Persons at Risk of Homelessness, while providing a basis for housing-led interventions, often employs discretionary language – using terms like 'may provide' – which can lead to administrative blind spots where the state's responsibility is not strictly mandated.

Moreover, the Act on the Prohibition of Discrimination against Persons with Disabilities and Remedy against Infringement of Their Rights provides a mechanism for legal redress, yet it has not been fully utilized to challenge the systemic segregation inherent in large-scale residential facilities. Consequently, the current legislative framework provides a robust foundation for community living, but its effectiveness depends on shifting from a discretionary welfare model to a rights-based administrative mandate that views institutionalization itself as a violation of the national residential standard.

Implementing Models

The practical implementation of de-institutionalization in South Korea is best exemplified by the Supportive Housing model. Pioneered by the Seoul Metropolitan Government, this model represents the most advanced domestic application of the housing first principle. Unlike traditional residential facilities or group homes, Supportive Housing provides permanent public rental housing where the resident holds a legal lease, effectively decoupling the right to housing from the requirement for clinical treatment ([Seoul Metropolitan Government, 2020](#)).

A critical component of this model is the strict adherence to physical accessibility standards, which ensures that the right to a home is not undermined by environmental barriers. Administratively, these standards are governed by the Act on the Support for Housing Disadvantaged Persons, Including Persons with Disabilities and the Aged. Article 9 of this Act mandates the installation of specific convenience facilities in housing units intended for disadvantaged populations to ensure safety and mobility (Act on the Support for Housing Dis-

advantaged Persons, Including Persons with Disabilities and the Aged).

In practice, the accessibility of Supportive Housing units is achieved through universal design principles and tailored modifications.

A barrier-free living environment should be met. Units are designed to eliminate height differences and ensure wide doorways and corridors that accommodate wheelchair movement. According to the Enforcement Decree of the Act, public rental housing must meet specific standards, such as entrance ramps with a slope of 1/18 or less and non-slip flooring materials in bathrooms and kitchens.

The facilities of the housing should be tailored safely. Key modifications include the installation of emergency call buttons, height-adjustable sinks, and grab bars in bathrooms. Furthermore, smart home technologies – such as audible alarms and emergency exit lighting – are increasingly integrated to protect residents during disasters ([Ministry of Health and Welfare, 2021](#)).

Also, for individuals living in existing community housing, Article of the Act on Housing Disadvantaged Persons allows the state to provide loans from Housing and Urban Fund to cover remodeling costs, ensuring that even private residences can meet accessibility benchmarks.

Despite these technical standards, a significant challenge remains in the geographic accessibility of these units. While the units themselves may be barrier-free, they are often located in areas with poor access to public transportation or essential community services. From a fair housing perspective, true accessibility must encompass the entire living environment, ensuring that the resident is not house-bound due to external barriers in the surrounding neighborhood. Achieving the goals of SDG 11 therefore requires not only the construction of barrier-free units but also the integration of these units into well-connected, inclusive urban neighborhoods.

Critical Barriers

The synthesis of international legal benchmarks and South Korea's domestic landscape reveals a significant discrepancy in the normative and administrative enforcement of the right to community living. In the United States, the transformative power of the *Olmstead v. L.C.* decision lies in its classification of unjustified institutional isolation as a form of discrimination, which created a mandatory, enforceable obligation for states to provide services in the most integrated set-

ting appropriate ([Justial, 1999](#)).

This judicial standard essentially converted the concept of community integration from a discretionary social service into a protected civil right, allowing individuals to seek legal remedy when their autonomy is restricted. In contrast, while the South Korean legislative framework – including the Framework Act on Residence and the Act on Welfare of Persons with Disabilities – formally recognizes the importance of independent living, it currently lacks a corresponding judicial mandate that defines institutionalization itself as an act of discrimination. This leads to an administrative environment where community placement is frequently treated as a discretionary welfare benefit, a distinction that fundamentally undermines the efficacy of the 2021 National Roadmap for De-institutionalization.

The UN CRPD, in its 2022 review of the Republic of Korea, echoed these concerns by highlighting the persistent reliance on segregated living arrangements and the insufficiency of individualized support services. The Committee's observations underscore that de-institutionalization under Article 19 must go beyond the physical closure of large-scale facilities and address the structural readiness barriers that prevent individuals from accessing community housing ([CRPD, 2022](#)). For South Korea to bridge this gap, the administrative language of its statutes must transition from the current discretionary terminology to a mandatory framework. This would ensure that the state's role is not merely to provide charity but to fulfill an affirmative legal obligation to protect the self-determination and housing choice of all citizens, regardless of the severity of their disability ([Tars, E.S., 2021](#)).

The integration of global housing first principles suggests that the South Korean model must more aggressively decouple the right to a residence from the provision of welfare services. While the pilot programs for Supportive Housing in Seoul have demonstrated the feasibility of this approach, the national rollout is hindered by the lack of a unified funding structure where the money follows the person rather than the institution ([Tsemberis, S., 2010](#)). Without such structural reform, the administrative system remains vulnerable to NIMBY phenomenon and geographic marginalization, as local governments may prioritize avoiding social conflict over fulfilling the individual's right to integrated community life. Ultimately, the successful realization of fair housing in South Korea requires a shift in the administrative paradigm, recognizing that true social inclusion under SDG 10 and SDG 11 is achieved only when an individual's legal agency and phys-

ical location are no longer conditioned upon their perceived readiness for society.

5. Synthesis and Discussion

The Synthesis of Global Norms and the Korean Integration Policy Model

The synthesis of the global normative framework with the South Korean administrative landscape reveals a profound discrepancy in how the right to community living is legally conceptualized and enforced. At the international level, the United Nations Convention on the Rights of Persons with Disabilities (CRPD), particularly Article 19, establishes a rights-based model where the autonomy and self-determination of the individual are paramount. This global standard, interpreted through General Comment Number 5, defines independent living not as a clinical milestone to be achieved, but as an inherent right to exercise freedom of choice and control over one's own life (CRPD, 2017). Within this framework, any form of institutionalization is viewed as a systemic failure to provide the necessary community-based adaptations and support services required for full social inclusion. This normative ideal is further reinforced by the SDGs, where SDG 10 and SDG 11 frame the dismantling of spatial segregation as a prerequisite for reducing inequalities and building inclusive, sustainable cities (UN, 2015).

In contrast, the South Korean domestic framework, while increasingly adopting the language of international standards, remains administratively anchored in a welfare-based model that prioritizes institutional stability and clinical assessment over individual choice. Although statutes such as the Framework Act on Residence and the Act on the Support for Housing Disadvantaged Persons provide a legal basis for housing support, they primarily function as discretionary welfare provisions rather than enforceable civil rights. Unlike the United States, where the *Olmstead v. L.C.* decision utilized the Americans with Disabilities Act to mandate community-based services as a remedy against discrimination (Justia, 1999), South Korean administrative law often treats community placement as a benefit provided based on available resources and perceived readiness. This administrative discretion creates a significant normative gap, as the state effectively retains the power to determine the appropriateness of a living arrangement, thereby contradicting the CRPD's mandate that individuals should not be obliged to live in any

particular setting.

To bridge this discrepancy, this study proposes the Korean Integration Policy model, which theorizes de-institutionalization as a mandatory rights-resource nexus. This model offers an original theoretical contribution by synthesizing the judicial mandatory integration established in the United States with the strategic financial flexibility of the European Union's individualized funding models (European Commission, 2021). Under this framework, housing is redefined as an enforceable civil right that is structurally supported by a systemic redirection of budgets from institutions to the individual. By establishing this nexus, the South Korean administrative paradigm can undergo a fundamental shift from viewing de-institutionalization as a policy of facility transformation to a mandate of rights fulfillment. This ensures that the state's role is not merely to provide charity but to fulfill an affirmative legal obligation to protect the self-determination and housing choice of all citizens, moving the domestic discourse closer to the global standard of housing as an absolute right rather than a conditional reward for rehabilitation.

The necessity of the Housing First paradigm is further reinforced by the principle of human diversity. Traditional institutional models rely on abstract and averaged standards of care that ignore the unique conversion factors—the personal, social, and environmental variations—that determine how an individual transforms resources into well-being. Since no single institutional setting can accommodate the diverse lived experiences and spatial needs of all persons with disabilities, the state must prioritize scattered-site housing that allows for individualized adaptations (Lee, 2023). By decoupling housing from a one-size-fits-all service mandate, the Korean Integration policy model ensures that the right-resource nexus is sensitive to the specific contexts of individuals' lives, fulfilling the CRPD's mandate of authentic social inclusion.

Supportive Housing as a Housing First Mechanism

The practical implementation of this paradigm is best exemplified by the Supportive Housing model, pioneered by the Seoul Metropolitan Government, which represents the most advanced domestic application of the housing first principle (Seoul Metropolitan Government, 2020). This approach operates on the inverse logic that permanent, stable housing is a fundamental human right and a necessary prerequisite

for any successful social or medical intervention (NAEH, 2022). Unlike traditional residential facilities or group homes, Supportive Housing provides permanent public rental housing where the resident holds a legal lease, effectively decoupling the right to housing from the requirement for clinical treatment. By making housing unconditional upon medical compliance, the model addresses the administrative significance of empowering individuals as tenants and citizens rather than patients or inmates.

A core mechanism of this model is the structural decoupling of tenancy and treatment, which ensures that an individual enters into a standard lease agreement and gains the full legal rights and responsibilities of any other tenant in the community. While intensive support services such as case management and healthcare are offered proactively, the individual retains the right to refuse these services without the threat of eviction or loss of their home. This decoupled structure ensures that a person's need for assistance does not cost them their right to choose where they call home, thereby fulfilling the integration mandate by promoting scattered-site housing throughout regular residential neighborhoods (Tsemberis, 2010).

Furthermore, the model shifts administrative resources from the surveillance and evaluation of the individual to the modification of the environment through the provision of personal assistance and physical adaptations. By removing the readiness test, the Supportive Housing model addresses the administrative trap where the most vulnerable populations remain indefinitely segregated because they cannot meet the very benchmarks that the stability of a home is designed to facilitate. This creates more sustainable and cost-effective urban social systems, as evidence consistently demonstrates that providing permanent housing first is far more efficient than the revolving door of emergency rooms, shelters, and long-term institutions (OECD, 2020). The physical accessibility of these units, governed by the Act on the Support for Housing Disadvantaged Persons, ensures that barrier-free living environments are met through universal design principles and tailored modifications, such as grab bars and audible alarms (Ministry of Health and Welfare, 2021).

To evolve the current supportive housing policy into a national standard, the administrative framework must ensure that the provision of a home is legally independent of an individual's participation in clinical services. This necessitates a redirection of policy toward a system where everyone can decide for themselves how they live and make use of com-

munity resources (Korea Institute for Health and Social Affairs, 2019). By institutionalizing this model, South Korea can bridge the gap between abstract legislative pillars and the enforceability of housing as a substantive right. This paradigm shift provides a vital benchmark for evaluating contemporary social policies, raising the critical question of whether emerging roadmaps truly prioritize the autonomy of the individual or continue to maintain institutional control.

The Fairness Gap and Spatial Justice

Despite the progress of pilot programs, the realization of fair housing in South Korea faces a significant fairness gap characterized by the discrepancy between abstract legal rights and the actual availability of substantive residential choices. This gap is most evident in the phenomenon of spatial stratification, where supportive housing and community facilities are often concentrated in specific urban sub-markets or tucked away in the outskirts of population centers to minimize social conflict (Han, 2022). From the perspective of fair housing, this results in a form of geographic marginalization that isolates persons with disabilities from areas of opportunity, such as employment hubs and robust transportation networks. While the 2021 National Roadmap aims to transition over 30,000 individuals into the community, the lack of a diverse and decentralized housing supply remains a primary hurdle (Global Online Information System for Disability, 2022).

The social dimension of this fairness gap is further exacerbated by the NIMBY phenomenon, which functions as a powerful informal barrier to community integration. Research indicates that the siting of special schools or public housing for disadvantaged groups frequently triggers intense opposition from local residents, often driven by perceived harms to property values or neighborhood safety (Park & Kim, 2025). This social exclusion creates a two-tiered housing market where persons with disabilities are funneled into segregated enclaves or small-scale facilities that, while technically located in the community, maintain institutional characteristics and restrict authentic social interaction. For women and elderly residents of public housing, the erosion of community bonds directly correlates with decreased acceptance of inclusive neighborhood planning (Park & Kim, 2025).

To mitigate these barriers and achieve spatial justice, the K-Integration model promotes the use of scattered-site housing as a social de-sensitizer. By integrating barrier-free units

into diverse, mainstream public rental housing stocks, the state can normalize community living and reduce the visibility of facilities that often trigger social stigma. This geographic invisibility ensures that de-institutionalization is not merely a physical relocation but an authentic inclusion into the economic and social fabric of society. Achieving the goals of SDG 11 therefore requires not only the construction of barrier-free units but also the integration of these units into well-connected, inclusive urban neighborhoods ([Habitat for Humanity, 2021](#)).

Furthermore, the administrative system must address the historical critical fairness gap between resources allocated to institutional care versus community-based support. Historically, the South Korean social care system has expanded institutions while many Western nations moved toward de-institutionalization, leading to an institutionalized society where agency is systematically stripped from the individual. Achieving housing fairness requires a redirection of policy toward a system that decouples support services from housing and ensures that everyone can decide for themselves how they live. True accessibility must encompass the entire living environment, ensuring that the resident is not house-bound due to external barriers in the surrounding neighborhood.

Strategic Policy Roadmap for the 2026 Reform

The anticipated 2026 expansion of the Individual Budget System provides a critical window for this systemic reform in South Korea ([The Asia Business Daily, 2026](#)). To ensure this reform leads to genuine rights fulfillment, it must be coupled with the formal adoption of an integration mandate within South Korean administrative law, similar to the judicial standard established in the United States (Justia, 1999). This would require amending the Act on Welfare of Persons with Disabilities or enacting the proposed De-institutionalization Support Act to replace discretionary terminology with mandatory language. By shifting from provisions stating the government may provide support to a requirement that the government shall provide services in the most integrated setting, the state creates an enforceable administrative obligation ([Tars, 2021](#)).

In conjunction with legal reform, implementing a money-follows-the-person financial model through the 2026 individual budget system will break the structural dependence on large-scale facilities. Instead of allocating block grants to institutions, the administrative system should empower individuals

with personalized budgets that they can use to procure housing and support services in the community ([European Network on Independent Living, 2022](#)). This decoupling of funding from the facility is essential for achieving the decoupling of housing from treatment. By allowing residents to choose their own personal assistance and housing providers, the state fosters a competitive market for community-based services that are responsive to the unique needs of the individual, rather than the operational needs of the institution.

The systemic implementation of the housing first model should be prioritized to overcome the administrative readiness barriers and social NIMBY phenomenon. The central government should expand the Seoul-style Supportive Housing model into a national standard, ensuring that individuals are provided with permanent, scattered-site housing as the first step of their transition ([OECD, 2020](#)). To mitigate local opposition, the administrative process must incorporate inclusive urban planning that avoids the concentration of disability housing in specific neighborhoods. This legal shift would allow individuals to challenge unnecessary institutionalization as a violation of their residential rights, thereby providing the judicial teeth necessary to realize the goals of self-determination regarding SDG 16.

Ultimately, the successful realization of fair housing in South Korea requires a fundamental shift in the administrative paradigm, recognizing that true social inclusion under the SDGs is achieved only when an individual's legal agency and physical location are no longer conditioned upon their perceived readiness for society. The integration of global housing first principles suggests that the model must more aggressively decouple the right to a residence from the provision of welfare services. Without such structural reform, the administrative system remains vulnerable to geographic marginalization, as local governments may prioritize avoiding social conflict over fulfilling individual rights. By synthesizing judicial, financial, and spatial strategies, the K-Integration model provides a robust roadmap for fulfilling international obligations and protecting the self-determination of all citizens.

6. Conclusion

Summary

This research has examined the evolution of fair housing through the lens of de-institutionalization, comparing the

global normative framework with the administrative realities of South Korea. The study established that international standards, specifically UN CRPD Article 19 and SDGs 10, 11, and 16, have shifted the global paradigm from a medical model of "care" to a human rights-based model of autonomy. Through the analysis of the United States' judicial approach in *Olmstead v. L.C.* and the European Union's strategic funding guidelines, it was demonstrated that successful de-institutionalization requires a mandatory integration mandate and the structural decoupling of housing from welfare services. The housing first paradigm emerged as the most effective administrative framework for realizing these goals, as it prioritizes immediate community integration and preserves the individual's legal agency as a tenant rather than a patient.

In the South Korean context, while the 2021 National Roadmap and the existing legislative framework – including the Framework Act on Residence and the Act on Rights of People with Developmental Disabilities – provide a necessary foundation, significant gaps remain. The research identified a fairness gap rooted in the discretionary nature of Korean administrative law, where community living is often treated as a welfare benefit rather than an enforceable right. Furthermore, social barriers such as the NIMBY phenomenon and the lack of a decentralized, scattered-site housing supply continue to result in spatial stratification and geographic marginalization. Ultimately, the study suggests that for South Korea to fulfill its international obligations and achieve true social inclusion, it must transition to a mandatory rights-based system supported by individualized funding models like the personal budget system.

Suggestion

Future scholarly inquiry should move beyond macro-level policy analysis to conduct empirical, longitudinal studies on the socio-economic impacts of the 2026 Individual Budget System expansion. Specifically, research is needed to provide a rigorous cost-benefit analysis of supportive housing versus institutional care in the Korean context, while also developing innovative urban planning models to mitigate NIMBYism and foster genuine community acceptance.

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Article

Environmental Carcinogens and Cancer Inequality: How Air Pollution Challenges the Achievement of SDG 3

Hyeonjung Yun*

Department of Biotechnology, Yonsei University, Seoul, Korea

Background: Cancer has traditionally been understood as a disease driven primarily by genetic mutations; however, growing evidence indicates that environmental exposures play a significant role in shaping cancer risk and outcomes. Among these exposures, air pollution has been classified as a Group 1 carcinogen by the International Agency for Research on Cancer (IARC). Beyond its biological effects, air pollution is unevenly distributed across populations, raising concerns related to health inequality and long-term public health sustainability.

Methods: This narrative review synthesizes epidemiological and molecular studies examining the association between particulate matter (PM_{2.5}) exposure and carcinogenesis. Key biological mechanisms discussed include oxidative stress, DNA damage, chronic inflammation, and epigenetic dysregulation.

Results: The reviewed literature shows consistent associations between long-term PM_{2.5} exposure and increased lung cancer incidence and mortality, with more limited evidence for other cancer types. Unequal exposure to air pollution, combined with disparities in healthcare access, contributes to differences in cancer risk and survival across socioeconomic groups.

Conclusion: By integrating biological evidence with environmental and equity perspectives, this paper highlights the importance of addressing air pollution as part of comprehensive cancer prevention strategies. Reducing environmental cancer risk factors is essential for promoting equitable and sustainable population health.

Keywords

Air pollution, Cancer inequality, Sustainability, PM_{2.5}, Lung cancer

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*Corresponding author: Hyeonjung Yun, E-mail: yunhj803@gmail.com

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1. Introduction

Cancer remains one of the leading causes of morbidity and mortality worldwide, posing a major challenge to global public health systems (World Health Organization [WHO], 2023). Traditionally, cancer has been understood primarily as a biological disease driven by genetic mutations and cellular dysregulation. Advances in molecular biology and precision medicine have improved diagnosis and treatment outcomes in many settings; however, substantial disparities in cancer incidence and survival persist across populations and regions (Bray et al., 2018). These persistent inequalities indicate that cancer risk and outcomes cannot be fully explained by biological mechanisms alone but must also be examined within broader environmental and social contexts.

Among environmental risk factors, air pollution has emerged as a significant contributor to cancer risk. The International Agency for Research on Cancer (IARC) classifies outdoor air pollution and particulate matter with an aerodynamic diameter of $\leq 2.5 \mu\text{m}$ (PM2.5) as Group 1 carcinogens, indicating sufficient evidence of carcinogenicity in humans (IARC, 2016). Epidemiological studies consistently report associations between long-term PM2.5 exposure and increased lung cancer incidence and mortality, with more limited but growing evidence for other cancer types (Hamra et al., 2014; Pope et al., 2020). Despite this evidence, air pollution is often addressed primarily as an environmental or urban planning issue rather than as a central determinant of cancer prevention.

Importantly, exposure to air pollution is unevenly distributed. Individuals living in low-income communities, densely populated urban areas, or near industrial zones are more likely to experience higher levels of PM2.5 exposure (Hajat et al., 2015). These same populations frequently face structural barriers to healthcare access, including limited cancer screening, delayed diagnosis, and reduced access to advanced treatment, which together exacerbate cancer-related inequalities (Marmot et al., 2020). In South Korea, regional disparities in air quality and cancer outcomes have been reported, particularly in urban and industrialized areas, highlighting the relevance of this issue for national public health policy (Kim et al., 2021).

Within this context, sustainability is understood not only as environmental protection but also as the capacity of health systems to prevent disease equitably and maintain population health over the long term. From this perspective, effective

cancer prevention requires approaches that reduce environmental risk exposures while simultaneously addressing structural inequalities in health and healthcare access. International public health frameworks increasingly emphasize the importance of minimizing preventable disease burden and narrowing health disparities as core components of sustainable development. Accordingly, environmental regulation and equity-oriented public health strategies play a critical role in shaping long-term, sustainable cancer control.

This paper is a narrative review and conceptual analysis that examines air pollution as both a biological carcinogenic factor and a social determinant of cancer inequality. By synthesizing existing epidemiological and mechanistic evidence, this study explores how PM2.5 exposure is associated with carcinogenesis—particularly lung cancer—and how social and structural factors modify these associations. The aim of this paper is to highlight the necessity of integrating environmental policy and equity-oriented public health strategies into sustainable cancer prevention frameworks. Figure 1 presents a conceptual framework summarizing the key relationships examined in this study.

2. Materials and Methods

Materials

This study is based on a qualitative literature review of existing peer-reviewed research. The materials for this study consisted of peer-reviewed academic literature, reports from international health organizations, and publicly available epidemiological studies related to air pollution and cancer. Key sources included publications from the World Health Organization (WHO), the International Agency for Research on Cancer (IARC), and major epidemiological studies examining particulate matter (PM2.5) exposure and cancer risk. These materials were selected to provide a comprehensive overview of both biological mechanisms and social dimensions of cancer associated with air pollution.

Methods

This study employed a narrative review methodology to synthesize existing research findings across multiple disciplines, including environmental health, oncology, and public health policy (Grant & Booth, 2009). A literature search was conducted using Google Scholar and PubMed, focusing on

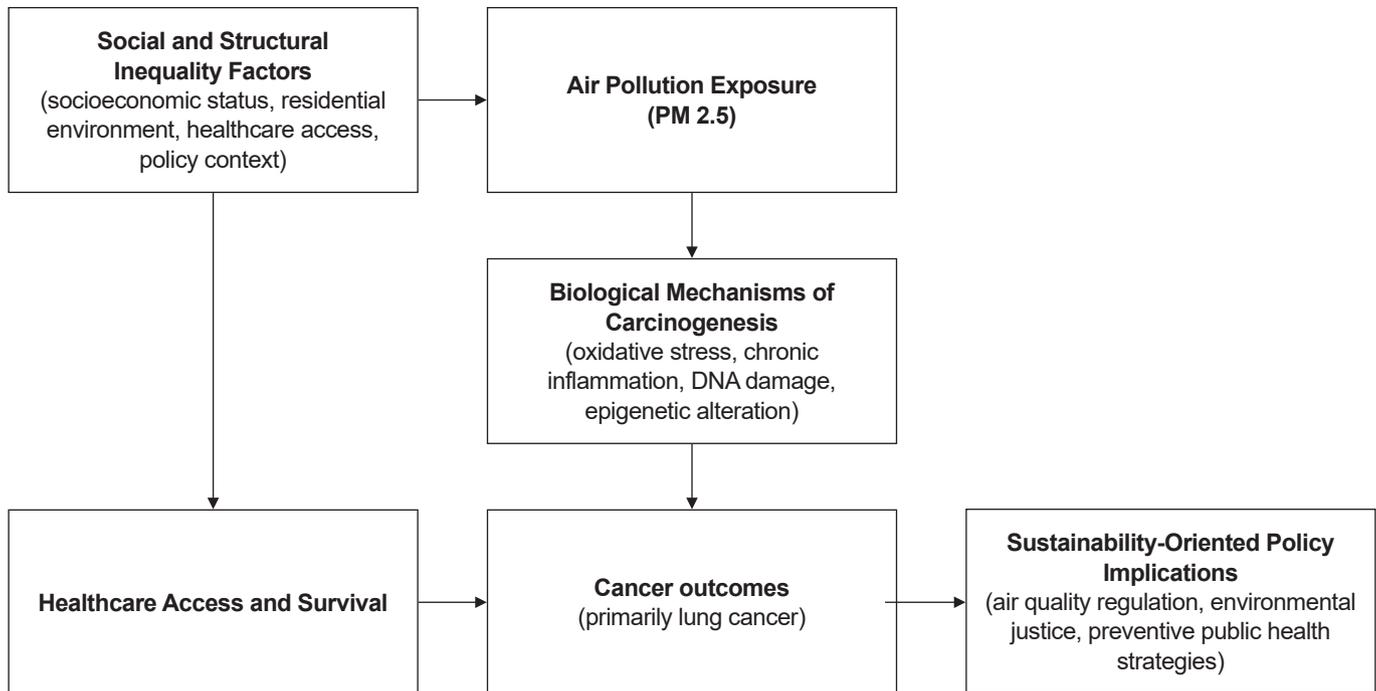


Figure 1. Conceptual Framework Illustrating Associations Between Air Pollution, Social Inequality, and Cancer Outcomes.

articles published in English between 2000 and 2024. Search terms included combinations of “air pollution,” “PM2.5,” “cancer,” “lung cancer,” “health inequality,” “environmental justice,” and “sustainability.”

Rather than quantitatively aggregating data, this method aimed to identify consistent patterns and themes within the literature, allowing for an integrated discussion of cancer as both a biological and social phenomenon.

1) Study Model

Based on the reviewed literature, a conceptual study model was developed to illustrate how social and structural inequality factors shape exposure to air pollution, biological pathways of carcinogenesis, and cancer outcomes. This framework also highlights the role of healthcare access and sustainability-oriented policy implications in modifying cancer risk and survival (Figure 1).

Analysis: The selected literature was analyzed qualitatively to extract key themes related to cancer risk, environmental exposure, and inequality. Particular attention was paid to evidence supporting associations between PM2.5 exposure and specific cancer types, especially lung cancer, which is most consistently reported in the literature. Studies addressing regional and socioeconomic disparities—including urban

industrial areas and East Asian contexts such as South Korea—were examined to highlight how uneven exposure contributes to cancer inequality.

The analysis focused on associative evidence rather than causal claims, reflecting the limitations of observational studies and the narrative review design.

3. Results

This section summarizes key findings from existing epidemiological and molecular studies regarding the relationship between air pollution, carcinogenesis, and cancer inequality. Rather than presenting original experimental data, the results reflect consistent patterns identified across the reviewed literature.

Associations between PM2.5 Exposure and Cancer Risk

Across epidemiological studies, long-term exposure to ambient air pollution—particularly PM2.5—has been consistently associated with increased cancer risk. The strongest and most robust evidence has been reported for lung cancer, with cohort and case-control studies demonstrating

higher incidence and mortality rates among populations exposed to elevated PM_{2.5} concentrations (Hamra et al., 2014; Pope et al., 2020). These associations remain significant after adjustment for major confounders such as smoking status, age, and occupational exposure, suggesting an independent contribution of ambient air pollution.

Emerging evidence also suggests potential associations between PM_{2.5} exposure and other cancer types, including bladder and breast cancer, although findings remain less consistent and are subject to greater uncertainty (Turner et al., 2017). Overall, the reviewed literature indicates that air pollution contributes to cancer burden primarily through lung cancer, with additional cancer risks requiring further investigation.

Biological Mechanisms Linking Air Pollution and Carcinogenesis

Mechanistic studies provide biological plausibility for the observed associations between PM_{2.5} exposure and cancer outcomes. Experimental and observational research suggests that fine particulate matter induces oxidative stress, leading to DNA damage and impaired DNA repair pathways (Li et al., 2016). Chronic exposure to PM_{2.5} has also been associated with persistent inflammation, which creates a tumor-promoting microenvironment and facilitates malignant transformation (Coussens & Werb, 2002).

In addition, growing evidence indicates that air pollution may influence epigenetic regulation, including DNA methylation and histone modification, potentially altering gene expression patterns relevant to carcinogenesis (Bollati & Bacarelli, 2010). While these mechanisms do not establish direct causation in human populations, they support a biologically plausible pathway linking environmental exposure to increased cancer risk.

Social and Structural Inequalities in Exposure and Cancer Outcomes

The reviewed studies consistently indicate that exposure to air pollution is shaped by social and structural inequality factors. Populations with lower socioeconomic status and those residing in densely populated urban or industrial areas experience disproportionately higher levels of PM_{2.5} exposure (Hajat et al., 2015). These exposure patterns overlap with disparities in healthcare access, including reduced participa-

tion in cancer screening programs and delayed diagnosis.

In the South Korean context, regional variations in air quality and cancer outcomes have been reported, particularly in metropolitan and industrialized regions, suggesting that environmental and social determinants jointly influence cancer risk and survival (Kim et al., 2021). These findings highlight that cancer outcomes are not determined solely by biological exposure but are modified by broader structural conditions.

Implications for Sustainable Cancer Prevention

Synthesized evidence from the reviewed literature indicates that addressing air pollution has implications beyond environmental protection. Policies aimed at reducing ambient PM_{2.5} levels—such as stricter emission controls and urban planning interventions—are associated with population-level health benefits, including reduced cancer burden (Pope et al., 2020). Importantly, prevention-oriented strategies that prioritize high-exposure and underserved populations have the potential to reduce cancer-related health inequalities.

These findings collectively suggest that cancer prevention strategies centered on environmental risk reduction and equitable healthcare access are essential components of long-term, sustainable cancer control.

4. Discussion and Conclusions

Discussion

This narrative review synthesized existing epidemiological and mechanistic evidence to examine how ambient air pollution, particularly PM_{2.5}, is associated with cancer risk and inequality. The findings suggest that air pollution contributes to cancer burden primarily through lung cancer, supported by consistent epidemiological associations and biologically plausible mechanisms. Importantly, the results highlight that cancer risk linked to air pollution is not distributed evenly across populations but is shaped by social and structural conditions that influence both exposure and healthcare access.

From a biological perspective, the reviewed literature indicates that oxidative stress, chronic inflammation, and epigenetic dysregulation provide plausible pathways through which PM_{2.5} exposure may increase cancer susceptibility. While these mechanisms do not establish direct causation in human populations, they support the interpretation that environ-

mental exposures interact with biological processes to influence cancer development. This reinforces the need to consider environmental risk reduction as a component of cancer prevention rather than focusing exclusively on treatment.

The discussion of cancer inequality underscores that environmental exposure and healthcare access are deeply interconnected. Populations experiencing higher levels of air pollution often face barriers to early detection and timely treatment, which may contribute to poorer cancer outcomes. In South Korea, urban density and industrial activity intensify exposure disparities, emphasizing the importance of region-specific environmental and public health strategies. These patterns suggest that cancer prevention efforts that overlook environmental inequality risk reinforcing existing health disparities.

Framing cancer prevention as a sustainability issue shifts attention toward long-term, preventive approaches that integrate environmental regulation and public health policy. Sustainable cancer control, in this context, refers to the capacity of health systems to reduce preventable cancer risk while promoting equity over time. Policies that reduce air pollution exposure have the potential to deliver co-benefits for population health, healthcare system resilience, and social equity, particularly when targeted toward high-risk communities.

Limitations

This study has several limitations. First, as a narrative review, it does not provide a quantitative synthesis of effect sizes, and the interpretation of findings is dependent on the quality and scope of the existing literature. Second, much of the evidence linking PM2.5 exposure to cancer outcomes is derived from observational studies, which are subject to residual confounding and exposure measurement error. Third, regional bias exists in the literature, with a predominance of studies from high-income countries, potentially limiting generalizability to other contexts. Finally, evidence for cancers other than lung cancer remains limited, underscoring the need for further research.

Conclusion

This paper examined cancer not only as a biomedical condition but as a public health challenge shaped by environmental exposure, social inequality, and structural policy contexts. Focusing on air pollution as a representative environ-

mental carcinogen, this narrative review synthesized epidemiological and mechanistic evidence suggesting that long-term PM2.5 exposure is strongly associated with increased lung cancer risk and may contribute to other cancers to a lesser extent. Biological processes such as oxidative stress, chronic inflammation, and epigenetic alteration provide plausible pathways through which environmental exposure may influence carcinogenesis.

Importantly, the findings highlight that cancer risk related to air pollution is not distributed evenly across populations. Communities experiencing higher environmental exposure often face additional barriers to cancer prevention, early detection, and treatment, compounding existing health inequalities. In contexts such as South Korea, where urban density and industrial activity shape regional air quality, these disparities underscore the need for prevention strategies that account for both environmental and social determinants of health.

From a sustainability perspective, effective cancer control depends on the capacity of health systems to reduce preventable disease burden while promoting equity over the long term. Addressing environmental carcinogens such as air pollution should therefore be understood as an integral component of cancer prevention, rather than as a separate environmental concern. Preventive approaches that reduce population-level exposure offer the potential to lower cancer incidence before irreversible biological damage occurs, while also alleviating pressure on healthcare systems.

This study also emphasizes the evolving role of life sciences in advancing sustainable health outcomes. Beyond therapeutic innovation, life science research can contribute to cancer prevention by engaging with environmental health, exposure science, and policy-relevant evidence. Integrating molecular biology with environmental and social frameworks enables a more comprehensive understanding of how cancer risk is produced and how it may be mitigated.

In conclusion, meaningful progress in cancer control requires a shift toward prevention-oriented strategies that address environmental and structural drivers of disease. Reducing air pollution represents a critical opportunity to lower cancer burden, narrow health inequalities, and support sustainable public health systems capable of protecting both present and future generations.

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Article

A Conceptual Study on ‘After-Critical’ Global Citizenship: A New Perspective of Interconnected Society Based on Critical Realism

Eunbin Lee*

The Department of Education, Yonsei University, Seoul, Korea

This paper explores the critical realist approach to global citizenship education (GCED) by reviewing contemporary discussions of GCED, primarily addressing the most relevant concepts of global citizenship from post-colonial/critical perspectives. In particular, this paper aims to discuss the distinctiveness of critical realist GCED in comparison with the preceding approach. While critical GCED has advanced important implications towards theory and practice in the field, and it is one of the most intensively accepted among the most recent scholarly discussions, it still encounters challenges such as a binary standpoint, a lack of deeper ontological consideration, and a failure to involve generative mechanisms to judge and achieve social justice. This necessitates a new or an alternative conceptualization of GCED. In response to the arguments, this paper suggests ‘after-critical’ global citizenship education that offers theoretical and methodological implications in developing a balanced analysis of the complex globalization and education. Calling for transformative praxis and reflexivity, it promotes relational engagement with concerns that situate oneself within and beyond a mode of being as global citizen. It envisages reconfiguring and responding the possibility of self and collective ontology, grounded in a deeper recognition of our essential totality in the social world in globalized community.

Keywords

Global citizenship education, Critical realism, After-critical global citizenship education

1. Introduction

With the expanding differentiation of globalization and the rapid rise of global crises, scholarly discussions of global citizenship and education have accelerated and often been renewed. Typically, theories of globalization have deterritorialized and denationalized the human community. The new one is that they even redefine not just the lines between the glob-

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*Corresponding author: Eunbin Lee, E-mail: eunbin.lee@yonsei.ac.kr

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al and local (i.e., glocalism) but also between human, animal, and other non-humans (i.e., post-humanism). Further rise of such planetary crises (e.g., global capitalism, digital revolution, climate change, and the COVID-19 pandemic) has prompted renewed international efforts to articulate shared global responsibilities. These developments are reflected in global policy frameworks such as United Nations Sustainable Development Goals (SDGs). In particular, SDG situates global citizenship education (here-after, GCED) as global agenda within broader commitments to sustainable development in SDG 4.7.

Moreover, recent discourse points to the need to conceptualize GCED as planetary ethics embracing humans and non-humans in achieving global solidarity (Torres & Bosio, 2025). It necessitated a rediscovery of the conception of the place of human community and nature, a shift in a new ontology. Perhaps, however, it is still too early to refer to the newly emerging form of society without deeply formulating relational properties and the complexities of global configurations. We still encounter the crisis at the sustainable unity of the human and all species or all beings, in a situation where our interdependence or interconnectedness has never been more acute (Bhaskar, 2002/2012).

The contemporary notion of interdependence (or interconnectedness), intrinsically connected to the social dynamics of globalization and globalization-within, is underpinned in education that upholds cosmopolitan morality, advocates inclusiveness for minorities, promotes social justice, and overcomes liberal, western-oriented globalism. Transnational semantics of interdependence and strategies of global citizenship serve those whose identities have been historically excluded from state citizenship, rearticulating themselves in modern territorial logic (Ong, 1996; 2006; Yuval-Davis, 1999). In this regard, recognizing how the typology of global citizenship and education is situated, “constructs (different) realities” (Andreotti, 2010). In accordance with it, the theoretical development of GCED is conceived as constitutive of a transformative trajectory to critical approaches, in emerging conflict to revise unity and responsibility in changing society (Bellino, 2018). This reveals the importance of noticing how discourses of GCED interact with transnational networks and power structures within adoption and interpretation on local, national, and global scales.

Widespread research on GCED underscores the importance of a critical approach and capacities for deliberating on social issues linked to global problems, structures, and sys-

tems, and call for a more critical approach has been emphasized in educational policy and practices (Andreotti, 2006; 2010; Alviar-Martin & Baildon, 2021; Goren & Yemini, 2017; Bellino, 2018; UNESCO APCEIU, 2024). It attempts to provide the space to reflect the notion of interdependence in the relationships among their own and others’, in particular among contingencies (Andreotti, 2006). However, it leads to a crucial question to explain how you can judge what is socially just or not, even though the critical approach inevitably entails a transformative orientation to social justice.

This parallels what Bhaskar (2002/2012; 2008) called ‘ontological irrealism’ and ‘epistemic fallacy,’ which systematically dissolve the irreducible and ontologically independent world into only that of the transitive network, and what network describes. Moreover, this lack of ontology fails to explain how existing relativity and interconnectedness emerge and mediate in the collective entities. In essence, its emphasis on individuals as autonomous actors falls back to superficial interplay between structure and agency, which is still caught in binary oppositions. The overarching discussion in critical GCED addresses the contrasting relations between the global North and South, as well as the dominant and subordinate. Moreover, this reveals the risk of weakening internal properties by neutralizing cultural differences and justifying post-modernist life forms in extreme cultural relativism.

In the meta-analysis of the theoretical discussions on GCED from Pashby et al. (2020), it stated that GCED asks only methodological and epistemological questions rather than those in the ontological aspect. The GCED requires a new ontological stand-point that ‘would likely not be legible for those over-socialized within a modern/colonial ontology.’ Therefore, they argue that GCED should support learners in the modern/colonial ontology. However, the post-modernist/post-colonial approach, properly so-called, finds it almost impossible to grasp a sense of underlying unity as members of a collectivity. Concerned with possibilities, tendencies, and powers, this paper argues that the concept of ontology should concern real categories that essentially construct our social world. There is no way of thinking about structural change without invoking a causality that exists constitutive of reality in different social actions of different social agents (Bhaskar & Hartwig, 2010).

In the pursuit of significant change and social justice, critical GCED aims for a better world than the existing system. It still remains, however, critical questions: How can we judge whether something is worth changing? How far should

change be pursued? Throughout, what is the alternative, and where to the next step of critical interrogation? In response to these inquiries, therefore, this paper examines the discourse of critical GCED and suggests the 'after-' critical global citizenship education. This critical realist approach can offer an alternative perspective.

2. The Discourses of Global Citizenship Education and Interpretations

The branches of the conceptualization of GCED are aligned with globalization process and development of citizenship. It has evolved through theoretical discourses synthesized from neoliberal, moral, social justice, and critical orientations (Franch, 2020; Pashby et al., 2020; Bosio & Schattle, 2021). With the historical resurgence of global citizenship, it relates and conflates with the roots that inherit the contested nature of citizenship and the complexities of global sentiment. The emergence of different local agendas and cultural frameworks informs the diverse languages and grammars surrounding the concept of global citizenship (Oxley and Morris, 2013), in both correlated and conflating ways. Aligning with the question of whether a global conception of citizenship does constitute a new theory of citizenship, the global notion of education is intensively discussed as a necessity for culturally diverse societies (Pashby, 2011, as cited in Franch, 2019).

The modern idea of nationstates and national citizenship had not destructed the idea of globalization and global citizenship. However, it assumes the reification of global society, or globalization as a dynamic historical process that has become (and it becomes) more complex, more uncertain, and more problematic. Although the economic dimension has been predominantly referred to as a scale of globalization, it has also generated responses to new global problems across interdisciplinary arenas across political, social, economic, and cultural dimensions of 'time-space compression' (Beck, 2002). It requires focusing more on other actors and spaces.

Global citizenship has its historical roots in a tradition that predates that of national citizenship (Schattle, 2008). However, it is challenging to see how notions of the 'global citizenship' can be defined and understood among the various concepts of 'global (or globalization)' or citizenship. One interpretation of the globalization processes questions they lead to the establishment of the so-called 'global village'. In-

stead, this realist approach suggests that the processes largely coincide with the Westernization of the world (Bauman, 1998). Global citizenship, through this standpoint, is not secure but is contingent. Put simply, the realist perspective emphasizes sovereignty, national interest, self-determination, and tends to critical against transnational justice (Mearsheimer, 2003, as cited in Auh & Kim, 2025). In this sense, education serves to individuals to navigate transnational interactions while prioritize the continuity of national identity as well as state-centric responsibility over normative universality. In that GCED aspires to universal values, global solidarity, and responsibility for humanity, it rather contrasts with the realities of global power dynamics and state-centric ideologies. As realist argues, the globalization process disintegrated the roots of masses, but does not integrate them. In the processes of industrialization, technological change, nor does it include them in a 'global citizenship' (Zolo, 2007).

Despite its stance against global integration, realism indeed acknowledges the influence of globalization on transnational obligation and rights. From this vantage point, GCED is considered as "a new form of currency that aligns with global power dynamics". This leads education to be critical on the limitations of global citizenship while maintaining learners' national identities and fundamental rights in the form of the states. This approach encourages a pragmatic understanding of global dynamics, aligning with realism's focus on the strategic deployment of GCED (Auh & Kim, 2025). However, the realist assumption tends to dismiss the educational necessities to be involved in the global issues, and empowering learners to address borderless issues like climate change, migration, and discrimination. The critics, therefore, stresses that such approaches risk maintaining power imbalances and fail to address global challenges, particularly including social justice, and systemic inequality (Carr, 2004).

3. The Post-Colonial/Critical Approach to Global Citizenship Education

The critical approach to GCED has been highlighted in response to the limitations of preceding interpretation of global citizenship and education. With the primary emphasis on social justice in challenging the status quo, critical GCED addresses the question: How can global citizenship education advance equality and justice within unequal societies? This includes identity-based conflict, the complex nature of de-

mocracy in multicultural societies, whether it promotes substantive change in the power relations inherent in the deepening inequalities of globalization, or whether it remains trapped within the neoliberal pressures that produce global competitiveness in markets. The GCED framework aims to expand circles of identification and shift toward collective values such as human rights, respect for diversity, and social justice. It warrants a critical approach to education; the purpose of change should be to examine and overcome the underlying structural inequalities of power and advocate for those marginalized to advance their expression of diversity and difference.

This post-colonial/critical approach to GCED relates to the epistemology of cultural relativism (Andreotti, 2006). Cultural relativism asserts that no culture can be judged by absolute or fixed standards. This contributed to deconstructing the Western-centric approach to the conceptual framework of globalization and to empowering voices of non-Western countries, including the Third sector. It highlights the complex, contingent, multicultural, and heterogeneous approach to deconstruct systemic injustice. This assertion of the difference is impactful to the conversation of global citizenship and GCED. It objects to the homogenizing structures of traditional politics and seeks to avoid imposing uniformity that shadows the oppressed people. As Andreotti (2014) suggested, critical GCED pursues social justice by cultivating critical literacy to realize that all subjects are a multiplicity of power relations. Indeed, critical assessment of 'false dichotomy' within, for example, global capitalism and global justice contributes to grappling with how the complexity of neoliberal power relations interacts with multiple scales and how it privileges some but oppresses others. It underscores the extension of our critique by pointing out 'onto-epistemic possibilities' beyond modernity (Oxley and Morris, 2013) and by promoting a discussion of modern/colonial imaginary, focusing on the systemic changes to the status quo.

The distinction between 'soft' GCED and 'critical' GCED, proposed by Andreotti (2014), has gained attention in both theoretical and empirical studies. The soft version of GCED is grounded in equality of interdependence, aiming for achievement development, harmony, tolerance, and acting in accordance with the general principles of democracy and universal values in a single moral community and common humanity (Schattle, 2008; Stein, 2015). It imposes values and norms constructed under the standardization of equality, which tends to eliminate difference and avoid critical investi-

gation of sociopolitical issues. This drives education to focus on competitiveness in the global market and enterprise (Gaudelli, 2009). In contrast, critical GCED contains the interdependence arising from a structured, unjust, and violent system and inequality. In the critical interrogation of pedagogy, learners critically perceive and what surrounds their world as global common, advancing practical action to reconstruct and change asymmetries (Torres, 2017; Torres & Bosio, 2025). Likewise, critical GCED accepts a more relativist ideology that aims to empower individuals to become agents of social transformation, particularly through a localized, grassroots, and post-colonial agenda in uneven globalization (Oxley & Morris, 2013; Shultz, 2007). Therefore, critical GCED involves examining a 'complex web of cultural and material local/global processes and contexts' (Andreotti, 2014), exploring social phenomena within their own context, identifying problems, and taking responsible actions.

GCED, particularly in a critical perspective, has been seen as pluralized, context-dependent, and discursively framed, which promotes the inclusion of the marginalized by power systems (Andreotti, 2014; Goren & Yemini, 2017; Shultz, 2007; Pashby, 2016). Therefore, it requires acknowledging complexity, contingency, multiple and partial conception, and underlying asymmetry and injustice; and education in a post-colonial/post-critical approach is accepted as the way to address this demand (Andreotti, 2010). While their orientations are rooted in various typologies, they 'represent a conflation of key debates regarding the extent to which structural change should focus on changing existing structures or forging entirely new ways of relating' (Pashby et al, 2020). In parallel with post-colonial orientation, a continued revision and mapping of discursive configurations is emphasized to enable GCED to be responsive to different kinds of challenges and situated interventions. Therefore, a postcolonial or post-critical GCED needs to center on continuing processes. This more critical orientation involves an educational framework that moves beyond traditional learning models, emphasizing the 'unlearn the learning from below.' (Andreotti, 2006). It is important to reflectively examine their own context and that of others through ethical relations to difference. It should serve as a means of 'conscientization' (in Freire's conception), involving gaining a deep, critical understanding of the world; enabling the detection and discussion of social and political contradictions and fostering identity development through the transmission of knowledge, skills, and values across generations (Bosio & Schattle, 2021).

Critical GCED claims to analyze one's position within the situated structures, thereby altering the underlying assumptions and power relations. That is, through critical literacy, education can empower individuals to challenge and change for social justice. However, this approach to emancipation education remains caught within a colonial way of thinking (Biesta, 1998, 2010, as cited in [Mannion et al., 2011](#)). Therefore, it necessitates a new perspective of GCED that seeks alternative theoretical discourse and practice in response to today's interrelated and complex community crisis which cannot be divided into binary way such as majority and minority, dominant and surrendered. In the following paragraphs, this paper will introduce the approach based on the critical realism.

4. Exploring an Alternative Approach to GCED based on Critical Realism (CR)

Critical realism (CR) is a metatheory in philosophy and the social sciences, developed by Roy Bhaskar. This began with intensive critiques against the positivist conception of science, which substitutes observable events for reality. CR also contests the resurgence of idealism and its discursive persuasion, which asserts that science operates by constructed imaginaries. Rejecting the collapse of ontological reality into epistemological notions (i.e., epistemic fallacy) and skepticism about deep structures making ontological commitments (i.e., ontological irrealism), CR insists on explanatory knowledge to understand the causality in social events as a *sui generis* reality. It primarily aims to explore the collective entities that exist with underlying properties and causal mechanisms rather than the regularities.

CR is distinctively featured by its commitment to ontology, or the theory of being. It believes that there is a real world that exists and acts independently of our knowledge. It consists of structures, generative mechanisms, and all sorts of complexity and relations. It is important to notice that from a critical realist standpoint, ontology cannot be reduced to epistemology. By virtue of the dispositional ontology, the world exists independently of conceptions, descriptions, and representations, as a real, causal structure that possesses emergent properties and generative powers. At the same time, knowledge is socially produced and therefore contextual, changeable, and fallible. It is concept-dependent; the structures do not exist without a conception of agents, but at the same time, we must remember that agents do not al-

ways have an absolutely correct conception ([Bhaskar, 2008](#)). We are open to the possibility that the social world can be falsely categorized, which could be in contrast to underlying structures or even conceal other truths. The social process and what we know can change over time.

While we cannot always separate observation from reality, we can approach the truth only if we can acknowledge that some are better than others and judge the best argument available. Put differently, it is possible to give better or worse grounds for preferring one system of beliefs or practices to another, so that we can sustain the rationality of our grounds for choice. Through these ideas, CR features in virtue of its explicit thematization of being; its understanding of the stratification of being; and its development of the ideas of being as in process, as a totality, can show the possibilities of a non-dualistic world ([Bhaskar, 2002/2012](#)).

Referring to stratified ontology means that each stratum is coconstitutive of the others, and should be conceived of in relational terms. It should be noted that higher orders do not determine lower orders of reality that mediate and actualize the causal powers of the systems. In this sense, CR understands society as an open system in which causality interweaves within a specific context, in contrast to a closed society that cuts off external influences, which is impossible in social activities. CR considers a social reality more than a transaction (open system) in which different causal powers emerge in contingent operation. Therefore, throughout these premises, CR asks: 'What are the distinguishing features of structures (or mechanisms) in the social world?' ([Bhaskar, 2002/2012](#))

CR understands reality as structured and ongoing, and social structure as identified through generative powers as mechanisms treated in causal analysis. This feature has the advantage of reconciling the overriding dichotomies, such as between positivism and idealism, and between macro-social and micro-social distinctions ([Granados-Sánchez, 2023](#)). In fact, historically, GCED has often been caught in binary oppositions: nationalism and cosmopolitanism; universalism and particularism; liberal and social justice; global and local; top-down and bottom-up; Western and non-Western; human and non-human; abstract and concreteness, theory and practice. In contrast, CR stands for the reality of non-dual states and phases of being, showing how they underpin and sustain all complex and multiple determinations of social forms and human history.

By analytically distinguishing social systems and citizens

at different levels, this provides a device for examining their causal mechanism, rather than reducing them to mere interaction. This ontological vantage point includes conceptual shift in such as interconnection, objectivity, subjectivity, internal relationality, universality or totality. Objectivity and subjectivity both emerge in the relation and presuppose sociality. In this sense, critical realist approach can be distinctive from post-colonial/critical approach (Table 1). Post-colonial/critical perspective on GCED emphasizes difference and diversity. It views society as a verb, ongoing process, and as always in flux. Each of individuals is engaged in a complex series of collectivity through exchange of diverse perspective. In contrast, critical realist says we are different, if we do not split or alienate ourselves from our universal structure ('essential unity') as human beings with others (Vandenbergh, 2014). That underlying unity is what the critical approach dismisses, or the lack of authentic notions of truth or objectivity. The critical realist approach is distinctive in accepting citizenship with 'intersubjectivity' of collective entities. It thematizes the specificity of both group interest and individual identity, without downgrading the idea of the essential unity of humanity,

particularly concerning the global crisis, as our interconnection has become striking. Therefore, it aims to uncover the mechanisms of interplay among different powers and reconstruct the complex globalized society (Vincent & O'Mahoney, 2018).

5. Discussion: The Implications for 'After-Critical' Global Citizenship Education to promote transformative praxis and reflexivity

Through the novel conception of stratified reality and the acknowledgement of the irreducibility of emergent properties, CR provides a balanced examination of possibilities in the complexity and coexistence of social elements: On the one hand, social phenomena have underlying mechanisms and relations (not only functional, but also causal) among other phenomena, rather than being reduced to regularities and tendencies. On the other hand, in order to access the generative mechanisms, they are articulated and experienced through investigation and judgment. It enables us to

Table 1. Post-colonial/critical GCED and Critical Realist GCED

Post-colonial/critical GCED (Andreotti, 2006)	Aspect	Critical realist GCED
All knowledge is partial and incomplete, constructed in contexts/cultures/experiences	Strategic Assumption	There is no inconsistency between the independent and socially produced knowledge
Direct interaction between agency and structure	Scope of Analysis	Analytically distinguish structure, culture, and agency with each unique property
Asymmetrical globalization, unequal power relations	Understanding of interdependence	World nevertheless depends upon, ultimately sustained by the non-dual states
Individuals as autonomous agents; participate in changing structures, assumptions, and power relations in their contexts	Social conscience	Reconcile structure (and culture) and agency, through which the irreducibility of each
Empower individuals to think/feel/act in the way of the system	Empowerment	Empower individuals to view social structure as pre-existing, but only in virtue of ongoing human activity
Explanation is to provide a socio-political account of how reality is socially constructed	Explanation	Explanation is to provide a causal account of the mechanisms by which and why the event occurs
Complexity, contingency, difference, diversity, change, accountability of 'otherwise'	Principle for change	Reaction to difference, diversity, and change without leaving the whole idea of universality
Reflexivity: the analysis and critique of the relations among perspectives, language, power, social groups, and social practices by individual)		Reflexivity: internal conversation defining configurations of concerns in relational totality
Dialogue		Choice as a real, irreducible feature of social life as change
Radical alterity		Relational alterity and intersubjectivity
Development of critical literacy	Goal of GCED	Understanding of differentiations and mediations in morphogenetic process
Notions of power, voice, and difference		Transformative activity and reflexivity
Responsibility for decisions and actions		Universal and harmonious satisfaction of human needs, striving for universal human emancipation

transcend the macro/micro debate; rather, it opens the 'black box' of the connection between macro-, meso-, and micro-orders (Vandenbergh, 2014). For example, at the macro level, we can identify the social and cultural order which constitutes citizenship in relational terms. At the meso-level, we find the institutional order of citizenship as a set of most efficacious ways. At the micro level, global citizenship exists as both the order of individual identification and interconnected association (Figure 1).

Referring to globalizing parameters not only indicates the transformation of de-territorial modifiers but also the radical transformation of human existence and survival. It should be understood dialectically, with explanatory critiques on the 'flux/dilemma' of globalization and global citizenship. In response, an 'after-critical' GCED grounded in the paradigm of critical realism can be an alternative. It is important to note that the term 'after-' is meant to be relevant but distinctive (as Pierpaolo Donati (2011) explains in his term of after-modernity) from critical GCED as we turn back to the next page and shift to the beginning of a new chapter of the story, whereas 'post-' assumes the continuity in the same chapter.

We are one world, a single world. Therefore, for de-alienation, we must think very profoundly of our own role in that universality. Because each and every one of us in what we do can make a difference. But we can only make a difference if, in some way, we are not alienated from ourselves.

(Bhaskar, 2002/2012)

This approach offers theoretical and methodological impli-

cations in developing a balanced analysis of the complex global citizenship and education. With its distinctive vantage point of ontological realism, it opens up the avenues for discussion about the multifaceted phenomenon of social activity, politics of identity, and difference. Notably, it simultaneously suggests abstract but 'real' universality, which is the critical GCED has considered problematic. Calling for transformative praxis and reflexivity, it offers the possibility for social transformation and change for examining emergent and complex mechanisms in global life forms. The new social movements are explained through interconnectedness in which a sense of our unity as members of the species, let alone as citizens within a united society, has been more essential to assert (Bhaskar, 2002/2012). It envisages reconfiguring and responding the possibility of self and collective ontology, grounded in a deeper recognition of our essential totality in the social world.

Based on CR, 'After-critical' GCED suggested in this paper can promote new approach to global society by showing explanatory critiques of the complex connection between individual needs and society. The praxis of the global citizen for social change is not just cognitive but consists of trouble, conflict, changes in power relations, the breaking up of social structures, and the building up of others. In this sense, global citizenship education in this framework focuses on examining the generative mechanism of how to understand the interconnectedness of the global community, and how the international subjects collaborate and take actions to address

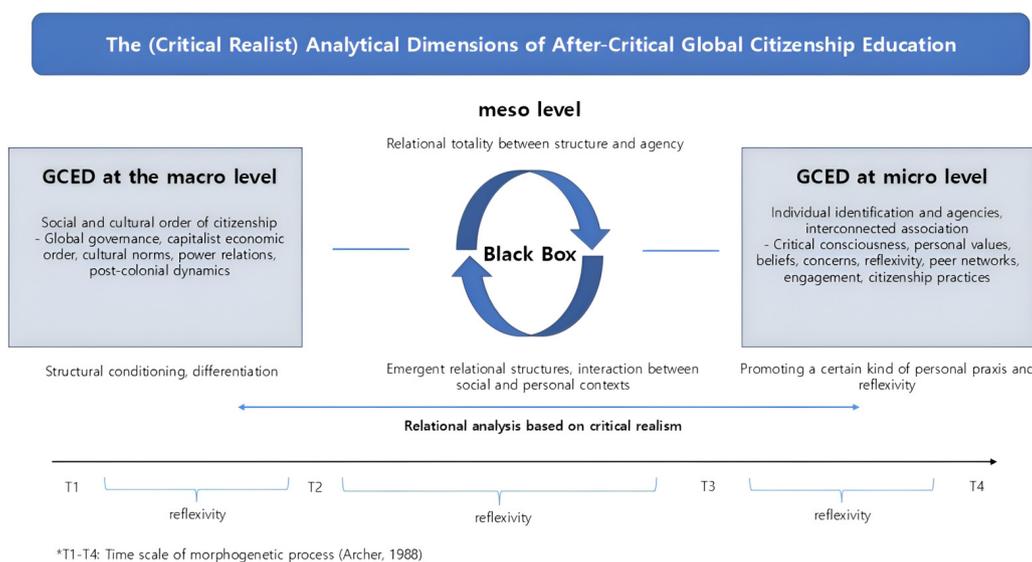


Figure 1. The Comprehensive Conceptual Framework for after-critical GCED (Source: drawn by author).

global crisis and collective goals for sustainable world as relational reality. The inquiries of this conceptualization of GCED, therefore, should produce explanations answering the 'why' question, which is relevant to the essential relations that necessitate social life in the globalized community.

This understanding emerges through 'reflexivity.' Critical realism, by virtue of its thematization of the stratified being as a new conception of interconnectedness and as transformative praxis and reflexivity, can show the possibilities of social life as change (Bhaskar, 2002/2012). Archer develops the conception of reflexivity as the internal conversation in which people are concerned with the connection of their social context. It is a mediating mechanism between structure and agency rather than conflating them, or between individual's situated outcomes and their actions (and vice versa) (Archer, 2003; 2012). The actor's powers of reflexivity on both self and society enable them to mobilize and commit themselves towards their 'concerns' (Archer, 2007). In a rapidly changing, dynamic society accorded by globalization, Archer emphasizes that reflexivity as an activity 'shared by all people, to consider themselves in relation to their social context and vice versa' (Archer, 2012), plays a primary role in enabling people to pursue 'concerns,' such as a sustainable society and well-being.

Post-colonial/critical GCED claims reflexivity to analyze one's position within the situated structures, thereby altering the underlying assumptions and power relations. That is, through critical literacy and self-emancipation, reflexivity can empower individuals to challenge and change for social justice. However, this approach to emancipation education remains caught within a colonial way of thinking (Biesta, 1998, 2010, as cited in Mannion et al., 2011). Moreover, that conception of reflexivity as well as the relationship between social structure and individual just points to transaction without "the specification of the conditions under which a transaction was likely to be successful, one whose are and to what end" (Archer, 2020). Therefore, it necessitates a new concept of GCED that seeks alternative educational theorization and practice in response to the interrelated crisis.

Such emphasis on the understanding of society and its relations in globalization process highlights that global challenges should not be addressed through isolated act. Rather, it requires forms of collective engagement grounded in concept of totality and universality based on critical realist approach. This vantage point presents an ontological inquiry into how relational structures sustain or hinders sustainable

community. It necessitates reconsidering humanity's place within ontological unities and calls for a renewed understanding of the generative properties that shape global interconnectedness. In this sense, the educational role to global citizenship with relational praxis for social change, is not simply a goal but a relational reality that must be understood ontologically.

Conclusion

This paper examined GCED through the lens of critical realism and proposed the conceptual framework of 'after-critical' global citizenship education. By reviewing theoretical discoursed and interpretations regarding GCED, particularly post-colonial/critical approach. At the same time, it identified limitations focusing on ontological understanding and the tendency to remain in binary oppositions that constrain deeper explanations of social transformation that global citizenship aims to promote.

In response to this argument, this paper introduced critical realism as a meta-theoretical framework to address these limitations. By emphasizing stratified ontology, emergent properties of transformative social change and analytically investigating the relational totality, the critical realist approach provided a framework for new understanding interconnectedness in more balanced way as an alternative world view. This perspective aimed to enable a more coherent account of how generative mechanisms shape both individual and social structure mutually conditions in complex global networks.

Based on the aforementioned discussions, this paper articulated 'after-critical' GCED. It tried to rediscover – rather than dismiss the critical approach – GCED with a relational ontology that acknowledges difference while affirming the structural interdependence of social life. Through this concept, GCED can be understood as situated within stratified social realities in which sustainable forms of society depend upon underlying causal relations.

In conclusion, this conceptual study can contribute to ongoing theoretical discussions GCED and sustainable global community. By clarifying the new ontological assumption of GCED, this paper can offer a conceptual basis for understanding how education can promote relational forms of cooperation in an increasingly interconnected world.

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