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edited by Alessandro Boccanelli
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Reframing Vulnerability in Global Health: Relations, Institutions and Inequalities

by Alessandro Boccanelli, Marco Menon, Laura Elena Pacifici Noja, Christina Savino*

In this issue of «UniCamillus Global Health Journal», the contributions converge around a shared reflection on vulnerability as a central category for a better understanding of the challenges posed by contemporary global health. Rather than being treated as either an individual condition or a simple outcome of structural factors, vulnerability is approached here as a dynamic phenomenon shaped by social relations, institutions, and broader global processes. From different disciplinary perspectives, the articles show how health risks and protective capacities are deeply shaped by the quality of relationships among individuals, between citizens and institutions, and across social groups embedded in political and economic contexts. Within this framework, vulnerability appears inseparable from inequalities in the distribution of resources, power, and agency, which manifest both in decision-making processes and in everyday practices and professional settings. At the same time, vulnerability offers a way to connect biological, social, ethical, and environmental dimensions of health that are often treated separately. Taken together, the contributions invite a rethinking of global health as an inherently relational space, in which understanding and addressing vulnerability requires integrated approaches that are attentive to the complexity of contexts.

Building on this understanding of vulnerability, Vera Kopsaj develops an original conceptual contribution that places social relations at the center of her analysis. Moving beyond dominant frameworks that conceptualise vulnerability primarily in individual or structural terms, Kopsaj introduces the notion of relational vulnerability, drawing on relational sociology to argue that health risks emerge through the configuration, quality and asymmetry of social ties, as well as their absence. The paper proposes an analytical framework based on four dimensions (density, quality, asymmetry, and absence), exploring how they interact over time. Finally, it proposes the idea of relational epide-

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miology as a complementary orientation that foregrounds relational processes rather than treating them as secondary variables.

Extending this concern to the way social and institutional relations shape unequal outcomes, Valentina Chiariello turns to the relationship between women's political representation and public health expenditure. Her article argues that gender differences in policy preferences can translate into distinct budgetary priorities, particularly in health and social sectors. By integrating cross-country evidence, subnational analyses, and quasi-experimental studies, the contribution documents a robust positive association between women's presence in political institutions and investment in healthcare, while also addressing persistent challenges of causal identification. Chiariello places particular emphasis on the still underexplored role of women in executive positions and on the mechanisms linking representation to policy outcomes, including spending priorities, allocative efficiency, and critical mass dynamics.

Valentina Alfonsi shifts the focus to sleep, a dimension of health that is often overlooked in global health debates. Her article first outlines the biological mechanisms regulating sleep, highlighting its essential role in cognitive functioning, immune response and metabolic balance. It then situates sleep within contemporary social transformations, showing how modern lifestyles (characterised by digitalisation, shift work and continuous activity) have generated widespread circadian misalignment and the phenomenon of "social jet lag". Alfonsi also highlights how sleep deprivation is unevenly distributed across socioeconomic groups, suggesting that sleep should be understood not only as a biological need but also as a socially patterned resource. By linking chronic sleep loss to major health, cognitive and economic consequences, the paper underscores its relevance for public health.

Moving from population-level determinants to the clinical sphere, Antonio Gioacchino Spagnolo highlights how vulnerability is also enacted and negotiated within everyday ethical relations in healthcare practice. The article highlights the centrality of clinical ethics in the education of healthcare professionals, positioning it as a foundational component of clinical competence rather than a supplementary domain. Moving beyond traditional models that privilege technical knowledge, Spagnolo shows how everyday clinical practice is inherently shaped by ethical questions, from patient autonomy and informed consent to resource allocation and end-of-life care. The paper conceptualises clinical ethics as a practice-based discipline rooted in the clinician-patient relationship and highlights its formative role in developing ethical competence, professional identity and patient-centred care. Adopting a global health perspective, it further demonstrates how ethical decision-making is deeply intertwined with structural inequalities, cultural diversity and conditions of vulnerability.

The relational framing of vulnerability is further reflected in Lorenzo Ippoliti's examination of hepatitis B vaccination among healthcare students, where institutional and training contexts shape exposure to health risks. After outlining the epidemiological burden of HBV infection and the achievements of universal vaccination programs, the article highlights the specific vulnerability of healthcare

students, who may face exposure to bloodborne pathogens during clinical training. Particular attention is given to the persistence of immune protection over time, noting that declining antibody levels do not necessarily imply loss of immunological memory. The paper further explores practical challenges faced by universities, especially in increasingly international academic contexts marked by heterogeneous vaccination strategies and documentation gaps. By analysing screening strategies, booster policies and the management of non-responders, Ippoliti underscores the importance of standardized protocols.

Finally, the global and structural dimensions of vulnerability are brought into focus by Mario Di Giulio's analysis of Tuvalu. It explores the intersection between climate change, legal identity, and human well-being. Facing the existential threat of sea-level rise, this small Pacific state has pioneered an unprecedented "digital statehood" strategy, seeking to preserve governance, citizenship, and cultural continuity beyond physical territory. The article explores how such innovations challenge traditional international law, particularly the territorial foundations of statehood, while raising critical questions about rights, equity, and resilience in a warming world. By situating Tuvalu's experience within broader debates on climate justice, displacement, and technological governance, it highlights the health implications of environmental loss, not only in material terms, but also in relation to identity, community, and access to essential services, offering thus a compelling lens on emerging global health vulnerabilities.

Taken together, the contributions in this issue offer a multifaceted account of how vulnerability is shaped across different scales of global health. Rather than treating it as a fixed condition, the six articles show it as a process that emerges through relations, institutions, and global dynamics, from clinical encounters to geopolitical transformations. This shared analytical orientation allows for a more integrated understanding of health risks and inequalities, while also opening up new perspectives on how vulnerability can be identified, governed, and potentially mitigated in increasingly complex and interconnected contexts.

Towards a Relational Understanding of Vulnerability in Global Health

by Vera Kopsaj*

Abstract
Global health scholarship has increasingly recognised the importance of social determinants in shaping health outcomes. Yet vulnerability is still commonly understood either as an individual condition or as the effect of broad structural disadvantage. Comparatively less attention has been devoted to the relational processes through which vulnerability is produced and experienced. This article proposes the concept of relational vulnerability, defined as a condition shaped by the density, quality, asymmetry and absence of social ties. It develops a parsimonious analytical framework based on these four dimensions and introduces relational epidemiology as a complementary perspective for examining how health inequalities emerge through relational contexts. Rather than replacing existing approaches, this perspective extends them by showing how vulnerability is constituted, mediated and reproduced through social relations.

Keywords
Global Health, Relational Vulnerability, Relational Epidemiology, Health Inequalities, Social Determinants of Health, Relational Sociology.

1. Introduction

Global health has increasingly moved beyond a strictly biomedical paradigm, giving greater attention to the social and economic conditions that shape health outcomes. Sociological research has contributed significantly to this shift by showing how inequalities, stigma and institutional arrangements influence patterns of disease, access to care and experiences of illness [1,2]. At the same time, longstanding sociological traditions have emphasised that health and illness are embedded in social relations and interactions rather than reducible to individual characteristics alone [3]. More recent contributions have also called for renewed attention to relational and ecological dimensions within epidemiological thinking [4,5,6].

Within this broad literature, the relevance of social relations for health is well established. Research shows that social integration, support, isolation and relational stress significantly influence morbidity and mortality [7,8]. Other studies have examined the effects of loneliness, social disconnection and network

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structures across different populations [9,10,11]. However, although relational factors are widely recognised, they are often treated as secondary variables within broader explanatory models rather than as a central lens for understanding vulnerability.

In dominant global health frameworks, vulnerability is still commonly conceptualised either as an individual condition or as the outcome of structural disadvantage. Even in influential approaches to the social determinants of health, factors such as income, education and housing are typically analysed as distinct variables [12,13]. While this perspective remains essential for identifying patterned inequalities, it often leaves less visible the relational processes through which health risks are mediated and experienced in everyday life. Debates in social epidemiology and population health have increasingly questioned the limits of variable-based approaches and called for more integrative, process-oriented frameworks [5,6].

This article develops that line of reflection by proposing the concept of relational vulnerability. Drawing on relational sociology [14,15], it argues that vulnerability should be understood not only in terms of individual attributes or structural locations, but also through the configuration, quality, asymmetry and absence of social ties. In this sense, vulnerability is approached as a relationally constituted condition, shaped by patterns of interaction, dependence, support and disconnection.

On this basis, the article advances a parsimonious analytical framework organised around four interconnected dimensions: relational density, relational quality, relational asymmetry and relational absence. It also introduces the idea of relational epidemiology as a complementary orientation for examining how health inequalities emerge through relational contexts. Rather than replacing existing approaches, this perspective extends them by making more explicit the relational mechanisms through which vulnerability is produced, mediated and reproduced across different settings.

2. Relational Vulnerability: A Conceptual Framework

Sociological work on health has consistently shown that illness and well-being are shaped by social conditions and interactions [3]. At the same time, a substantial body of research has demonstrated that social ties, networks and forms of integration play a significant role in influencing health outcomes [7,8,11]. However, these insights have not always been translated into a framework that systematically captures how vulnerability itself takes shape through concrete relational contexts. Much of the existing literature focuses on describing social conditions or identifying correlations, while paying less attention to how such conditions operate through everyday relational processes [5,6].

The concept of *relational vulnerability* is introduced here as a way of systematising these insights. It refers to a condition in which exposure to health risks is shaped by the configuration, quality and imbalance of social relations, as well as by their absence. In this sense, vulnerability is not approached as an individual attribute, nor solely as a structural position, but as a relationally constituted condition emerging through interactions, dependencies and disconnections over time [16].

In this view, individuals are not simply "vulnerable" in

themselves; rather, they become more or less vulnerable depending on how they are positioned within networks of relationships. This helps explain why individuals with similar socio-economic characteristics may experience different health trajectories depending on the relational environments in which those characteristics are lived. Such a perspective is particularly relevant in global health research, where populations are often treated as relatively homogeneous groups defined by socio-economic indicators, while internal differentiation linked to relational configurations remains less visible.

To clarify this approach, four analytically distinct but empirically interconnected dimensions can be identified.

1. *Relational density* refers to the extent and frequency of meaningful social ties through which individuals are embedded in networks of interaction. Higher levels of density may facilitate access to emotional, informational and practical support, whereas sparse or fragmented networks may limit such access, increasing exposure to risk. However, density alone is not necessarily protective and must be considered in relation to other dimensions.
2. *Relational quality* concerns the affective and interactional character of relationships. Supportive, trusting and cooperative ties may have protective effects on both physical and mental health, while conflictual, stressful or ambivalent relationships may contribute to vulnerability [10]. This dimension highlights that not all social ties are beneficial, and that the content of relationships is as important as their presence.
3. *Relational asymmetry* refers to structured imbalances of power, dependence or control within relationships. These asymmetries may shape access to resources, decision-making capacity and autonomy, thereby producing forms of vulnerability that are not always immediately visible. Such dynamics are particularly relevant in contexts such as caregiving, economic dependence, institutional settings or migration processes, where unequal relations may significantly affect health outcomes.
4. *Relational absence* captures the lack, erosion or breakdown of meaningful social ties. Conditions such as social isolation and loneliness are increasingly recognised as significant determinants of health [9], yet they are not always fully integrated into global health frameworks. This dimension emphasises that vulnerability may arise not only from the presence of problematic relationships, but also from their absence.

These dimensions are analytically distinct but often empirically intertwined. High relational density does not necessarily imply protection if relationships are conflictual or strongly asymmetrical; conversely, limited networks may intensify vulnerability through relational absence. Vulnerability thus tends to emerge from the interaction between these dimensions rather than from any single relational condition.

Relational vulnerability should also be understood as a dynamic process. Social ties are not static; they are formed, maintained, transformed and sometimes eroded over time. Processes such as the gradual weakening of support net-

works, prolonged exposure to conflictual relationships, or increasing dependence within asymmetrical ties may produce cumulative effects on health [5]. This temporal dimension highlights how vulnerability can develop progressively, rather than appearing as a fixed or pre-existing condition.

From a global health perspective, this framework suggests a shift from viewing populations primarily as aggregates defined by socio-economic indicators to recognising the internal differentiation produced by relational configurations. It does not replace established approaches based on social determinants, but complements them by making more visible the relational mechanisms through which vulnerability is lived, negotiated and reproduced within everyday social contexts.

Figure 1 illustrates how vulnerability emerges through social relations and is structured across four relational dimensions – density, quality, asymmetry and absence – which jointly shape health outcomes. The model highlights the importance of analysing relational processes in global health, in line with recent efforts to reintroduce relational and contextual awareness into epidemiological thinking.

The dimensions outlined above highlight vulnerability as a dynamic process emerging through ongoing relational interactions rather than as a fixed individual condition. From this perspective, vulnerability develops through patterns of interaction, support, dependence and disconnection that unfold over time. Health outcomes, therefore, cannot be fully explained without considering how individuals are positioned within networks of relationships, and how these positions shape access to resources, exposure to risk and opportunities for support. In this sense, a relational approach helps account for variations in health that remain difficult to explain through socio-economic indicators alone.

To synthesise, relational vulnerability can be understood as the combined effect of four interconnected dimensions: density (the extent of social ties), quality (the affective and interactional character of relationships), asymmetry (power and dependency imbalances), and absence (the lack or erosion of meaningful ties). Considered together, these dimensions provide a parsimonious framework for analysing how vulnerability emerges through relational configurations.

From an operational perspective, each dimension can be translated into measurable indicators that allow empirical investigation. Relational density may be assessed through network size, frequency of interaction or measures of network centrality. Relational quality can be explored using validated scales of perceived support, trust or relational strain. Relational asymmetry may be captured through indicators of economic dependency, decision-making power or caregiving imbalance, while relational absence can be measured through indicators of social isolation, loneliness or network fragmentation. These dimensions can be analysed both independently and in combination, allowing researchers to examine how different relational configurations shape exposure to health risks across contexts.

3. Toward a Relational Epidemiology

If vulnerability is understood as relationally constituted, it follows that the analytical frameworks used to study health

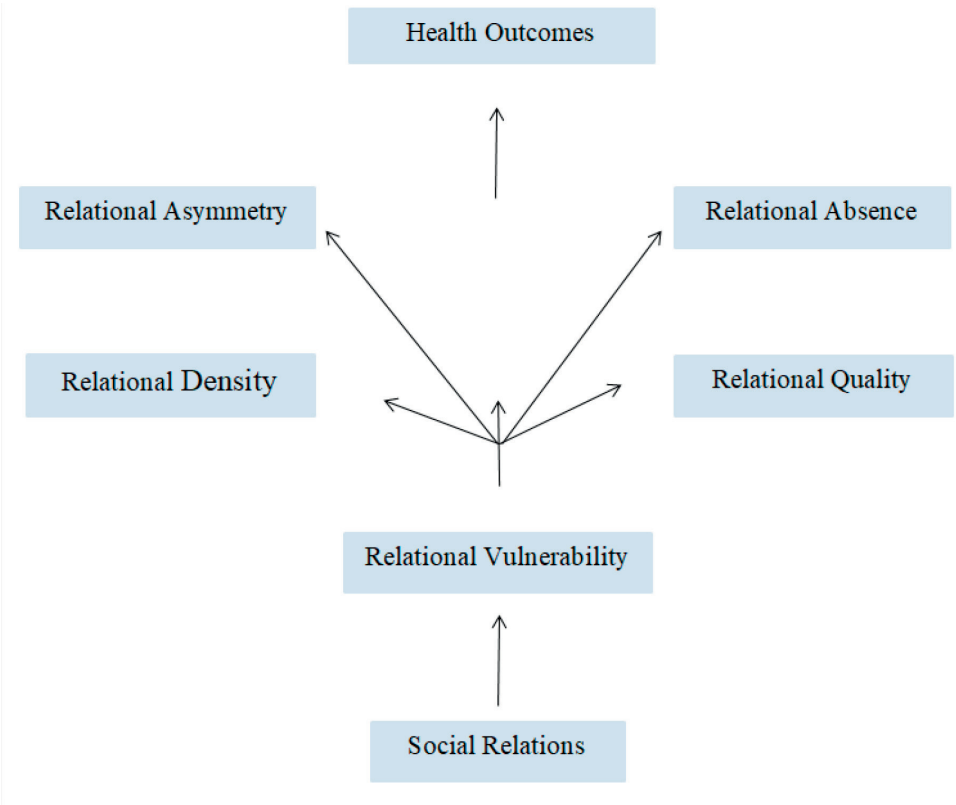

Figure 1. *A relational model of vulnerability in global health. Source: Author's elaboration.*

risks must also be reconsidered. Existing approaches in global health, including social epidemiology, have made important contributions by identifying patterned associations between health outcomes and social factors such as income, education and living conditions. These approaches have been highly effective in documenting inequalities and making them visible at population level [12,13].

At the same time, a growing body of scholarship has pointed to the limits of approaches based primarily on analytically separate variables, highlighting the need for more integrative and process-oriented frameworks capable of capturing interdependence and contextual embeddedness [5,6]. In this context, the relational dimension of health has increasingly been recognised, but often remains conceptually secondary or operationalised through proxy indicators such as social support or network size.

Against this background, the notion of *relational epidemiology* can be understood not as a new subfield, but as a complementary analytical orientation. Relational epidemiology is defined here as an approach to the study of health and disease that places the structure, quality and dynamics of social relations at the centre of explanation, rather than treating them as contextual or secondary variables. This perspective resonates with recent calls for a more relational and ecologically grounded epidemiology, which emphasises interdepen-

dence, care and situated forms of vulnerability [4,5].

From this perspective, the key question is not only how social factors correlate with health outcomes, but how such factors become consequential through concrete relational processes. While social epidemiology typically examines associations between variables, a relational approach directs attention to how individuals are positioned within networks of relationships, and how these positions shape exposure to risk, access to resources and capacities for response. This includes not only the presence or absence of ties, but also their quality, stability and asymmetry [11].

Such an orientation makes it possible to analyse how vulnerability develops over time through relational dynamics. Prolonged exposure to conflictual relationships, the gradual erosion of social ties, or increasing dependence within asymmetrical relationships may generate cumulative effects on health that are difficult to capture through standard indicators [10,9]. More broadly, relational configurations can mediate the impact of structural conditions, helping to explain why similar socio-economic contexts give rise to different health outcomes. This becomes particularly evident in the case of migrant populations, where vulnerability often arises not only from structural disadvantage but also from disrupted or fragmented social networks. The loss of family ties, combined with dependence on asymmetrical relationships with employers or institutions, may increase exposure to both physical and mental health risks. At the same time, the gradual reconstruction of supportive networks within migrant communities can mitigate such vulnerabilities.

These dynamics illustrate how the interaction between relational density, quality, asymmetry and absence produces differentiated health outcomes even within comparable socio-economic conditions.

This perspective is particularly relevant in contemporary global health contexts characterised by mobility, migration, institutional fragmentation and changing family structures, where relational ties may be unstable, unevenly distributed or subject to rapid transformation. In such settings, vulnerability is often produced not only by structural constraints, but also by disruptions, gaps or asymmetries in relational networks.

From a methodological point of view, a relational epidemiology suggests the need to combine different types of data and approaches. Quantitative methods may help identify patterns of association, while qualitative and network-based approaches can provide insight into how relationships are formed, maintained and experienced [7,11]. This does not imply replacing existing methods, but rather extending them to better capture relational processes.

From a clinical and policy perspective, this orientation also has implications. It suggests that individuals should be understood not only in terms of their individual characteristics, but also in relation to the social environments in which they are embedded. It also highlights the potential relevance of interventions aimed at strengthening social ties, reducing isolation and addressing relational asymmetries, alongside more traditional structural and biomedical interventions [17].

These considerations suggest that a relational epidemi-

ology can complement existing frameworks by bringing into focus mechanisms that are often difficult to capture through variable-based approaches alone. Rather than adding complexity for its own sake, it contributes to a more precise understanding of how health inequalities are generated and sustained across different contexts. In this sense, it aligns with broader efforts to develop more context-sensitive and relationally grounded approaches within global health [4].

At the same time, a relational epidemiological approach raises specific methodological challenges. The collection of relational data may be affected by recall bias, cultural variability in the meaning of relationships, and difficulties in capturing dynamic processes over time. In global health contexts characterised by mobility and institutional fragmentation, relational ties may be fluid and difficult to map using standard instruments. Addressing these limitations requires combining longitudinal designs, mixed methods approaches and culturally sensitive tools capable of capturing both the structure and the lived experience of relationships. Network analysis, qualitative interviews and participatory methods may be particularly useful in this regard.

4. Conclusions

Despite the growing attention to social determinants, global health research still tends to frame vulnerability in individual or aggregated terms. These approaches remain essential, but they do not fully capture how health risks take shape within everyday social relations.

This article has proposed the concept of relational vulnerability to address this limitation. The four dimensions outlined – density, quality, asymmetry and absence – offer a way of analysing how vulnerability develops through patterns of interaction, dependence and disconnection, rather than as a fixed condition.

The notion of relational epidemiology places social relations at the centre of analysis and calls for closer attention to how relational configurations shape exposure to risk and access to support over time.

A relational approach does not replace existing frameworks in global health, but complements them by making more visible the processes through which vulnerability is formed and experienced in concrete social contexts. This perspective may help to better account for variations in health outcomes that remain difficult to explain through socio-economic indicators alone.

Notes and References

1. Harris J., White A. (2019), *The sociology of global health: A literature review*, «Sociology of Development», 5(1), pp. 9-30.

2. Leonard C. (2024), *The sociology of global health: Inequality, disease-related stigma, and the rise of nongovernmental organizations*, «Sociology Compass», 18(2), e13176.

3. Barry A.M., Yuill C. (2021), *Understanding the sociology of health: An introduction* (4th ed.), Sage, London.

4. Adiabu S., Bemo V.N. (2026), *Compassionate epidemiology: A catalyst for reawakening ecological and relational awareness in global health*, «International Journal of Wellbeing», 16(2), pp. 1-12.

5. Krieger N. (2021), *Ecosocial theory, embodied truths, and the people's health*, Oxford University Press, Oxford.

6. Valles S. (2018), *Philosophy of population health: Philosophy for a new public health era*, Routledge, London.

7. Berkman L.F. *et al.* (2000), *From social integration to health: Durkheim in the new millennium*, «Social Science and Medicine», 51(6), pp. 843-857.

8. Holt-Lunstad J. *et al.* (2015), *Loneliness and social isolation as risk factors for mortality: A meta-analytic review*, «Perspectives on Psychological Science», 10(2), pp. 227-237.

9. Holt-Lunstad J. (2018), *Why social relationships are important for physical health: A systems approach to understanding and modifying risk and protection*, «Annual review of psychology», 69, pp. 437-458.

10. Majka E.A., Cacioppo J.T. (2020), *Loneliness*, in Gellman M.D. (Ed.), *Encyclopedia of Behavioral Medicine*, Springer, Cham, pp. 1302-1303.

11. Smith K.P., Christakis N.A. (2008), *Social networks and health*, «Annual Review of Sociology», 34(1), pp. 405-429.

12. Solar O., Irwin A. (2010), *A conceptual framework for action on the social determinants of health*, Discussion Paper, WHO Document Production Services, Geneva.

13. World Health Organization (2024), *Operational framework for monitoring social determinants of health equity*, World Health Organization, Geneva.

14. Emirbayer M. (1997), *Manifesto for a relational sociology*, «American Journal of Sociology», 103(2), pp. 281-317.

15. Donati P. (2011), *Relational sociology: A new paradigm for the social sciences*, Routledge, London.

16. Delgado J. (2021), *Vulnerability as a key concept in relational patient-centered professionalism*, «Medicine, Health Care and Philosophy», 24(2), pp. 155-172.

17. Abel Th., Frohlich K.L. (2012), *Capitals and capabilities: Linking structure and agency to reduce health inequalities*, «Social Science and Medicine», 74(2), pp. 236-244.

Women in Politics and Public Health Spending: A Review of the Literature

by Valentina Chiariello*

Abstract
This paper examines the relationship between women's political representation and public health spending. Drawing on the theory of substantive representation, it argues that gender differences in policy preferences lead female politicians to prioritize health and social expenditures. This article is intended as a literature review synthesizing comparative, subnational, and quasi-experimental evidence on the relationship between women's political representation and public health spending. Synthesizing evidence from different cross-country and subnational studies, the paper highlights that higher female representation, especially in executive positions, is associated with increased public health spending and improved health outcomes. It also observes key identification challenges, particularly endogeneity, and synthesizes recent empirical strategies to address them. Overall, the analyzed studies suggest that women's political participation has important implications for social sector and in particular public health, although its effects depend on institutional and socio-economic contexts.

Keywords
Political Representation, Health Spending, Gender and Politics, Social Policy.

> The priorities of women differ because women still have a different role in society, although with respect to gender equality there have been positive changes over the years. Women do have different experiences in everyday life, especially with regard to family and children. In addition, the way women act (for example in conflict resolution) is different to men.
>
> (Woman Member of the European Parliament)

> I think that women are more concerned about issues such as home help for families and carers, equal pay and human rights. They also want to see women represented more equally in all areas of life, not least in politics.
>
> (Male parliamentarian, United Kingdom)

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> Women's perspectives and political priorities emphasize social matters such as education, culture, food security and health care.
>
> (Woman parliamentarian, Lao People's Democratic Republic)

> Women and men are equal but different. Women are more family-oriented. They want running water, food and security. Men will focus more on transport, roads, communications, sports and war!
>
> (Woman parliamentarian, Kenya. Source: A survey of Women and Men in Parliaments IPU 2008)

1. Introduction

Public health spending represents a cornerstone of modern welfare states and plays a crucial role in shaping population health, social equity, and long-term economic development. As governments allocate substantial resources to healthcare systems, understanding the political determinants of public health expenditure has become a central concern in political economy and public finance.

In recent years, a growing body of literature has examined whether the gender composition of political institutions influences government spending priorities. In particular, scholars have investigated whether women in political office, as legislators, cabinet members, or local executives, affect both the level and allocation of public expenditures, with particular attention to social sectors such as health, education, and family policies.

A key motivation for this line of inquiry lies in documented gender differences in policy preferences. Empirical studies consistently show that women tend to prioritize health and social spending more than men [1,2]. These differences may translate into policy outcomes when women hold political office, either through their own preferences or through their ability to better represent the interests of female constituents [3,4]. Consistent with this intuition, a growing empirical literature finds that higher female representation in legislative bodies is associated with increased allocation of public resources to health and other social policies [5,6].

Despite this progress, much of the existing literature has focused on women's representation in legislatures, while comparatively less attention has been devoted to women in executive branches of government. This represents an important gap, as cabinets play a central role in shaping fiscal policy. Public spending decisions are typically formulated through cabinet negotiations during the budget process and subsequently approved by legislatures [7,8]. As a result, the gender composition of cabinets may have particularly strong implications for policy outcomes. Supporting this view, existing research shows that women in cabinet positions are associated with the adoption of female-friendly social policies [9].

Moreover, identifying the causal effect of women's political representation remains challenging due to issues of endogeneity. Policy environ-

ments, including levels of public health spending, may themselves influence women's political participation, while unobserved institutional and cultural factors may jointly determine both representation and policy outcomes. While some micro-level studies have addressed these concerns using electoral variation or quota policies [4,10], cross-country analyses often face more severe identification challenges.

An important contribution to this debate is provided by Mavisakalyan [11], who focuses on women's representation in government cabinets and proposes an innovative instrumental variable strategy based on the gender composition of national leaders' children. The study finds that higher female representation in the cabinet causally increases public health spending and contributes to improved health outcomes, including reductions in gender gaps in life expectancy. These findings highlight the importance of considering not only the presence of women in political institutions, but also their position within the hierarchy of decision-making power.

This article builds on and synthesizes this growing body of literature by reviewing the empirical evidence on the relationship between women in politics and public health expenditure. It integrates cross-national analyses [12,11], subnational and quasi-experimental studies [16,18], and research on contextual and conditional effects [19]. By combining insights from these different strands, the paper provides a comprehensive framework for understanding how gender representation shapes public health policy. Overall, the evidence reviewed suggests that women's political representation is not only relevant for issues of equality and democratic inclusion, but also has important implications for fiscal policy and the allocation of public resources to health systems.

This paper contributes by providing a focused narrative review of the relationship between women's political representation and public health spending. The reviewed studies were selected based on their relevance to the relationship between women's political representation and public health spending, welfare expenditure, and health outcomes. The review includes cross-country analyses, subnational studies, and quasi-experimental contributions. Particular attention is devoted to studies addressing endogeneity and causal inference through instrumental variables, regression discontinuity designs, and electoral or quota-based variation.

2. Theoretical Framework: Gender Representation and Spending Priorities

The literature on gender and public policy is grounded in the theory of substantive representation, which posits that descriptive representation, the presence of women in political institutions, can translate into policy outcomes reflecting women's preferences and interests [20]. Applied to public finance, this framework suggests that female politicians may prioritize sectors such as healthcare, preventive medicine, and social protection.

Within the framework of *Equality in Politics: A Survey of Women in Parliament* (IPU, 2008), the histogram shows a strong consensus that women bring different views, perspectives, and talents to politics. A clear majority of both men and women agree or strongly agree with the statement, with support being notably higher among women (72% strong-

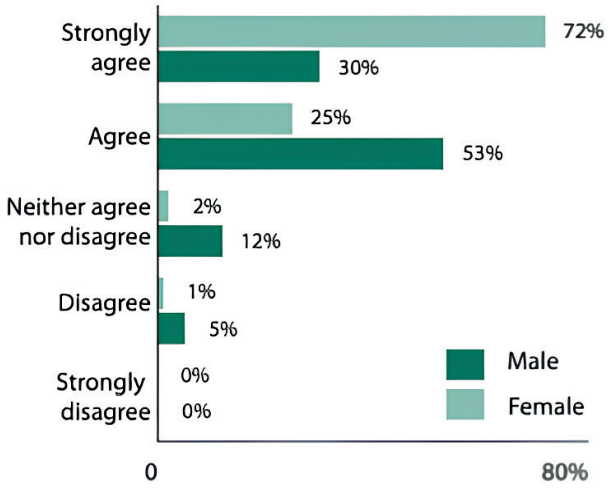

Figure 1. *Women bring different views, perspectives and talents to politics. Source: a survey of women and men in Parliaments IPU 2008.*

ly agree compared to 30% of men). Men are more likely to express moderate agreement, while levels of disagreement remain minimal across both groups. Overall, the data highlights a broad recognition, particularly among women, of the distinctive contributions women make to political life. The quotations and survey evidence reported by the IPU reflect perceptions expressed by parliamentarians and should not be interpreted as direct causal evidence of gender-specific policy behavior.

A central mechanism underlying this relationship is the existence of gender differences in policy preferences. A large body of empirical research shows that women tend to prioritize health and social spending more than men [1,2]. These differences may arise from both socio-economic roles and differences in risk perception, as well as from women's greater exposure to caregiving responsibilities.

When women gain access to political office, these preference differences may translate into policy outcomes through two main channels. First, female politicians may exhibit direct preference effects, shaping policy decisions according to their own priorities [3,4]. Second, they may improve policy responsiveness, as they are better able to represent and respond to the preferences of female constituents. Consistent with this view, several studies find a positive relationship between women's representation in legislatures and the allocation of public resources to health [5,6].

In addition to preference-based explanations, a care-oriented policy perspective highlights that health spending is closely linked to caregiving roles, which women bear [13]. This may lead female politicians to place greater emphasis on investments in maternal and child health, preventive care, and services for vulnerable populations.

A complementary line of argument emphasizes governance and efficiency effects. If women in political office are less prone to corruption or rent-seeking behavior [21], public resources may be allocated more effectively, increasing spending on productive sectors such as healthcare.

However, the literature also emphasizes that these effects are not automatic. Recent lit-

erature reviews also highlight the importance of institutional and contextual factors in shaping the substantive effects of women's political representation. Hessami and da Fonseca, in a comprehensive review of the empirical literature [22], show that female political representation is often associated with greater attention to welfare, health, and redistributive policies, although these effects vary considerably depending on institutional settings and the strength of causal identification strategies. Institutional constraints, such as party discipline, fiscal rules, and centralized budget processes, may limit the ability of individual politicians to influence spending outcomes. Moreover, the extent of women's impact may depend on their position within political hierarchies and their access to decision-making power [23,24,25]. Importantly, much of the early literature has focused on women's representation in legislatures, while comparatively less attention has been paid to women in executive positions, such as government cabinets. This represents a significant gap, as cabinets play a central role in shaping fiscal policy. Public spending decisions are typically formulated through cabinet negotiations during the budget process and subsequently approved by legislatures. As a result, cabinet members exert substantial influence over both the initiation and design of public health policies. Furthermore, compared to legislators, cabinet members are often appointed rather than directly elected, which may reduce electoral constraints and allow them to act more freely according to their preferences. This suggests that the gender composition of cabinets may have particularly strong implications for policy outcomes. Supporting this intuition, existing research shows that women in cabinet positions are associated with the adoption of female-friendly social policies [9].

A key empirical challenge in this literature is the issue of endogeneity. Public health spending and broader policy environments may themselves influence women's political participation, creating reverse causality [26,27,28]. Additionally, unobserved country characteristics, such as cultural attitudes and institutional quality, may simultaneously affect both gender representation and policy outcomes. While micro-level studies have addressed these issues using electoral discontinuities or reservation policies [4,10], cross-country analyses have often struggled with identification. An innovative approach to this problem is proposed by Mavisakalyan [11], who instruments women's representation in cabinet using the share of daughters among national leaders' children. The underlying intuition is that parenting daughters may shift leaders' attitudes toward gender equality and increase their propensity to appoint women to cabinet positions. Empirical evidence supports this mechanism, showing that having daughters influences political behavior and attitudes toward women's issues [29]. Using this instrumental variable strategy, the study finds that higher female representation in cabinets causally increases public health spending across countries. Moreover, it shows that greater female cabinet participation contributes to improvements in health outcomes, including reductions in gender gaps in life expectancy.

Although the validity of this identification strategy relies on strong assumptions, it represents an important contribution to the literature by

providing causal evidence on the role of women in executive decision-making. Overall, this line of research highlights the importance of considering not only the presence of women in political institutions but also their position within the hierarchy of power.

3. Evidence on Women and Public Health Spending

A substantial body of *cross-national research* examines the relationship between women's political representation and public health expenditure, providing consistent evidence of a positive association across different institutional and economic contexts. Ennser-Jedenastik contributes to this literature by examining the composition of family-related expenditures in OECD countries [30]. The study finds that women's political representation is associated with higher spending on in-kind benefits, such as childcare services, rather than cash transfers. This reflects a preference for policies that address the structural constraints faced by women in balancing work and family responsibilities. Moreover, the effect is stronger in countries with higher female labor force participation, suggesting that women politicians are particularly responsive to social demand. De Siano and Chiariello [12] show that women's political empowerment is positively associated with welfare spending across European countries, including health expenditure. Their spatial econometric approach reveals that these effects are not confined within national borders but exhibit significant spillovers across neighboring countries, suggesting that gender-related policy changes may diffuse internationally. Complementing this evidence, global panel studies based on large country-year datasets [13,14,15] find that increases in the share of women in national parliaments are associated with higher public health expenditure as a share of GDP, particularly in low- and middle-income countries. These studies also highlight that public health spending acts as a key transmission channel linking women's representation to improved health outcomes, such as reductions in infant and maternal mortality. A crucial extension of this literature focuses on the role of women in executive positions. Mavisakalyan [11] provides evidence that women's representation in government cabinets has a causal effect on public health spending. Using an instrumental variable approach based on the gender composition of national leaders' children, the study finds that countries with higher shares of women in cabinet allocate more resources to healthcare. Importantly, this research highlights that cabinet-level representation may be particularly influential, as cabinets play a central role in budget formulation and policy design. Unlike legislatures, where individual influence may be diluted, cabinet members participate directly in negotiations over budgetary allocations, making their preferences especially consequential for public spending outcomes. Overall, cross-national studies provide strong evidence that women's political representation, both in legislative and executive branches, is associated with increased public health spending. At the same time, they highlight the importance of addressing identification challenges and considering institutional context when interpreting these relationships.

While cross-country studies provide valuable insights, they often face limitations related to endogeneity and identifi-

cation. *Subnational and quasi-experimental studies* address these challenges by exploiting variation within countries and using research designs that allow for causal inference. One of the most influential studies in this literature is Brollo and Troiano [16], who use a regression discontinuity design based on close mayoral elections in Brazilian municipalities. Their analysis shows that municipalities governed by female mayors receive more federal transfers and allocate more resources to public goods, including healthcare infrastructure. These findings suggest that female political leadership can influence both the level and composition of public spending, shifting resources toward sectors that are closely linked to public health. Similarly, Svaleryd examines the impact of women's representation in Swedish municipalities [17]. Using survey data, the study first documents that female politicians have different policy preferences than their male counterparts, particularly prioritizing childcare and education. It then uses panel data to show that these preferences translate into actual policy outcomes: municipalities with higher shares of women in local councils allocate more resources to childcare and education relative to elderly care. This provides evidence that gender differences in preferences can shape budgetary decisions. Evidence from developing countries further strengthens the causal argument. Bhalotra and Clots-Figueras [18] analyze the effects of female political representation in Indian state legislatures and find that an increase in the share of women politicians leads to improved access to antenatal and child health services and significant reductions in neonatal mortality. These results provide a direct link between political representation, public spending, and health outcomes. Additional evidence from Spanish municipalities [31,32] shows that female mayors tend to prioritize social and health-related expenditures, even when total spending levels remain unchanged. These findings suggest that gender effects may be more visible in the composition of public budgets rather than in aggregate spending levels.

Finally, several studies emphasize that the impact of women's political representation depends on contextual factors, particularly the level of *social need*. Evidence from developing countries indicates that women's political empowerment is particularly effective in contexts characterized by weak institutions and high levels of unmet health needs. In these settings, increased representation can lead to significant improvements in both public spending and health outcomes. Courtemanche and Green [19] show that a greater presence of women in politics leads to increased public spending on healthcare for vulnerable groups, including children, the elderly, and people with disabilities. However, this effect is conditional: it becomes significant only when there is substantial demand for intervention. This suggests that women legislators are more likely to influence policy outcomes when they can mobilize support around pressing social issues. Similarly, Tadadjeu *et al.* [33] analyze data from 48 African countries over the period 2000-2017 and find robust evidence that women's political empowerment, measured through civil liberties, participation in civil society, and political representation, leads to higher public health expenditure. Their results confirm that strengthening women's

political participation can be an effective strategy for improving health investment and policy outcomes in developing contexts.

4. Mechanisms Linking Women in Politics to Public Health Spending

The literature identifies several mechanisms through which women's political representation influences public health expenditure. These mechanisms operate both directly, through policy preferences and budget decisions, and indirectly, through institutional and political channels.

First, *budgetary prioritization* plays a key role. A substantial body of evidence shows that female politicians tend to assign greater importance to policies that directly affect household welfare, particularly preventive care, maternal and child health, and universal access to basic health services. This reflects both gendered policy preferences and differences in lived experiences, which may lead women to be more attentive to social sector needs. As a result, higher female representation is often associated with increased allocations to public health systems and a stronger emphasis on redistributive and social policies [4,15,13,34].

Second, *improved allocation efficiency may enhance the impact of public spending.* Beyond the overall level of expenditure, female leaders may influence how resources are allocated and implemented. Evidence from quasi-experimental and cross-country studies suggests that women in political office may be associated with lower levels of corruption, better targeting of public goods, and more effective service delivery. These improvements can translate into greater health outcomes even without large increases in total spending, as resources are used more efficiently and leakages are reduced [27,35,36,21].

Third, *the concept of critical mass highlights the importance of representation thresholds*. Recent contributions further emphasize that the policy influence of women depends not only on descriptive representation but also on their effective participation in decision-making processes. Baskaran and Hessami [37] argue that the substantive effects of women in political bodies vary according to institutional arrangements, representation thresholds, and the extent to which female politicians are able to shape policy agendas and budgetary decisions. The influence of women in political institutions is not necessarily linear; instead, it often depends on reaching a sufficient level of representation that allows women to move beyond symbolic presence and actively shape policy agendas. Early contributions argue that women are unlikely to significantly influence policy outcomes when they constitute only a small minority, but their impact increases once they reach a "considerable minority" that enables collective action and agenda-setting [38]. In this context, scholars often identify thresholds, commonly around 15-30 percent, at which women become more effective in promoting policies related to social welfare, health, and family issues. When women constitute a substantial share of decision-makers, they are better positioned to form coalitions, influence legislative priorities, and participate meaningfully in budget negotiations. This collective presence increases the likelihood that health-related issues receive sustained attention and are translated into concrete fiscal commitments. Empirical research further supports the relevance of critical mass dy-

namics, showing that higher shares of female legislators are associated with stronger effects on social and health-related spending, particularly when representation crosses specific thresholds [39,40].

Finally, *electoral incentives may reinforce these effects.* A growing political economy literature shows that gender differences in policy choices can emerge from the interaction between voter preferences and reelection concerns. In particular, voters' gender bias and electoral incentives can induce female and male leaders to adopt different policy strategies [41]. Empirically, female politicians have been found to be more responsive to social policy demands, particularly in domains such as healthcare and public goods provision [18,4,42]. This responsiveness can translate into higher investments in healthcare systems, especially when such policies are salient and electorally rewarding.

Despite this substantial body of evidence supporting a positive relationship between women's political representation and public health spending, the literature also identifies several limitations and mixed findings. In some high-income countries, institutional constraints such as centralized budgeting processes, strict fiscal rules, and strong party discipline may limit the ability of individual politicians to influence spending decisions. As a result, increases in women's representation may not always translate into higher overall health expenditure. Moreover, several studies suggest that women's influence may be more pronounced in the composition of spending rather than its total level. For example, female politicians may prioritize preventive care or services targeting vulnerable populations without significantly increasing aggregate health budgets. Finally, issues related to endogeneity and measurement remain important challenges. While quasi-experimental and panel data approaches have improved identification, further research is needed to fully understand the causal mechanisms linking gender representation to fiscal outcomes.

5. Conclusion

Despite the growing body of evidence, several limitations remain and suggest caution in interpreting the relationship between women's political representation and public health spending as fully causal or universally consistent. A central issue concerns endogeneity and identification, particularly in cross-country analyses. Countries characterized by stronger welfare institutions, higher levels of development, or more progressive social norms may simultaneously exhibit both greater female political representation and higher public health expenditure, making it difficult to isolate the independent effect of women in politics. Although several studies attempt to address these concerns through instrumental variables, panel techniques, or quasi-experimental designs, identification challenges remain important and the validity of some causal strategies continues to be debated in the literature.

At the same time, the evidence reviewed in this article generally suggests that women's political participation is associated with greater attention to health and social welfare policies. Across cross-country analyses, subnational studies, and evidence from developing countries, female political representation tends to be linked to higher public investment in healthcare, preventive services,

maternal and child health, and other social sectors. However, these effects are not always uniform in magnitude or direction. In several contexts, women's representation appears to influence primarily the composition of public expenditure rather than the aggregate level of spending, redirecting resources toward more socially oriented policies without necessarily increasing total public budgets.

Moreover, the impact of women's representation appears to depend strongly on institutional and socio-economic conditions. Factors such as electoral systems, party discipline, fiscal constraints, decentralization, and the degree of access women have to executive decision-making power may significantly shape policy outcomes. The literature also suggests that women's influence may become more visible once representation reaches a certain threshold, enabling female politicians to move beyond symbolic presence and exert more substantial influence on budgetary decisions and policy priorities. Similarly, evidence from developing countries indicates that the relationship between women's representation and public health spending may be particularly strong where unmet social and health needs are greater.

Overall, the literature reviewed in this article points toward a generally positive relationship between women's political representation and public health-related policy outcomes. Nevertheless, the evidence remains context-dependent and heterogeneous across institutional settings and empirical approaches. While a number of studies provide relatively robust causal evidence, others identify more limited or conditional effects. Consequently, the findings should not be interpreted as implying that greater female representation automatically leads to higher public health spending in all contexts. Rather, the existing evidence suggests that women's political participation can constitute an important factor shaping governments' responsiveness to health and social welfare priorities, particularly when institutional conditions allow female policymakers to exercise meaningful influence over budgetary and policy decisions.

References

1. Shapiro R.Y., Mahajan H. (1986), *Gender Differences in Policy Preferences: A Summary of Trends from the 1960s to the 1980s*, «Public Opinion Quarterly», 50(1), pp. 42-61.

2. Funk P., Gathmann C. (2015), *Gender gaps in policy making: Evidence from direct democracy in Switzerland*, «Economic Policy», 30(81), pp. 141-181.

3. Besley T., Case A. (2003), *Political institutions and policy choices: evidence from the United States*, «Journal of Economic Literature», 41(1), pp. 7-73.

4. Chattopadhyay R., Duflo E. (2004), *Women as policy makers: Evidence from a randomized policy experiment in India*, «Econometrica», 72(5), pp. 1409-1443.

5. Rehavi M.M. (2008), *Essays on the political economy and measurement of public finance*, University of California, Berkeley.

6. Chen L.J. (2010), *Do gender quotas influence women's representation and policies?*, «The European Journal of Comparative Economics», 7(1), pp. 13-60.

7. von Hagen J., Harden I. (1995), *Budget Processes and Commitment to Fiscal Discipline*, «European Economic Review», 39, pp. 771-779.

8. Hallerberg M., von Hagen J. (1999), *Electoral Institutions, Cabinet Negotiations, and Budget Deficits in the European Union*, in *Fiscal Institutions and Fiscal Performance*, University of Chicago Press, Chicago-London, pp. 209-232.

9. Atchison A., Down I. (2009), *Women cabinet ministers*

and female-friendly social policy, «Poverty & Public Policy», 1(2), pp. 1-23.

10. Clots-Figueras I. (2006), *Female political representation and economic development in India*, London School of Economics and Political Science, London.

11. Mavisakalyan A. (2014), *Women in cabinet and public health spending: Evidence across countries*, «Economics of Governance», 15(3), pp. 281-304.

12. De Siano R., Chiariello V. (2022), *Women's political empowerment and welfare policy decisions: a spatial analysis of European countries*, «Spatial Economic Analysis», 17(1), pp. 101-126.

13. Rustagi N., Akter S. (2022), *The impact of women's political representation on child health outcomes during 1990-2020: Evidence from a global dataset*, «Social Science & Medicine», 312, 115366.

14. Mechkova V., Dahlum S., Petrarca C.S. (2024), *Women's political representation, good governance and human development*, «Governance», 37(1), pp. 19-38.

15. Bhalotra S., Clarke D., Gomes J.F., Venkataramani A. (2023), *Maternal mortality and women's political power*, «Journal of the European Economic Association», 21(5), pp. 2172-2208.

16. Brollo F., Troiano U. (2016), *What happens when a woman wins an election? Evidence from close races in Brazil*, «Journal of Development Economics», 122, pp. 28-45.

17. Svaleryd H. (2009), *Women's representation and public spending*, «European Journal of Political Economy», 25(2), pp. 186-198.

18. Bhalotra S., Clots-Figueras I. (2014), *Health and the political agency of women*, «American Economic Journal: Economic Policy», 6(2), pp. 164-197.

19. Courtemanche M., Green J.C. (2017), *The influence of women legislators on state health care spending for the poor*, «Social Sciences», 6(2), 40.

20. Pitkin H.F. (1967), *The concept of representation*, University of California Press, Berkeley-Los Angeles.

21. Carillo M.R., Chiariello V., De Siano R., Pennacchio L. (2025), *Foreign Aid and Corruption: Do Women Make the Difference?*, «Italian Economic Journal», 11(1), pp. 103-151.

22. Hessami Z., Lopes da Fonseca M. (2020), *Female Political Representation and Substantive Effects on Policies: A Literature Review*, «European Journal of Political Economy», 63, 101896.

23. Htun M., Weldon S.L. (2010), *When do governments promote women's rights? A framework for the comparative analysis of sex equality policy*, «Perspectives on Politics», 8(1), pp. 207-216.

24. Kittilson M.C. (2008), *Representing women: The adoption of family leave in comparative perspective*, «The journal of politics», 70(2), pp. 323-334.

25. Schwindt-Bayer L.A. (2010), *Political power and women's representation in Latin America*, Oxford University Press, Oxford.

26. Duflo E. (2012), *Women empowerment and economic development*, «Journal of Economic literature», 50(4), pp. 1051-1079.

27. Pande R. (2003), *Can mandated political representation increase policy influence for disadvantaged minorities? Theory and evidence from India*, «American Economic Review», 93(4), pp. 1132-1151.

28. Besley T., Burgess R. (2002), *The political economy of government responsiveness: Theory and evidence from India*, «Quarterly Journal of Economics», 117(4), pp. 1415-1451.

29. Washington E.L. (2008), *Female socialization: How daughters affect their legislator fathers' voting on women's issues*, «American Economic Review», 98(1), pp. 311-332.

30. Ennser-Jedenastik L. (2017), *Campaigning on the welfare state: The impact of gender and gender diversity*, «Journal of European Social Policy», 27(3), pp. 215-228.

31. Cabaleiro R., Buch E.J. (2025), *Does the gender dissimilarity of female mayors with their political government team affect municipalities' budgets? Evidence from Spain*, «Journal of Urban Affairs», 47(10), pp. 3849-3871.

32. Hernández-Nicolás C.M., Martín-Ugedo J.F., Mínguez-Vera A. (2018), *Women mayors and management of Spanish councils: An empirical analysis*, «Feminist Economics», 24(1), pp. 168-191.

33. Tadadjeu S., Belek A., Njangang H., Belomo M.L., Kamguia B. (2021), *Does women's political empowerment promote public health expenditure in Africa?*, «Economics Bulletin», 41(3), pp. 1959-1969.

34. Funk K.D., Philips A.Q. (2018), *Supplemental Materials for* Funk K.D., Philips A.Q. (2019), *Representative budgeting: Women mayors and the composition of spending in local governments*, «Political Research Quarterly», 72(1), pp. 19-33.

35. Iyer L., Mani A., Mishra P., Topalova P. (2012), *The Power of Political Voice: Women's Political Representation and Crime in India*, «American Economic Journal: Applied Economics», 4(4), pp. 165-193.

36. Swamy A., Knack S., Lee Y., Azfar O. (2001), *Gender and Corruption*, «Journal of Development Economics», 64(1), pp. 25-55.

37. Baskaran T., Hessami Z. (2025), *Women in political bodies as policymakers*, «Review of Economics and Statistics», 107(6), pp. 1501-1517.

38. Dahlerup D. (2006), *The story of the theory of critical mass*, «Politics & Gender», 2(4), pp. 511-522.

39. Childs S., Krook M.L. (2008), *Theorizing women's political representation: Debates and innovations in empirical research*, «FEMINA POLITICA–Zeitschrift für feministische Politikwissenschaft», 17(2), pp. 7-8.

40. Park S.S. (2017), *Gendered representation and critical mass: Women's legislative representation and social spending in 22 OECD countries*, «Sociological Perspectives», 60(6), pp. 1097-1114.

41. Chauvin J.P., Tricaud C. (2024), *Gender and electoral incentives: Evidence from crisis response*, NBER Working Paper, (w32410).

42. Kläy Y., Eichenberger R., Portmann M., Stadelmann D. (2025), *Substantive representation of women: Empirical evidence*, «British Journal of Political Science», 55, e32.

The Role of Sleep in Global Health: From Biological Mechanisms to Social Implications

by Valentina Alfonsi*

Abstract
Sleep is a physiological process essential to the proper functioning of the body and is crucial to overall health. In recent decades, a growing body of scientific evidence has demonstrated how the quality and quantity of sleep profoundly influence our psychophysical well-being, impacting the functioning of our cognitive, metabolic, immune, and cardiovascular systems. At the same time, socioeconomic, technological, and cultural changes over the years, starting with industrialization, have contributed to a progressive reduction in sleep today, creating a real "epidemic" of sleep deprivation that characterizes our time. This article describes the main regulatory mechanisms of sleep, its essential functions for survival, and the consequences of its disruption for the individual and for society. Finally, possible strategies for promoting sleep quality at both the individual and, ultimately, global levels are presented.

Keywords
Sleep, Sleep Deprivation, Social Jet Lag, Socioeconomic Changes, Sleep Promotion Strategies, Global Health.

1. Introduction

We spend approximately a third of our lives sleeping, and, to quote one of the most prominent sleep researchers, Allan Rechtschaffen, "If sleep does not serve an absolutely vital function, then it is the biggest mistake the evolutionary process has ever made".

Sleep is one of the fundamental biological needs of human beings, as nutrition and physical activity. Although it was long considered a passive state, scientific evidence now clearly demonstrates that sleep is an active, dynamic, and finely regulated process, essential for maintaining physiological and psychological balance.

In our current society, characterized by hectic lifestyles and intensive work routines, increasing urbanization, and widespread use of digital technologies, sleep is often

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overlooked. This phenomenon has led to the so-called "sleep deprivation epidemic", with significant consequences for individual and collective health.

Growing attention from international institutions such as the World Health Organization highlights how sleep is not just a private matter, but a crucial factor for global health, with implications ranging from chronic disease prevention to economic productivity.

The aim of this paper is to examine the physiological functions of sleep and discuss the impact of sleep deprivation and circadian misalignment on physical and mental health in contemporary society.

2. Sleep Physiology: Regulatory Mechanisms and Functions of Sleep

To fully understand the relationship between sleep and society, and how they influence each other, it is important to understand the main processes that regulate its functioning.

The regulatory mechanisms of sleep involve two fundamental systems: the homeostatic system and the circadian system [1].

The first mechanism, defined as homeostatic, refers to a "pressure" or drive to sleep that progressively increases with the time spent awake and is gradually dissipated throughout the night's sleep. This process is primarily biologically linked to the accumulation of substances such as adenosine, which increases in the brain during waking hours and induces a state of increased drowsiness. This is why substances that inhibit adenosine, such as caffeine, are effective in reducing drowsiness.

Alongside the homeostatic process, a second fundamental mechanism is the circadian process, so called because it regulates the sleep-wake rhythm over the course of a 24-hour period. This process is regulated by the sophisticated functioning of a fundamental structure located in our brain, the suprachiasmatic nucleus of the hypothalamus. This structure, which receives information about light through the retina, acts as a true "biological clock", capable of regulating the production of melatonin, an important hormone secreted by the pineal gland. Its concentration increases in the evening and peaks at night, signaling the brain when to fall asleep. This circadian process is essential not only for regulating the sleep-wake rhythm, but also for regulating circadian variations in temperature, metabolism, and cortisol levels.

Sleep, therefore, arises from the combination of these two processes and has a specific architecture that supports the performance of its essential functions [1].

First, each night's sleep consists of alternating different cycles (about 4-5) lasting approximately 90 minutes, each containing a sleep stage called NREM (Non-Rapid Eye Movement) and a stage of REM (Rapid Eye Movement) sleep, characterized by the presence of rapid eye movements.

In turn, NREM sleep is composed of a series of stages, as sleep deepens, moving from NREM Stage 1 (transition between wakefulness and sleep) to NREM Stage 2 (deepening sleep), and Stage 3 (true deep sleep, also known as slow-wave sleep).

NREM sleep accounts for 70-80% of total sleep and is essential for its restorative function and for the proper functioning of learning processes. REM sleep, in addition to the presence of rapid eye movements, is characterized by muscle atonia and brain activity similar to that of wak-

ing. In this phase, vivid dreams frequently occur, reflecting the state of activation of our brain, which effectively reprocesses the day's experiences.

As mentioned, sleep plays essential roles in our survival. Among these, the neurobiological mechanisms that occur during the night's sleep allow us to maintain the proper ability to encode information acquired during waking and consolidate it in long-term memory stores. Thanks to the dialogue between different cortical and subcortical structures in our brain (i.e., neocortex, hippocampus, thalamus), sleep is the stage where information acquired during the day is processed and stored in our declarative and procedural memory.

Sleep supports not only memory but also the regulation of the immune system through its underlying physiological processes. During the night, our body produces substances called cytokines, which help reduce the likelihood of infections or inflammation. This is why prolonged disruption of natural sleep-wake patterns can increase the risk of developing physical and psychological illnesses, lowering the immune system and making the body more vulnerable to disease [2].

Sleep also profoundly affects metabolic regulation and hormonal balance, affecting hormones such as leptin (the satiety hormone) and ghrelin (the hunger hormone), contributing to appetite levels and body weight fluctuations [3].

Recently, a growing body of research has investigated the role of sleep in the brain's "cleansing" mechanism of metabolic waste products accumulated during wakefulness, through the so-called glymphatic system. This system is essential for ensuring the removal of substances such as beta-amyloid, associated with the onset of neurodegenerative diseases such as Alzheimer's disease [4].

3. Impact of Modern Society on Sleep

Beyond the alteration of sleep-wake rhythms due to sleep disorders, life events, or individual lifestyle, in today's 24-hour society, there is an intrinsic and widespread condition of chronic sleep deprivation, which affects the population on a large scale.

The increasing modernization of our society has led to drastic changes, especially over the last two hundred years. On the one hand, the process of technological innovation has maximized the efficiency of modern life (i.e., artificial light, digital connectivity, uninterrupted commercial and healthcare services, speed of transport), on the other hand, it has had negative repercussions on various areas of life. Modern society is characterized by the demand for continuous availability, which necessarily reduces the space dedicated to rest. Night work, irregular shifts, and constant use of technology contribute to this phenomenon.

The circadian rhythms imposed by society are in fact misaligned with our endogenous rhythm, creating a discrepancy between social obligations such as school or work and our biological clock [5].

As previously described, the sleep-wake cycle is regulated by the suprachiasmatic nucleus of the hypothalamus, thanks to information from external light, which is the primary synchronizer of the circadian rhythm. Exposure to artificial light, particularly the one emitted by electronic devices, can interfere with this mechanism, delaying the onset of sleep and altering its quality. This phenomenon is particularly relevant in modern societies, where the use of smartphones

and computers is common late into the night.

The evident misalignment in today's 24-hour society between the biological clock and social rhythms leads to staying awake well beyond the necessary window, with significant consequences for physical and mental health [6].

In the short term, the effects of sleep deprivation caused by circadian dysregulation are primarily related to an increase in sleepiness and the consequent reduction in psychomotor alertness. Consequently, a decline in performance is observed, especially in tasks requiring specific cognitive functions (attention, memory, executive functions).

In the long term, prolonged sleep deprivation becomes chronic and leads to the onset of pathological processes, with the risk of developing actual organic diseases, particularly metabolic and cardiovascular diseases [7].

Given the spread of the phenomenon in recent years, a specific term has been coined to indicate this condition: "Social Jet Lag" (SJT) [8]. This term refers to the discrepancy between endogenous biological rhythms and exogenous social rhythms (school, work, commitments), which is measured by calculating the absolute difference between the midpoint (i.e., the clock time halfway between when you fall asleep and when you wake up) of sleep during free days and the midpoint of sleep on work or school days.

Approximately two-thirds of the working and student population in developing countries suffers from SJL, with a range of between one and two hours, highlighting this phenomenon as a major public health concern [9].

Daylight saving time (DST) (i.e., seasonal time change in which clocks are set forward by one hour in spring and set back by one hour in autumn) further dissociates the relationship between the sun and the social clock, moving the start of the social day forward by one hour compared to standard time. Although this method results in a reduction in energy expenditure during the period of application (from spring to autumn), the deleterious effects on individual health are widely known. The acute effects of sleep deprivation on the night of the time change have been associated with an increase in traffic accidents and heart attacks. Furthermore, many individuals require several weeks to adapt to the new rhythm imposed by DST, with a general deterioration in cognitive performance and psychophysical health [10].

Furthermore, within the context of SJL, it is interesting to note the Covid-19 pandemic impact, significantly altering social rhythms and living conditions. On the one hand, the interruption of many work activities and social confinement has reduced the extent of circadian misalignment, allowing greater adherence to rhythms and schedules consistent with one's chronotype and individual needs. On the other hand, the enormous increase in the use of digital devices has produced even more intense exposure to artificial light sources (e.g., blue light) at inappropriate times, with a consequent deterioration in sleep quality [11]. Blue light exposure in the evening reduces melatonin production and alters circadian rhythms through the activation of the suprachiasmatic nucleus, increasing alertness and delaying sleep onset.

Finally, regarding the impact of society on sleep, it is also appropriate to consider the presence of social inequalities inherent in mod-

ern society, which determine significant differences in the quality and quantity of sleep among different socioeconomic groups.

Sleep is a fundamental biological need, but its quality and duration are not equally distributed across the population. Available data confirms the existence of a social gradient in sleep. Sleep deprivation is a significant problem in the US and OECD (Organization for Economic Co-operation and Development) countries. Specifically, studies based on CDC (Centers for Disease Control and Prevention) data indicate that 33.2% of American adults sleep less than the recommended 7 hours per night, with a picture that progressively worsens in poorer countries [12].

Social inequalities profoundly influence sleep-wake rhythms. For example, people with precarious or shift jobs are at greater risk of experiencing irregular schedules and unfavorable conditions that disrupt natural sleep-wake rhythms. Furthermore, living in noisy, unsafe, overly crowded environments with poor access to healthcare has been shown to reduce sleep quality. In addition to work and environmental conditions, stress associated with potential economic challenges can also hinder sustained rest and sleep, contributing to the onset of disorders such as insomnia [13].

Finally, given the bidirectional relationship between sleep and health, poor sleep increases the risk of physical and mental illnesses, which in turn contribute to poor sleep quality. All this creates a vicious cycle that further widens the gap between populations of different social backgrounds.

Accordingly, preventive and therapeutic measures targeting better sleep patterns, both at the individual level and through specific social policies, are increasingly urgent and crucial for public health.

4. Consequences of Sleep Deprivation on Individual and Public Health

Chronic sleep deprivation, a condition affecting modern society, leads to the accumulation of a sleep debt associated with numerous diseases, including type 2 diabetes, hypertension, vascular and metabolic diseases. These conditions represent some of the leading causes of mortality globally.

Chronic sleep deprivation not only affects physical health but also has significant negative effects on mental health and well-being. Good sleep is essential for properly processing experienced events and for the ability to regulate emotions. Impaired sleep quality and quantity are therefore associated with the risk of developing psychological disorders such as depression, anxiety, and stress.

From a cognitive perspective, attention, memory, decision-making, and problem-solving skills are impacted by sleep deprivation, both in terms of reduced psychomotor alertness and alterations in the neurobiological processes underlying these functions. As a result, daytime performance is inevitably compromised, resulting in an increase in car accidents, workplace errors, and at-risk behavior.

Furthermore, disruptions in sleep-wake rhythms can lead, in predisposed individuals, to the onset of actual sleep disorders, such as insomnia, obstructive sleep apnea, narcolepsy, or restless legs syndrome. Treatment of these disorders can also be hampered by living and working conditions that conflict with proper sleep hygiene practices.

Several categories of professionals are particularly exposed

to chronic sleep deprivation, such as shift workers. Approximately 20% of the overall workforce is forced to work shifts, especially in the healthcare and transportation sectors [14]. In addition to an increased prevalence of sleep disorders in this population, disruptions in sleep-wake rhythms have negative consequences for psychophysical health and work performance. In healthcare professions, the heightened sleepiness frequently observed in shift workers, such as doctors and nurses, is associated with a greater probability of errors in clinical practice, with obvious repercussions on the service offered and, ultimately, on the health of patients.

Another at-risk group is made up of those who frequently travel across different time zones, exposing themselves to jet lag. Since the circadian system adapts rather slowly (it takes about a day to resynchronize in each time zone), jet lag occurs frequently and contributes to circadian rhythm disruption. Jet lag is associated with a wide range of consequences, from daytime sleepiness and sleep disturbances to reduced cognitive function or the onset of psychological disorders [15].

Not only specific occupational groups, but also certain age groups, are considered to be at higher risk of developing sleep problems due to the SJL. Among these, the age group most at risk is undoubtedly adolescents.

We know that sleep needs undergo wide variations throughout lifespan, progressively decreasing from birth to old age [16]. Adolescence represents a crucial period of brain maturation, in which the body and the brain require an optimal amount of sleep, equal to approximately 10 hours [17]. In this specific period, homeostatic and circadian processes undergo variations in the direction of a lower propensity to sleep during the evening hours, with a consequent tendency to fall asleep later and to demonstrate a late chronotype. This biological factor combines with a series of environmental factors, such as the increase in late afternoon or evening activities or the massive use of electronic devices close to bedtime and, above all, starting school at a time that does not align with the natural tendency to sleep longer in the morning. The combination of these factors determines the so-called "perfect storm", which leads adolescents to experience a permanent condition of sleep deprivation. Also, for this population, sleep loss leads to negative consequences not only for psychophysical well-being, but also for cognitive abilities. Several studies have demonstrated a worsening of academic performance associated with high levels of sleep deprivation in adolescents, because of increased levels of daytime sleepiness and reduced psychomotor alertness [18].

Fortunately, the deleterious effects of sleep deprivation progressively decrease with age, paralleling the reduction in social commitments due to school or work in people with many years of work experience or in retirement. Therefore, it is crucial to consider the broader context and age- and work-related factors when assessing the extent and effects of SJL.

Beyond global health, the costs of modern society-induced sleep deprivation also impact the economy. Traffic and work-related accidents, welfare policies, declining productivity, and increased health problems result in significant financial costs, especially for industrialized countries where sleep deprivation is most frequently encountered.

A recent cross-national comparative analysis of the economic costs of insufficient sleep in five countries (Canada, the United States, the United Kingdom, Germany, and Japan) estimated that the resulting financial losses amount to $680 billion annually [19].

5. Strategies to Improve Sleep and Public Health

Several studies have demonstrated the need of a dual approach to counteract the effects of sleep deprivation caused by circadian disruption: on the one hand, preventing and reducing risk conditions, and on the other, mitigating already compromised conditions to minimize the aforementioned negative effects on health and performance.

From a preventive perspective, psychoeducational interventions have proven effective thanks to the possibility of increasing knowledge of sleep processes and sleep hygiene practices (e.g., maintaining regular sleep schedules, avoiding screens before bed, creating a comfortable sleep environment, limiting caffeine and alcohol consumption). Indeed, it has been shown that at-risk workers or students are less vulnerable to potential negative consequences and better able to cope with them by learning appropriate strategies following a psychoeducational program [20].

Furthermore, to mitigate the impact of circadian disruption, it is necessary to implement effective operational interventions, both from a therapeutic and public policy perspective.

Cognitive-behavioral therapy for insomnia (CBT-I) is considered the first-line treatment for chronic insomnia. Its effectiveness has also been demonstrated in reducing the impact of circadian misalignment, across different contexts and age groups [21]. However, it is a complex and expensive intervention when applied to a large group, due to the necessary involvement of specialized professionals and the adoption of personalized cognitive and behavioral strategies. A possible solution could lie in the selection of specific categories of workers or individuals at risk, to whom targeted treatment could be addressed.

Current evidence indicates that a critically relevant factor in determining vulnerability to the deleterious effects of shift work is chronotype. Even among adolescent students, the evening circadian typology has been linked to greater negative effects on health and performance, compared to what was observed in students with a morning chronotype [22].

Not only chronotype, but also factors such as age, gender, work experience, sleep habits, and lifestyle can be elements to take into consideration when identifying populations most at risk and therefore candidates for specific sleep treatments.

What appears well-established is that, given this variability, the most effective intervention strategy is one based on an individualized approach [23]. The indiscriminate application of the same intervention protocols could not only prove ineffective, but also more expensive in terms of implementation.

Given the key role of exposure to sunlight, one of the interventions that has proven to be effective is the application of intense light therapy. Exposure to artificial light that simulates natural sunlight can help regulate sleep rhythms by directly influencing melatonin levels. This type of intervention has been widely used and proven effective both in adolescents and in shift workers [24,25].

Even in this case, the optimal solution consists in selecting those who, due to individual characteristics, particularly benefit from this intervention, for example, subjects with an evening chronotype.

It is possible to counteract the phenomenon of SJL not only through individual or group treatment and psychoeducation interventions, but also through actual changes in social policies. First of all, it could be appropriate to address the root causes by modifying work and school schedules to make them compatible with the natural physiology of sleep, thus decreasing the phenomenon of circadian misalignment.

Over the last twenty years, a growing number of studies have investigated the effects of delaying the start time of school in populations of adolescent students [18]. A consistent improvement in both alertness and academic performance, as well as an improvement in the well-being and overall health of students, has been uniformly observed. This finding is not surprising if we consider the previously described aspects of the peculiar sleep profile in this crucial phase of development.

Not only adolescents but also shift workers represent an at-risk population. Regarding this category of workers, a significant reduction in the dissociation between endogenous circadian rhythms and the circadian rhythms imposed by working hours can be achieved through specific policies to adjust work shifts, especially among healthcare professionals. Numerous studies have demonstrated that setting a maximum limit on consecutive nights (already in use in many countries) and particular types of shift rotations (forward rotation) are protective factors against the onset of sleep disorders in this population [26].

In conclusion, adequate sleep is essential for both individual well-being and the maintenance of social health. Therefore, effective countermeasures are needed to alleviate the symptoms of circadian misalignment and address its underlying cause (i.e., the discrepancy between the biological, solar, and social clocks).

Given the current state of society, it's possible that the negative impact of circadian rhythm dysregulation may even increase in the future, given the ongoing technological advances and the strengthening of policies that ensure continuity of care. For these reasons, promoting healthy sleep must be a priority on the public agenda. Furthermore, an integrated and multidisciplinary approach is needed, considering preventive and operational interventions on multiple domains (medical, psychological, and social) and targeting multiple sectors (work, school, and environment).

Possible solutions to achieve this goal include individualized therapeutic and psychoeducational programs and public health interventions, such as changing work schedules for shift workers, delaying the start of school for adolescents, or abolishing daylight-saving time.

6. Conclusions

Sleep is a fundamental aspect of global health, with implications that extend far beyond individual well-being. Its influence spans physical, mental, social, and economic domains.

In a world that is becoming ever more dynamic and interconnected, recognizing the importance of sleep and promoting healthy habits represents a crucial challenge for the future. Investing in sleep means investing in people's health, productivity, and quality of life.

Notes and References

1. Borbély A. (1982), *A two process model of sleep regulation*, «Human neurobiology», 1(3), pp. 195-204.

2. Irwin M.R., Michael R. (2015), *Why sleep is important for health: a psychoneuroimmunology perspective*, «Annual review of psychology», 66(1), pp. 143-172.

3. Spiegel K. *et al.* (2004), *Sleep curtailment in healthy young men is associated with decreased leptin levels, elevated ghrelin levels, and increased hunger and appetite*, «Annals of Internal Medicine», 141(11), pp. 846-850.

4. Xie L. *et al.* (2013), *Sleep drives metabolite clearance from the adult brain*, «Science», 342(6156), pp. 373-377.

5. Roenneberg T., Merrow M. (2016), *The circadian clock and human health*, «Current Biology», 26(10): R432-143.

6. Wittmann M. *et al.* (2006), *Social jetlag: misalignment of biological and social time*, «Chronobiology International», 23(1-2), pp. 497-509.

7. Sletten T.L. (2020), *Health consequences of circadian disruption*, «Sleep», 43(1), zsz194.

8. Wittmann M. (2006), *Social jetlag: misalignment of biological and social time*, «Chronobiology International», 23(1-2), pp. 497-509.

9. Roenneberg T. *et al.* (2007), *Epidemiology of the human circadian clock*, «Sleep Medicine Reviews», 6, pp. 429-438.

10. Hadlow N.C. (2014), *The effects of season, daylight saving and time of sunrise on serum cortisol in a large population*, «Chronobiology International», 31(2), pp. 243-251.

11. Alfonsi V. *et al.* (2021), *COVID-19 lockdown and poor sleep quality: Not the whole story*, «Journal of Sleep Research», 30(5), e13368.

12. Pankowska M.M. *et al.* (2023), *Prevalence and geographic patterns of self-reported short sleep duration among US adults*, «Preventing Chronic Disease», 20, E53.

13. Morin C.M., Rodrigue S., Ivers H. (2003), *Role of stress, arousal, and coping skills in primary insomnia*, «Psychosomatic Medicine», 65(2), pp. 259-267.

14. Anttila T., Härmä M., Oinas T. (2021), *Working hours – tracking the current and future trends*, «Industrial Health», 59(5), pp. 285-292.

15. Hilditch C.J., Fischer D. (2023), *Jet lag, sleep timing, and sleep inertia*, in Rudin-Brown C., Filtness A.J. (Eds), *The handbook of fatigue management in transportation: waking up to the challenge*, CRC Press, New York, pp. 195-213.

16. Kocevska D. *et al.* (2021), *Sleep characteristics across the lifespan in 1.1 million people from the Netherlands, United Kingdom and United States: a systematic review and meta-analysis*, «Nature Human Behaviour», 1, pp. 113-122.

17. Short M.A. *et al.* (2018), *Estimating adolescent sleep need using dose-response modeling*, «Sleep», 41(4), zsy011.

18. Alfonsi V. *et al.* (2020), *Later school start time: the impact of sleep on academic performance and health in the adolescent population*, «International Journal of Environmental Research and Public Health», 17(7), 2574.

19. Hafner M. *et al.* (2017), *Why Sleep Matters-The Economic Costs of Insufficient Sleep: A Cross-Country Comparative Analysis*, «Rand Health Quarterly», 6(4), p. 11.

20. Shriane A.E. *et al.* (2023), *Healthy sleep practices for shift workers: consensus sleep hygiene guidelines using a Delphi methodology*, «Sleep», 46(12), zsad182.

21. Vallières A. *et al.* (2024), *Behavioural therapy for shift work disorder improves shift workers' sleep, sleepiness and mental health: A pilot randomised control trial*, «Journal of Sleep Research», 33(6), e14162.

22. Magnúsdóttir I. *et al.* (2025), *Efficacy of brief behavioral and sleep hygiene education with mindfulness intervention on sleep, social jetlag and mental health in adolescence: a pilot study*, «Sleep and Breathing», 29(1), 81.

23. Alfonsi V. *et al.* (2021), *Sleep-Related Problems in Night Shift Nurses: Towards an Individualized Interventional Practice*, «Frontiers in Human Neuroscience», 15, 644570.

24. Richardson C. *et al.* (2018), *A randomised controlled trial of bright light therapy and morning activity for adolescents and young adults with Delayed Sleep-Wake Phase Disorder*, «Sleep Medicine», 45, pp. 114-123.

25. Touitou Y. *et al.* (2017), *Association between light at night, melatonin secretion, sleep deprivation, and the internal clock: Health impacts and mechanisms of circadian disruption*, «Life Sciences», 173, pp. 94-106.

26. Costa G. *et al.* (2014), *Stress and sleep in nurses employed in "3 × 8" and "2 × 12" fast rotating shift schedules*, «Chronobiology International», 31(10), pp. 1169-1178.

The Relevance of Clinical Ethics in the Training Curriculum of Healthcare Students

From Theoretical Knowledge to Global Ethical Competence in Clinical Practice

by Antonio G. Spagnolo*

Abstract

The growing complexity of healthcare requires educational models that prepare students not only in biomedical knowledge and technical skill, but also in ethical reasoning, reflective judgment, and responsible clinical conduct. This paper examines the relevance of clinical ethics in the training curriculum of healthcare students and argues that it should be recognized as a core component of health professions education rather than a marginal or optional supplement. Clinical ethics education enables students to identify morally significant features of clinical situations, analyze conflicts among values and duties, communicate effectively with patients and families, and respond appropriately to dilemmas involving informed consent, confidentiality, end-of-life care, cultural diversity, vulnerability, and resource limitations. The practical relevance of this educational need becomes especially evident in undergraduate nursing and midwifery training, where students encounter ethically complex situations related to dependency, dignity, truth-telling, restraint, informed consent during labor, refusal of obstetric intervention, maternal-fetal conflict, and care in contexts of perinatal loss or social vulnerability. The paper further argues that the relevance of clinical ethics extends beyond bedside dilemmas and is closely connected to the broader aims of global health, including equity, justice, and sensitivity to social and cultural determinants of health. After discussing the main educational and professional reasons for strengthening ethics training, the article examines persistent weaknesses in current curricula, including fragmentation, excessive theoretical abstraction, insufficient assessment, and the hidden curriculum. It then proposes a longitudinal and practice-oriented approach to ethics education based on case discussion, reflective practice, simulation, interprofessional learning, and exposure to clinical ethics consultation, with attention to profession-specific scenarios in nursing and midwifery education. Meaningful integration of clinical ethics into healthcare curricula is essential for the formation of professionals who are not only clinically competent, but also morally responsible and responsive to the complexities of contemporary care.

Keywords

Clinical Ethics, Medical Education, Healthcare Students, Nursing Education, Midwifery Education, Ethics Curriculum, Professionalism, Global Health.

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1. Introduction

Healthcare education has traditionally emphasized scientific knowledge, technical competence, and evidence-based clinical reasoning. These dimensions remain indispensable. However, contemporary clinical practice continually confronts students and professionals with questions that cannot be resolved through biomedical expertise alone. Decisions concerning informed consent, truth-telling, confidentiality, proportionality of treatment, refusal of care, end-of-life decision-making, and the distribution of scarce resources all require ethical judgment in addition to clinical knowledge.

For this reason, healthcare training cannot be limited to the transmission of scientific information and procedural skill. Future professionals must also be prepared to recognize ethically significant situations, deliberate in a structured and responsible manner, communicate across differences in values and expectations, and act in ways that respect the dignity and vulnerability of patients. Clinical competence, therefore, should not be conceived as merely technical competence. It also includes the ability to integrate ethical reflection into patient care.

International educational frameworks support this view. The World Health Organization developed a module for teaching medical ethics to undergraduates aimed at fostering the knowledge, skills, and attitudes necessary to guide ethical conduct and decision-making in practice. The World Federation for Medical Education likewise embeds ethics and professionalism within its 2020 global standards for basic medical education [1,2]. In parallel, contemporary scholarship in health professions education emphasizes that ethics education should not be restricted to the transmission of principles, but should support the development of ethical competence in both university and clinical settings [4].

This paper argues that clinical ethics is indispensable in the training curriculum of healthcare students because it transforms ethical sensitivity into professional competence, strengthens patient-centered care, and prepares future practitioners to work responsibly in pluralistic and unequal healthcare contexts. It also contends that the relevance of clinical ethics extends beyond bedside dilemmas and is closely connected to the wider aims of global health, especially justice, equity, and attention to social and cultural determinants of health.

2. Clinical Ethics and Its Educational Meaning

Clinical ethics may be defined as the area of applied ethics concerned with moral questions arising in the care of individual patients. In contrast to bioethics in its broadest sense, which includes a wide range of philosophical, legal, social, and policy issues, clinical ethics is closely linked to concrete decision-making in healthcare settings. It addresses situations in which patient preferences, professional duties, family interests, uncertainty, vulnerability, institutional norms, and limited resources come into tension.

In introducing this field, it is important to acknowledge Edmund D. Pellegrino, widely regarded as one of the founding figures of modern clinical ethics and often described as a father of clinical ethics. Pellegrino gave particular prominence to the clinical encounter as the privileged moral space of

medicine and described clinical ethics as "biomedical ethics at the bedside" [3]. This formulation is especially significant because it underscores that ethical reflection in healthcare is not external to clinical practice, nor merely theoretical, but arises within the concrete relationship between clinician and patient. Clinical ethics, in this sense, is rooted in the moral dimensions of everyday care and in the decisions that must be made in conditions of vulnerability, trust, and uncertainty.

For students in the health professions, these questions are not remote or hypothetical. Ethical issues emerge early in training, often during observation, simulation, and clinical placements. Students may witness inadequate communication, paternalistic attitudes, disregard for vulnerable persons, or conflict among members of the healthcare team before they possess the conceptual tools to interpret such experiences. Ethics education provides those tools. It helps students recognize when a situation has an ethical dimension, analyze competing considerations in a structured way, and understand that ethically responsible action is part of good clinical practice rather than an optional addition to it.

The educational significance of clinical ethics lies precisely in this formative role. Its aim is not merely to familiarize students with principles or regulations, but to cultivate ethical competence. As synthesized in an integrative systematic review, ethical competence involves the ability to identify ethical problems, reflect on one's own knowledge and actions, make wise choices, and manage ethically challenging situations in practice [4]. This broader understanding is particularly important in healthcare, where students are preparing for professions in which decisions affect bodily integrity, suffering, trust, and sometimes life itself.

3. Why Clinical Ethics Should Be a Core Curricular Component

The first reason for integrating clinical ethics centrally into healthcare curricula is that ethical issues are intrinsic to healthcare practice. They are not exceptional occurrences. Every clinical environment involves questions about respect for persons, competing goods, professional responsibility, and the interpretation of what constitutes a patient's best interests. To treat ethics as marginal is therefore to misrepresent the nature of clinical work itself.

A second reason concerns professional identity formation. Students do not become healthcare professionals solely by acquiring disciplinary knowledge and practical skills. They also become professionals by internalizing norms of responsibility, honesty, accountability, respect, and compassion. Medical ethics education has been described as essential to the cultivation of professionalism because it supports the development of habits of judgment, integrity, and public accountability that extend beyond technical proficiency [5].

A third reason is the contribution of clinical ethics to patient-centered care. High-quality care does not consist only in selecting the technically appropriate intervention. It also requires careful attention to the patient's values, preferences, life context, and capacity for participation in decision-making. Ethical reasoning is therefore inseparable from communication, shared decision-making, and respect for autonomy.

A fourth reason is that ethics education can help stu-

dents manage moral distress. During training, students often encounter situations in which they perceive that something is wrong but lack the confidence, authority, or language to respond. When ethics is taught in a serious and structured way, students are given interpretive resources and legitimate spaces for reflection. This can reduce helplessness and reinforce the idea that raising ethical concerns is part of professional responsibility.

4. Clinical Ethics in a Global Health Perspective

The relevance of clinical ethics becomes even more evident when considered from a global health perspective. Global health is concerned not only with cross-border health problems, but also with the conditions that generate and reproduce vulnerability, unequal access to care, and disparities in health outcomes within and across societies. Contemporary healthcare is increasingly delivered in contexts marked by migration, demographic change, cultural pluralism, fragile health systems, constrained resources, and persistent social and economic inequalities. In such settings, clinical decisions are shaped not only by medical facts and individual preferences, but also by broader determinants such as poverty, legal precarity, discrimination, language barriers, unequal health literacy, and uneven distribution of services and opportunities for care.

For example, in nursing and midwifery education, the global health relevance of clinical ethics becomes especially visible in concrete care settings shaped by inequality and cross-cultural complexity. Midwives regularly encounter ethical challenges in practice that arise from the interaction of personal beliefs, cultural expectations, institutional constraints, and professional responsibilities. These challenges can affect their capacity to deliver care that is respectful, supports autonomy, and ensures fairness. Strengthening ethical competence, enhancing professional agency, and fostering supportive institutional environments are therefore crucial to better ethical decision-making and higher-quality maternal care [6]. Nursing students may encounter ethically significant situations when caring for migrants, undocumented patients, homeless persons, or older adults with limited family support, where discharge planning, continuity of care, adherence, and confidentiality are affected by structural barriers rather than individual choice. As future providers of medical services, nursing students require strong ethical sensitivity to effectively manage clinical ethical dilemmas. However, studies have shown that they often exhibit lower ethical sensitivity than practicing nurses, which may hinder their ability to address ethical challenges competently.

They may also confront tensions between institutional rules and patient needs in overcrowded or under-resourced settings, where respect for dignity and equitable access to care become difficult to secure in practice. Midwifery students, similarly, may face ethical challenges in caring for women with limited access to antenatal services, linguistic mediation, or pain relief during labor; in situations where cultural expectations surrounding childbirth differ from institutional protocols; or in contexts where social vulnerability, gender inequality, or precarious legal status restrict a woman's effective autonomy. In such circumstances, clinical ethics education helps students to understand that apparently

individual clinical problems are often shaped by broader global health inequities, and that ethically responsible care requires sensitivity not only to personal preferences, but also to the structural conditions that constrain choice, voice, and access to appropriate care.

Within this framework, clinical ethics acquires a significance that goes beyond the management of isolated bedside dilemmas. It becomes a necessary interpretive and practical tool for understanding how structural conditions enter the clinical encounter and influence both decision-making and the possibility of genuinely patient-centered care. A patient's apparent non-adherence, for example, may reflect socioeconomic exclusion, unstable housing, limited access to medication, or fear linked to migration status rather than individual irresponsibility. Difficulties in obtaining meaningful informed consent may arise not only from inadequate communication, but also from language exclusion, educational disadvantage, gender inequality, or mistrust rooted in previous experiences of marginalization or institutional injustice. Similarly, decisions about whether to pursue costly interventions, allocate limited resources, or ensure continuity of care often reveal tensions between individual benefit and distributive fairness that are central to global health ethics.

From this perspective, clinical ethics education should not be confined to a narrow catalogue of classical dilemmas, but should prepare students to recognize the ethical significance of structural vulnerability and social determinants of health as they manifest in everyday clinical practice. This includes the ability to understand how inequities related to class, gender, ethnicity, disability, geography, or migration status may shape not only access to care, but also communication, trust, autonomy, and the range of choices realistically available to patients. Clinical ethics, therefore, serves as a bridge between the moral responsibilities of individual practitioners and the broader normative commitments of global health, especially justice, equity, solidarity, and respect for human dignity.

This broader framing is particularly important in the education of future healthcare professionals. Students must be prepared not only to respond to interpersonal ethical conflict, but also to recognize that clinical practice is embedded within health systems and social structures that may either mitigate or intensify vulnerability. In this sense, teaching clinical ethics within a global health perspective encourages a more critical and socially responsive understanding of professional responsibility. It helps students see that ethical care requires more than technical competence and good intentions; it also requires attention to context, power asymmetries, and barriers that prevent patients from benefiting equally from available care.

Clinical ethics is therefore relevant to global health because it equips future professionals to care responsibly across difference, to respond with sensitivity to culturally and socially diverse populations, and to connect individual care with wider concerns of justice. This broader framing reinforces the central argument of this paper: that ethics education is essential for preparing healthcare students to practice in a world where clinical decisions are inseparable from the moral realities of inequality, diversity, and interdependence.

5. Limits of Current Ethics Teaching

Despite widespread acknowledgment of its importance, ethics teaching in healthcare curricula often remains inadequate. In many programs, ethics is confined to a single module delivered early in training, detached from clinical practice, or taught predominantly through lectures focused on principles, laws, and codes. Although such teaching may provide useful conceptual foundations, it often fails to develop the interpretive and dialogical capacities required in real clinical situations.

Another major limitation is the hidden curriculum. Students learn not only from formal teaching, but also from the institutional culture and everyday behaviors they observe in clinical environments. When the formal curriculum emphasizes dignity, empathy, and shared decision-making, but students witness indifference, hierarchy, or efficiency pursued at the expense of patient voice, the educational message becomes contradictory. Scoping reviews have shown that the hidden curriculum exerts substantial influence on medical students' learning, values, and professional identity, with both constructive and harmful effects [7,8].

In addition, ethics is often insufficiently assessed. What institutions choose to evaluate communicates what they truly value. If ethics is absent from meaningful assessment, students may regard it as secondary to biomedical subjects. Assessment methods should therefore extend beyond factual recall and include ethical reasoning, communication, reflective capacity, and professional conduct. A systematic review aimed to evaluate the effectiveness of educational interventions in enhancing the ethical sensitivity of nursing students. The results indicated that current educational interventions primarily focus on two dimensions: teaching methods and curricular content. Among teaching methods, situational participatory learning was found to be more effective than traditional didactic instruction in enhancing nursing students' ethical sensitivity. This review confirmed that interactive teaching methods effectively enhance nursing students' ethical sensitivity. Therefore, nursing education should integrate cross-cultural competencies, spiritual care training, and emerging ethical issues while establishing comprehensive ethics curricula within clinical training. Such approaches will better prepare nurses for ethical challenges in practice [9].

6. Toward a Longitudinal and Practice-Oriented Model

If clinical ethics is to have genuine formative impact, it must be taught longitudinally and in close connection with clinical experience. A single isolated course cannot accomplish this task. Students need repeated opportunities to engage ethical questions throughout their education, beginning in the early phases of training and continuing through clinical placements and professional preparation.

A practice-oriented model of ethics education should combine theoretical grounding with experiential and dialogical methods. Case-based discussion is particularly valuable because it allows students to confront realistic dilemmas and practice structured deliberation. Simulation can further strengthen ethical learning by placing students in scenarios involving consent, breaking bad news, conflict with fami-

lies, disclosure of error, or end-of-life communication. Reflective writing helps students process morally troubling experiences and articulate the relationship between personal response and professional responsibility. Interprofessional learning is equally important, since many ethical issues arise within teams and require collaborative reasoning rather than solitary judgment.

To be educationally effective, however, this model should also include discipline-sensitive scenarios that reflect the moral realities of specific health professions. In undergraduate nursing education, ethically salient situations include confidentiality in team-based or shared-care environments, truth-telling in situations of poor prognosis, the use of physical restraint in frail, older, or cognitively impaired patients, refusal of treatment, and moral distress when students witness care they perceive as disrespectful, disproportionate, or inconsistent with patient dignity. Such scenarios are particularly important because nursing students are often among the first trainees to encounter the everyday ethical tensions of dependency, vulnerability, intimacy, and continuity of care. Their proximity to patients and families makes them especially likely to experience the moral weight of decisions that may appear routine from a purely technical perspective but are ethically complex in practice.

In undergraduate midwifery education, ethics teaching should likewise be closely aligned with the distinctive moral landscape of reproductive and perinatal care. Relevant scenarios include informed consent during labor, especially where pain, urgency, fear, or fatigue may affect understanding and voluntariness; refusal of recommended obstetric intervention, including cesarean section; maternal-fetal conflict; communication in cases of fetal anomaly, stillbirth, or perinatal loss; and culturally or religiously mediated expectations surrounding pregnancy and childbirth. Midwifery students may also encounter ethical tensions related to requests for pain relief in settings where access is limited, to differences between institutional protocols and women's birth preferences, and to the challenge of safeguarding both maternal autonomy and fetal welfare without reducing the pregnant woman to a means of protecting fetal interests. These scenarios demonstrate with particular clarity that clinical ethics is inseparable from questions of embodiment, trust, vulnerability, and respect.

The inclusion of nursing- and midwifery-specific scenarios is important not only for pedagogical realism, but also for the development of professional identity. Ethics education becomes more meaningful when students can recognize their own future responsibilities within the cases discussed. In this sense, profession-specific teaching does not fragment ethics education; rather, it strengthens it by showing how shared ethical principles take shape within different forms of care practice. Respect for autonomy, beneficence, non-maleficence, justice, and professional integrity are not applied identically across all healthcare roles, but must be interpreted in light of the relational and clinical contexts in which students will eventually act.

Recent qualitative work on health professions students' approaches to practice-driven ethical dilemmas found that students draw on emotions, personal experience, legal understanding, professional

background, and interprofessional learning when reasoning through ethically difficult cases, and that case-based ethics workshops can support application of the core ethical principles in structured discussion [10]. This supports the view that ethics teaching is most effective when it is embedded in realistic, practice-linked educational settings.

Exposure to clinical ethics consultation and ethics support services may also be educationally valuable. Observing how ethical deliberation is conducted in institutional settings can help students appreciate that ethical disagreement is not merely a matter of subjective opinion, but can be addressed through disciplined analysis, dialogue, and accountability. Such experiences may also demonstrate that ethics is not external to clinical care, but part of the effort to improve the quality and integrity of decision-making [11].

7. Discussion

The inclusion of clinical ethics in the training curriculum of healthcare students should not be justified merely as a matter of academic completeness or professional tradition. Its relevance is substantive and practical. Ethics education strengthens the capacity of future professionals to interpret clinical situations adequately, communicate responsibly, justify decisions, and remain attentive to the dignity, vulnerability, and lived experience of those entrusted to their care. In this sense, ethical competence is not external to clinical competence, but one of its constitutive dimensions.

The relevance of this claim becomes especially clear when examined through the concrete experiences of different healthcare students. Nursing and midwifery education offer particularly compelling examples. Nursing students often encounter ethical tensions in situations involving dependency, frailty, intimacy, and continuity of care. Questions concerning truth-telling, refusal of treatment, confidentiality in team-based environments, the use of restraint, or distress caused by witnessing care perceived as disrespectful are not marginal episodes, but part of the ordinary moral landscape of clinical training. Similarly, midwifery students confront ethically charged situations in the context of pregnancy, childbirth, and perinatal care, where issues such as informed consent during labor, refusal of obstetric intervention, maternal-fetal conflict, perinatal loss, and culturally mediated expectations surrounding birth reveal the depth and immediacy of ethical decision-making in practice.

These examples reinforce a central argument of this paper: clinical ethics is most meaningful when it is taught not as an abstract body of theory detached from professional formation, but as a discipline rooted in the actual circumstances in which students learn to care. Profession-specific scenarios do not weaken the universality of ethical principles; rather, they show how those principles acquire meaning within different forms of clinical responsibility. Respect for autonomy, beneficence, non-maleficence, justice, and professional integrity are shared across the health professions, but they are interpreted and enacted differently depending on whether a student is working in acute nursing care, community care, labor and delivery, neonatal contexts, or end-of-life settings. Ethics education must therefore be sufficiently broad to provide common conceptual foundations and sufficiently

concrete to illuminate the particular moral realities of each field of practice.

This point is particularly important in resisting reductionist views of healthcare education. A curriculum centered exclusively on technical performance risks producing graduates who are proficient in procedures yet insufficiently prepared to address conflict, suffering, uncertainty, and value pluralism. The ethical challenges encountered by nursing and midwifery students show that many of the most important professional decisions are not simply technical choices, but judgments made in relational contexts marked by vulnerability, asymmetry of power, emotional intensity, and the need for trust. Ethical education helps students recognize these dimensions and respond to them in a disciplined and professionally accountable way.

Moreover, the examples drawn from nursing and midwifery strengthen the paper's global health perspective. Birth, care dependency, access to pain relief, communication barriers, gendered experiences of health, and disparities in treatment are all areas in which clinical encounters intersect with wider social and structural inequalities. A student who learns to reflect ethically on restraint, informed consent during labor, or culturally shaped expectations around childbirth is also learning to recognize how justice, equity, and vulnerability operate at the bedside. In this respect, clinical ethics education serves as a bridge between individual patient care and the broader moral commitments of global health.

Integrating ethics meaningfully into training can also counter several distortions of contemporary healthcare, including technicism, depersonalization, fragmentation of responsibility, and uncritical reliance on protocol. Protocols and guidelines are indispensable, but they do not eliminate the need for judgment. Clinical situations frequently involve uncertainty, competing values, and context-dependent considerations that no algorithm can fully resolve. The experiences of nursing and midwifery students illustrate this clearly: no protocol alone can settle how to respond when a laboring woman refuses intervention, when an older patient resists care, when a family requests non-disclosure, or when a student experiences moral distress after witnessing care perceived as undignified. In each of these cases, technical knowledge must be accompanied by ethical discernment.

From this perspective, the curricular inclusion of clinical ethics is not optional enrichment, but an educational necessity. Students who are not trained to recognize and analyze ethical problems may still learn to perform procedures competently, yet remain underprepared for the moral demands of professional life. By contrast, students exposed to longitudinal, practice-oriented, and profession-sensitive ethics education are better equipped to become reflective practitioners capable of providing care that is not only effective, but also humane, just, and worthy of trust.

8. Conclusion

Clinical ethics should be regarded as an essential component of the education of healthcare students because it pertains to a constitutive dimension of clinical practice itself. It is through clinical ethics that students learn to identify morally relevant features of care, to deliberate in situations of conflict and uncertainty, to justify decisions in a rea-

soned manner, and to exercise professional responsibility in relation to patients, families, and healthcare teams. Its educational value therefore lies not at the margins of professional formation, but at its core.

The analysis developed in this paper has shown that ethical issues are not episodic or extrinsic to training, but are embedded in the ordinary reality of healthcare practice. This is particularly evident in the concrete scenarios encountered, as in nursing and midwifery education, where questions of dignity, vulnerability, autonomy, relational responsibility, and justice arise with particular intensity. Such evidence confirms that clinical ethics cannot be reduced to a merely theoretical, decontextualized, or ancillary domain of instruction. On the contrary, it must be understood as a foundational area of competence, indispensable to the preparation of healthcare professionals capable of responding adequately to the moral complexity of contemporary care.

On this basis, the arguments advanced in this paper should also lead to an institutional and curricular implication. If clinical ethics is indeed essential to the formation of competent, reflective, and responsible professionals, then this recognition ought to be translated into a critical revision of the study plans defined by universities within their educational provision. The place of clinical ethics within undergraduate healthcare curricula should no longer be left to isolated modules, occasional lectures, or formally declarative learning objectives. Rather, it should be structurally embedded within curricula through longitudinal teaching pathways, integration with clinical placements, profession-specific learning activities, and assessment strategies capable of evaluating ethical reasoning, reflective capacity, and professional judgment.

Such a revision would not constitute a secondary adjustment in educational design, but a necessary response to the real demands currently placed upon healthcare education. In a context marked by technological development, social and cultural pluralism, structural inequalities, and increasing complexity in care delivery, universities are called to ensure that their educational offerings prepare students not only to perform competently, but also to deliberate responsibly and to act justly. A curriculum that neglects clinical ethics risks producing graduates who are technically proficient yet insufficiently equipped to confront the moral demands of professional life. By contrast, a curriculum that accords clinical ethics a central and coherent place contributes to the formation of practitioners capable of delivering care that is scientifically sound, ethically grounded, and socially responsive.

References

1. World Health Organization (2009), *Module for teaching medical ethics to undergraduates*, WHO Regional Office for South-East Asia, New Delhi.

2. World Federation for Medical Education (2020), *Basic medical education: WFME global standards for quality improvement*, 2020, WFME, Ferney-Voltaire.

3. Pellegrino E.D. (1988), *Clinical ethics: biomedical ethics at the bedside*, «The Journal of the American Medical Association», 260(6), pp. 837-839.

4. Andersson H., Svensson A., Frank C., Rantala A., Holmberg M., Bremer A. *et al.* (2022), *Ethics education to support ethical competence learning in healthcare: an integrative systematic review*, «BMC Medical Ethics», 23(29).

5. Carrese J.A., Malek J., Watson K., Lehmann L.S.,

Green M.J., McCullough L.B. *et al.* (2015), *The essential role of medical ethics education in achieving professionalism: the Romanell report*, «Academic Medicine», 90(6), pp. 744-752.

6. Getu T., Tega A., Aragaw G.M. *et al.* (2025), *Ethical dilemmas experienced by midwives in their professional practice in Northwestern Ethiopia: a phenomenological interview study*, «BMC Medical Ethics», 26(1), p. 102.

7. Lawrence C., Mhlaba T., Stewart K.A., Moletsane R., Gaede B., Moshabela M. (2018), *The hidden curricula of medical education: a scoping review*, «Academic Medicine», 93(4), pp. 648-656.

8. Parra Larrotta S., Hernández Rincón E.H., Niño Correa D., Jaimes Peñuela C.L., Romero Tapia A.E. (2025), *Effects of the hidden curriculum in medical education: scoping review*, «JMIR Medical Education», 15:11:e68481.

9. Shi X., Wang R., Li Y., Zeng L. (2025), *A systematic review of educational interventions to enhance ethical sensitivity in nursing students in Asia and the Middle East*, «BMC Medical Ethics», 26(1), p. 185.

10. Hlaing P.H., Hasswan A., Salmanpour V. *et al.* (2023), *Health professions students' approaches towards practice-driven ethical dilemmas; a case-based qualitative study*, «BMC Medical Ethics», 23(1), p. 307.

11. Fox E., Myers S., Pearlman R.A. (2007), *Ethics consultation in United States hospitals: a national survey*, «The American Journal of Bioethics», 7(2), pp. 13-25.

Hepatitis B Immunization Among Healthcare Students: What Do We Really Know

by Lorenzo Ippoliti*

Abstract
Hepatitis B virus (HBV) infection remains a relevant global health issue despite the availability of effective vaccines and the implementation of widespread immunization programs. Recent international strategies have set ambitious goals for the elimination of viral hepatitis, with vaccination representing the cornerstone of prevention. Healthcare personnel are at increased risk of occupational exposure to HBV, making immunization a key component of infection control policies. Healthcare students represent a particularly important group, as they begin to face these risks during clinical training, often many years after completing primary vaccination in childhood. Although vaccination coverage is generally high, protective antibody levels may decline over time, and some students may show low or undetectable anti-HBs titers during pre-clinical screening. The increasing internationalization of universities further complicates this scenario, as students may come from diverse backgrounds with different vaccination schedules and documentation practices, potentially affecting their immunization status. This article reviews the current evidence on hepatitis B vaccination among healthcare students, focusing on occupational risk, long-term immunity, and the challenges associated with multicultural academic settings. Strengthening vaccination assessment and surveillance strategies is essential to ensure adequate protection for future healthcare professionals.

Keywords
Hepatitis B, HBV Vaccination, Healthcare Students, Occupational Risk.

1. Introduction

Hepatitis B virus (HBV) infection remains a major global health concern. According to the World Health Organization, hundreds of millions of people worldwide live with chronic HBV infection [1], which may lead to severe complications such as liver cirrhosis and hepatocellular carcinoma [2]. Despite the availability of an effective vaccine for more than four decades, HBV continues to represent a significant public health issue, particularly in populations at increased risk of exposure [3,4].

Healthcare workers are among the professional groups most frequently exposed to HBV infection due to their

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occupational contact with blood and biological fluids [5]. For this reason, hepatitis B vaccination has long been recognized as a cornerstone of occupational health policies in healthcare settings [6]. Universal vaccination programs introduced in many countries since the 1990s have significantly reduced the incidence of HBV infection and have contributed to the decline of chronic liver disease associated with the virus [7,8].

Within this context, healthcare students represent a specific population of interest. During their clinical training, students in medical and health-related programs may be exposed to the same occupational risks faced by healthcare professionals, particularly through contact with patients, blood samples, and medical instruments. Ensuring adequate protection against HBV infection before the start of clinical activities is therefore essential both for the safety of students and for the protection of patients [9].

However, several issues remain under discussion. Although many students received the hepatitis B vaccine during childhood through national immunization programs, long-term immunity and the persistence of protective antibody levels may vary over time [10]. Several studies have shown that anti-HBs titres may decrease after primary vaccination. However, long-term follow-up studies have demonstrated that a significant proportion of vaccinated individuals maintain protective antibody levels even after decades. For instance, persistence of anti-HBs up to 30 years after vaccination has been reported in healthcare workers, although antibody levels tend to decline progressively over time. Moreover, international universities increasingly host students from different countries with heterogeneous vaccination histories and documentation practices, which may complicate the assessment of immunization status [11].

For these reasons, understanding the current evidence regarding hepatitis B immunization in healthcare students is crucial. This article aims to review the main aspects related to HBV vaccination in this population, including occupational risk, long-term immune protection, and the challenges faced by universities in ensuring adequate immunization coverage.

2. Global Elimination of Hepatitis B

The Hepatitis B Virus (HBV), a prototype member of the *Hepadnaviridae* family (genus *Orthohepadnavirus*), possesses a unique genomic architecture characterized by a small, circular, and partially double-stranded DNA molecule. This genome is sequestered within an icosahedral nucleocapsid, which is further encapsulated by a lipid envelope. The replication cycle of HBV is highly tissue-tropic, with hepatocytes serving as the primary site for viral synthesis and assembly [12].

While closely related HBV genotypes have been identified in non-human primates, humans remain the sole known reservoir for human-specific HBV genotypes. This restricted host range presents a significant epidemiological opportunity: because the virus lacks a zoonotic reservoir capable of re-infecting human populations, HBV is theoretically amenable to global eradication [12].

Unlike pathogens that circulate in wildlife – where "spillover" events can trigger recurrent outbreaks – the survival of human HBV is entirely dependent on its continued

transmission within the human population. Therefore, if the chain of transmission can be broken through universal vaccination and the suppression of viral loads in chronic carriers, the human-specific genotypes of HBV could be permanently eliminated.

In fact, in recent years the global approach to hepatitis B virus (HBV) infection has shifted from simple disease control to the more ambitious goal of elimination. The World Health Organization (WHO) has identified viral hepatitis as a major public health priority and has launched a global strategy aimed at eliminating hepatitis B and C as public health threats by 2030 [13]. This objective is defined by measurable targets, including a 90% reduction in new infections and a 65% reduction in hepatitis-related mortality compared to 2015 levels.

Despite these ambitious goals, HBV remains a significant global burden, with hundreds of millions of people living with chronic infection and over one million deaths each year due to complications such as cirrhosis and hepatocellular carcinoma. However, unlike many other chronic viral infections, hepatitis B is largely preventable through vaccination, and effective antiviral treatments are available to control disease progression. For this reason, elimination is considered an achievable target, provided that preventive strategies – particularly universal vaccination, early diagnosis, and access to care – are adequately implemented worldwide [14].

3. Hepatitis B Vaccination: General Aspects

Hepatitis B vaccination represents the cornerstone of global HBV prevention strategies and is widely regarded as one of the most effective vaccines currently available [1]. Since its introduction in the 1980s and subsequent inclusion in national immunization programs, the vaccine has dramatically reduced the incidence of HBV infection, particularly in countries that have implemented universal childhood vaccination [8,15]. The standard vaccination schedule typically consists of a three-dose series administered during infancy, often beginning within the first year of life, although alternative schedules may be adopted depending on national policies [16], such as accelerated schedules (e.g., 0, 1, 2, and 12 months) or vaccination during adolescence in countries where infant immunization was not initially implemented.

The vaccine induces the production of hepatitis B surface antibodies (anti-HBs), which are considered a marker of protective immunity. An antibody level equal to or greater than 10 mIU/mL is generally accepted as the threshold for protection [17]. In most vaccinated individuals, this immune response is highly effective and long-lasting, with protection persisting for decades even in the presence of declining antibody levels. This long-term protection is largely attributed to immunological memory, which enables a rapid immune response upon exposure to the virus [18].

The widespread implementation of hepatitis B vaccination has not only reduced transmission in the general population but has also played a crucial role in preventing vertical transmission from mother to child and in protecting high-risk groups, including healthcare workers. As a result, vaccination remains the central pillar of all global strategies aimed at reducing HBV transmission and achieving long-term disease control.

4. Hepatitis B Vaccination for Healthcare Personnel

Healthcare personnel represent one of the professional groups most exposed to bloodborne pathogens, including hepatitis B virus (HBV) [19]. Occupational exposure may occur through needlestick injuries, contact with contaminated sharp instruments, or exposure of mucous membranes and damaged skin to infected biological fluids [20]. Because HBV can be efficiently transmitted through blood and other body fluids, healthcare settings have historically been considered high-risk environments for viral hepatitis transmission [21].

For this reason, hepatitis B vaccination has become a fundamental component of occupational health programs in healthcare institutions worldwide. International guidelines consistently recommend that all healthcare workers with potential exposure to blood or body fluids receive the complete hepatitis B vaccination series and undergo post-vaccination testing to document protective antibody levels [16].

The introduction of hepatitis B vaccination among healthcare personnel has significantly reduced the incidence of occupational HBV infections. In many countries, vaccination is offered free of charge to workers at risk and is often required before employment in clinical environments. Vaccination policies are usually combined with additional preventive strategies, including standard infection control precautions, safe handling of needles and sharps, and appropriate management of occupational exposures.

Protection after vaccination is generally defined by the presence of anti-HBs antibody levels above 10 mIU/mL [17]. Individuals who achieve this level of response are considered protected against HBV infection, and long-term immunity is believed to persist even when antibody titres decline over time. However, a small proportion of vaccinated individuals may fail to develop an adequate immune response, requiring additional vaccine doses or alternative immunization strategies [18].

Overall, hepatitis B vaccination represents one of the most effective preventive measures for protecting healthcare personnel from occupational infection and for reducing the risk of transmission within healthcare settings.

5. Vaccination Among Healthcare Students

Healthcare students constitute a specific subgroup within the broader category of healthcare personnel. During their training, students in medical, nursing, dental, and other health-related programs progressively engage in clinical activities that may expose them to blood, biological samples, and invasive procedures. For this reason, the risk of HBV exposure may begin even before graduation, during the period of clinical training.

Most healthcare students in many countries today have received hepatitis B vaccination during infancy or childhood as part of national immunization programs. This widespread childhood vaccination has significantly reduced the prevalence of HBV infection among younger generations entering health professions. Nevertheless, the persistence of protective antibody levels over time remains a subject of ongoing discussion.

Several studies have shown that anti-HBs titres may decrease years after the completion of the primary vaccination series [10,17]. As a result, a proportion of healthcare students undergoing occupational

health screening before clinical training may show antibody levels below the commonly accepted protective threshold [22]. In most cases, however, this decline does not necessarily indicate loss of immune memory, since vaccinated individuals may still develop a rapid anamnestic response following booster doses.

Because of these factors, many universities and healthcare institutions implement screening programs to assess hepatitis B immunization status in students before they begin clinical placements [22]. Occupational health services may verify vaccination records, measure anti-HBs antibody levels, and administer booster doses when necessary. These preventive strategies aim to ensure adequate protection for students while also reducing the potential risk of HBV transmission in healthcare environments.

6. Management of Low or Absent Anti-HBs Titres in Healthcare Students

One of the most frequently encountered issues during occupational health screening of healthcare students is the detection of low or absent anti-HBs antibody titres despite a documented history of hepatitis B vaccination. Because many students received the primary vaccination series during infancy or early childhood, several years or even decades may pass before antibody levels are measured again during university health surveillance programs [10,22].

A decline in circulating anti-HBs antibodies over time is a well-known phenomenon and does not necessarily indicate loss of protection. In individuals who initially responded to vaccination, immunological memory may persist for many years, allowing the immune system to mount a rapid and effective response following exposure to the virus [16,18]. For this reason, the presence of anti-HBs levels below the conventional protective threshold does not automatically imply susceptibility to infection.

Nevertheless, in healthcare settings it is essential to ensure a clear and documented immune status, particularly for individuals who will be exposed to blood or biological fluids during clinical activities. Many occupational health protocols therefore recommend measuring anti-HBs titres before students begin their clinical training. When antibody levels are found to be below the protective threshold, a booster dose is often administered to evaluate the presence of immune memory.

In most previously vaccinated individuals, this booster dose induces a rapid increase in antibody levels, confirming the persistence of immunological memory. In some cases, clinical management protocols for these individuals follow a structured revaccination strategy. Persons unresponsive to an initial three-dose series are recommended to complete a second full course of the vaccine [23]. However, a small proportion of individuals may fail to develop an adequate antibody response even after additional vaccine doses. These subjects are generally classified as "non-responders" and may require further clinical evaluation and specific preventive measures in case of occupational exposure.

To address this challenge, advanced prophylactic strategies have evolved to include glycosylated preS1/preS2/S-containing vaccines produced in mammalian cell lines. Currently licensed in Israel and parts of East Asia, these multivalent formulations are increasingly utilized both

for universal neonatal immunization and as a corrective intervention for the aforementioned non-responders. Specifically, these vaccines are indicated for individuals whose anti-HBs antibody concentrations fail to reach the protective threshold of 10 mIU/mL following a standard three-dose regimen of conventional yeast-derived vaccines. By incorporating additional antigenic components, these mammalian-derived vaccines aim to bypass the limitations of traditional formulations and ensure broader population-wide protection [24].

The management of low antibody titres therefore represents an important component of preventive strategies in healthcare education. By combining vaccination records, antibody testing, and booster policies when appropriate, universities and occupational health services can ensure that healthcare students enter clinical training with adequate protection against hepatitis B infection.

7. Challenges in Multicultural Student Populations

In recent decades, universities and medical schools have become increasingly international. Many academic institutions now host students from a wide range of geographical regions, each with different vaccination histories, healthcare systems, and immunization policies. While this diversity represents an important educational and cultural strength, it may also create challenges for occupational health management.

One of the main difficulties concerns the heterogeneity of vaccination schedules. Countries introduced universal hepatitis B vaccination at different times and sometimes adopted different strategies, such as vaccination at birth, during infancy, or during adolescence. Consequently, healthcare students entering international universities may have received the vaccine at different ages or according to different dosing schedules.

Another challenge is the variability in vaccination documentation. Students coming from different healthcare systems may not always have complete or reliable vaccination records, making it difficult for occupational health services to determine their immunization status. In such cases, antibody testing is often required to assess whether protective immunity is present.

Furthermore, differences in healthcare infrastructure and vaccine coverage between countries may influence the proportion of students with adequate long-term protection. Students vaccinated in regions with limited access to healthcare services or inconsistent vaccination programs may have a higher probability of incomplete vaccination or lower antibody titres.

For these reasons, universities hosting international healthcare students must often adopt standardized screening and vaccination protocols. These measures allow institutions to ensure adequate protection against HBV infection while accommodating the diversity of vaccination backgrounds present in modern academic environments.

8. Conclusions

Hepatitis B vaccination represents one of the most successful preventive interventions in modern medicine and has played a crucial role in reducing the global burden of HBV infection. For healthcare personnel, vaccination remains a fundamental component of occupational health policies aimed at preventing exposure

to bloodborne pathogens and ensuring safe healthcare environments.

Healthcare students occupy a unique position within this framework. As future healthcare professionals, they begin to face occupational risks during their clinical training, often many years after receiving the primary hepatitis B vaccination series in childhood. For this reason, assessing their immunization status before the start of clinical activities is essential to guarantee adequate protection both for the students themselves and for the patients with whom they interact.

The progressive internationalization of universities has further increased the complexity of this issue. Students from different geographical regions may have been vaccinated according to diverse immunization schedules, may present variable documentation of their vaccination history, and may show different patterns of long-term antibody persistence. These factors highlight the importance of standardized occupational health protocols capable of addressing the needs of increasingly multicultural academic communities.

Regular evaluation of vaccination history, targeted measurement of anti-HBs antibody levels, and appropriate booster strategies when needed represent practical tools that universities can implement to ensure adequate protection against HBV infection. Strengthening these preventive measures within academic institutions contributes not only to the safety of healthcare students but also to the broader goal of maintaining high standards of infection control in healthcare systems.

In this context, hepatitis B immunization among healthcare students remains a relevant topic for both public health and occupational medicine, requiring continuous attention as healthcare education and global mobility continue to evolve.

Notes and References

1. World Health Organization (2024), *Global hepatitis report 2024: Action for access in low- and middle-income countries*, World Health Organization, Geneva.

2. Stella L., Santopaolo F., Gasbarrini A., Pompili M., Ponziani F.R. (2022), *Viral hepatitis and hepatocellular carcinoma: From molecular pathways to the role of clinical surveillance and antiviral treatment*, «World Journal of Gastroenterology», 28(21), pp. 2251-2281.

3. Paccoud O., Surgers L., Lacombe K. (2019), *Infection par le virus de l'hépatite B: histoire naturelle, manifestations cliniques et principes thérapeutiques* [*Hepatitis B virus infection: Natural history, clinical manifestations and therapeutic approach*], «Revue de médecine interne», 9, pp. 590-598.

4. Hogan S., Page A., Dixit S., McBride K.A. (2023), *HBV prevalence in Sub-continental countries: A systematic review and meta-analysis*, «Public Library of Science (PLOS) One», 18(12), e0295670.

5. Tavoschi L., Mason L., Petriti U., Bunge E., Veldhuijzen I., Duffell E. (2019), *Hepatitis B and C among healthcare workers and patient groups at increased risk of iatrogenic transmission in the European Union/European Economic Area*, «Journal of Hospital Infection», 102(4), pp. 359-368.

6. Pappas S.C. (2016), *Hepatitis B and Health Care Workers*, «Clinical Liver Disease», 25(4), pp. 859-874.

7. European Centre for Disease Prevention and Control (2016), *Systematic review on hepatitis B and C prevalence in the EU/EEA*, ECDC, Stockholm.

8. Yue T. *et al.* (2022), *Trends in the disease burden of HBV and HCV infection in China from 1990-2019*, «International Journal of Infectious Diseases», 122, pp. 476-485.

9. De Schryver A *et al.* (2014), *Hepatitis B vaccination policies for student healthcare workers in Europe*, «Journal of Hospital Infection», 86(2), pp. 147-150.

10. Coppeta L. *et al.* (2019), *Persistence of Immunity for Hepatitis B Virus among Heathcare Workers and Italian Medical Students 20 Years after Vaccination*, «International

Journal of Environmental Research and Public Health», 16(9), p. 1515.

11. Cocchio S. *et al.* (2021), *Persistence of Anti-Hbs after up to 30 Years in Health Care Workers Vaccinated against Hepatitis B Virus*, «Vaccines» (Basel), 9(4), p. 323.

12. Gerlich W.H. (2013), *Medical Virology of Hepatitis B: how it began and where we are now*, «Virology Journal» 10, p. 239.

13. World Health Organization (2022), *Global health sector strategies on HIV, viral hepatitis and sexually transmitted infections for the period 2022-2030*, World Health Organization.

14. Shen F. *et al.* (2026), *Global, regional, and national burden of chronic hepatitis B, 1990-2021, and projections to 2030: An urgent call for action to achieve hepatitis B elimination goals by 2030*, «Human Vaccines & Immunotherapeutics», 22(1).

15. Kruszon-Moran D. *et al.* (2020), *Prevalence and Trends in Hepatitis B Virus Infection in the United States, 2015-2018*, «NCHS Data Briefs», 361, pp. 1-8.

16. World Health Organization (2017), *Hepatitis B vaccines: WHO position paper – July 2017*, «Weekly Epidemiological Record», 92(27), pp. 369-392.

17. Jack A.D. *et al.* (1999), *What level of hepatitis B antibody is protective?*, «Journal of Infectious Diseases», 179, pp. 489-492.

18. Bruce M.G. *et al.* (2016), *Antibody levels and protection after hepatitis B vaccine: results of a 30-year follow-up study and response to a booster dose*, «Journal of Infectious Diseases», 214, pp. 16-22.

19. Van Damme P. *et al.* (2013), *Hepatitis B Vaccines*, in Plotkin S.A., Orenstein W.A., Offit P.A. (Eds), *Vaccines* (6th ed.), Elsevier Sanders, e-book, pp. 205-234.

20. Favero M.S. *et al.* (1973), *Hepatitis B antigen on environmental surfaces*, «Lancet», 3, p. 1455.

21. Gershon R.R. *et al.* (2007), *Non-hospital based registered nurses and the risk of blood borne pathogen exposure*, «Industrial Health», 45, pp. 695-704.

22. Di Giampaolo L., Coppeta L., Borrelli P., Astolfi P., Resta A., Loffredo L., Di Menno Di Bucchianico F., Mangifesta R., Ippoliti L., Ferrari C. (2025), *Persistence of Anti-HB Antibodies in Healthcare Trainees: The Impact of Childhood Versus Adolescent Vaccination*, «Vaccines» (Basel), 13(6), p. 562.

23. Meireles L.C., Marinho R.T., Van Damme P. (2015), *Three decades of hepatitis B control with vaccination*, «World Journal of Gastroenterology», 7(18), pp. 2127-2132.

24. Gerlich W.H. (2015), *Prophylactic vaccination against hepatitis B: achievements, challenges and perspectives*, «Medical Microbiology and Immunology», 204(1), pp. 39-55.

Towards a Dematerialized Sovereignty: The Tuvalu Case and the Challenge of Digital Statehood

by Mario Di Giulio*

Abstract
This article examines the Government of Tuvalu's plan to transform itself into a digital nation as a legal strategy to preserve sovereignty in the face of the potential loss of its physical territory due to rising sea levels. The analysis focuses on the digital migration of state functions, archives, and collective identity, with particular attention to the Digital Ark project, conceived to ensure institutional continuity and the international legal personality of the State. The article assesses the compatibility of this model with the classical criteria of statehood, integrating historical precedents such as governments in exile and non-territorial subjects of international law. The article argues that the Tuvalu case represents a systemic challenge to international law, requiring an evolutionary reinterpretation of sovereignty in functional and digital terms, as well as a redefinition of the relationship between territory, identity, and international legal personality.

Keywords
Tuvalu, Digital State, Sovereignty, International Law, Climate Change, Digital Ark, Governments in Exile, ICJ Advisory Opinion, Falepili Union.

1. Introduction

Tuvalu, a small island State comprising nine atolls in the Pacific Ocean, has become one of the most emblematic cases of global climate vulnerability. With an average altitude of less than two meters above sea level and a maximum altitude of only 4.6 meters, its territory is increasingly exposed to coastal erosion, saltwater intrusion into freshwater lenses, and, above all, progressive sea level rise. According to widely accepted projections from the Intergovernmental Panel on Climate Change (IPCC) and the United Nations Development Programme (UNDP), a substantial part of Tuvalu's land could become uninhabitable by the end of the 21st century, with some scenarios suggesting complete territorial loss within a few decades [1,2].

This scenario raises a crucial legal question: can a State

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continue to exist under international law in the absence of its physical territory? The question is not merely academic. It undermines the Westphalian conception of statehood that has characterized international relations since 1648 and calls into question the fundamental assumptions embedded in the architecture of international law. While international law has historically been shaped by territorial assumptions – that is, the notion that sovereignty is exercised over a defined space and the population within it – climate change is now destabilizing the material foundations on which these assumptions are based.

In response to this threat, Tuvalu has adopted a remarkable innovative strategy based on the digitalization of statehood. Through its "Digital Nation Initiative", officially announced in 2022 and progressively implemented thereafter, the government has undertaken a systematic effort to migrate key elements of the State to digital infrastructures. A central element to this strategy is the Digital Ark, a comprehensive framework designed to perpetually preserve state archives, legal identity, governance mechanisms, and cultural heritage, regardless of the physical fate of the islands.

This Tuvaluan approach challenges the traditional understanding of sovereignty as anchored to territory and calls for a reconsideration of statehood as a functional and relational construct. Thus, it sits at the intersection of international law, technological innovation, and climate justice, raising questions that go far beyond the immediate circumstances of a small Pacific nation.

This article aims to analyze the legal implications of Tuvalu's digital transition, assessing its compatibility with established doctrines and its potential to reshape the international legal order. The analysis is structured in several stages: first, it examines the classical criteria of statehood and their application to cases of territorial loss; second, it considers historical precedents; and finally, it analyzes the specific mechanisms of digital statehood and emerging international responses, including the 2025 Advisory Opinion of the International Court of Justice [3] and the 2023 Falepili Union agreement between Australia and Tuvalu (2023 Falepili Union).

2. Statehood in International Law: The Montevideo Framework and Its Limits

The classical definition of statehood is codified in Article 1 of the 1933 Montevideo Convention on the Rights and Duties of States [4], which identifies four essential criteria: a permanent population, a defined territory, an effective government, and the capacity to enter into relations with other states. Although the Convention was a regional instrument adopted by American states, its criteria have gained near-universal acceptance, as they reflect customary international law on statehood.

Traditionally, these elements have been considered cumulative and indispensable prerequisites for the existence of a state. Among these, territory has often been considered the most fundamental, as the spatial basis for the exercise of sovereignty, the delimitation of jurisdiction, and the identification of the population subject to government authority.

However, international practice reveals a more complex reality than the Montevideo Convention criteria might suggest. These criteria have never been applied with mechanical precision, and con-

siderable flexibility has been demonstrated where one or more elements are contested or ineffective in practice [5,6]. Specifically, the temporary loss of effective control over a territory or government functions does not necessarily entail the extinction of statehood, especially where such loss arises from illegitimate situations such as occupation or annexation.

The case of Estonia, Latvia, and Lithuania provides a particularly telling example. Following their annexation by the Soviet Union in 1940, many Western states maintained a consistent policy of non-recognition, and these entities were not generally considered as having ceased to exist. Their re-emergence as independent states in 1991 was widely treated not as the creation of new states, but rather as the restoration of pre-existing states whose legal continuity had persisted throughout the period of occupation.

The case of Tuvalu presents a qualitatively different challenge. Unlike situations of occupation or annexation, in which the loss of territorial control is typically understood as temporary and reversible – the threat Tuvalu faces concerns the potential permanent disappearance of its territory due to environmental factors beyond the state's control. This raises the fundamental question of whether the territorial criterion should be interpreted strictly, as requiring the continued existence of a physical territory, or more functionally, as referring to a state's capacity to exercise authority rather than the mere existence of a territory [7,8,9].

A growing body of scholarship, particularly in the context of climate change and its impact on small island states, suggests that statehood should be understood as a dynamic and constant evolving concept, rather than a static legal status determined at a single point in time [10,11]. From this perspective, the essence of the state lies not solely in its physical attributes, but also in its ability to perform core functions – governance, representation, and provision of services to its population – and to maintain recognition as a subject of international law by other states and international organizations. The principle of continuity, well established in international law, supports the view that once a State has come into existence, it benefits a strong presumption of continuity, which can only be rebutted in exceptional circumstances.

In this context, Tuvalu's digital strategy may be understood as an attempt to preserve the functional elements of statehood in the face of existential environmental threats. Rather than completely replacing physical territory, these initiatives seek to maintain governance structures, national identity, and international legal personality through digital means, while preserving the traditional indicia of statehood – namely, a defined population, an organized government, and the capacity to engage in international relations, as reflected in the Montevideo Convention.

3. Governments in Exile and Non-Territorial Subjects: Historical Precedents

Historical precedents provide useful, though imperfect, analogies for understanding the legal status of a potentially deterritorialized Tuvalu. The most frequently cited examples are those of the governments in exile during World War II, when several European states saw their territories occupied by the Axis powers [12,13].

The governments of Poland, Norway, Netherlands, Belgium, Luxembourg, and Greece operated from London and continued to exercise a range of governmental functions, including diplomatic relations and military organization, while maintaining recognition by Allied states and, in some cases, neutral States. The Free French movement led by Charles de Gaulle further illustrates the complexity of state representation in a context of competing claims to legitimacy.

These precedents support the principle that the loss of effective territorial control does not necessarily entail the extinction of statehood, particularly where international recognition and claims to continuity are maintained. The continued legal personality of these states was generally accepted during the conflict, and the restoration of territorial control after the war was widely understood as a reestablishment of normal governmental authority rather than the creation of new states.

Another notable example is the Sovereign Military Order of Malta, a unique subject of international law that maintains diplomatic relations with numerous states despite lacking a conventional sovereign territory. Its status reflects an exceptional historical and diplomatic evolution, rather than a general model of deterritorialized statehood.

However, these precedents are only partially applicable to the case of Tuvalu. Governments in exile were conceived as temporary arrangements tied to the expectation of territorial recovery, while the Order of Malta constitutes a highly exceptional entity whose legal status cannot be easily generalized. Tuvalu, on the other hand, raises the unprecedented question of whether a state may maintain continuity in the face of potentially permanent territorial loss due to environmental change, thus challenging the traditional assumption that territoriality is an indispensable element of statehood.

4. The Digital Ark and Institutional Continuity

The Digital Ark is a central component of Tuvalu's broader digital statehood strategy. Officially launched in 2023 and progressively developed thereafter, it is conceived as a comprehensive digital ecosystem aimed at preserving key government and societal functions in the context of existential climate risks.

The scope of the Digital Ark extends beyond simple archival storage and includes civil registries, legislative and judicial records, administrative proceedings, and selected elements of cultural heritage and customary land tenure systems. These components are intended to ensure the continuity of essential state functions and the preservation of institutional memory.

Technically, the system relies on a secure and distributed digital infrastructure, designed to enhance resilience and data integrity. While these features contribute to robustness, they are not in themselves a determining factor in the state's legitimacy.

From a legal perspective, the Digital Ark can be understood as an attempt to strengthen institutional continuity by preserving documentation and administrative capacity. This includes the preservation of records relating to citizenship, legal rights, and governmental decisions, which are relevant to the continued functioning of state institutions.

The initiative also contributes to the ongoing debate on

the evolving nature of sovereignty. While sovereignty has traditionally been closely associated with territorial control, it also includes functional dimensions such as governance, the regulation of nationality, and participation in international relations. These functions may, in certain respects, be supported by digital means.

In this sense, the Digital Ark can be seen as an innovative attempt to adapt state functions to new technological and environmental conditions. However, the question remains open in international law whether such developments can replace territoriality as a constitutive element of statehood: the place where sovereignty and jurisdiction apply and which requires, in our established understanding, a physical reality; a physical space operating as the ambit and the limit for their application.

5. Toward Digital Citizenship: The National Digital ID

A central component of Tuvalu's digital transformation is the introduction of a national digital identity system (National Digital ID), one of the most innovative elements of the broader Digital Nation Initiative. The system is designed to enable Tuvaluan citizens to access certain government services, manage their administrative data, and preserve their legal status as citizens regardless of their location.

The National Digital ID is more than a simple form of digital identification. It functions as a platform for accessing selected rights and administrative services in a partially deterritorialized context. Through the system, citizens can obtain official documents, register vital events, and interact with public authorities through digital channels, thus strengthening the administrative relationship between individuals and the state.

Digital citizenship, as embodied in this system, represents an evolution in modes of political belonging [14,15]. While classical theories of citizenship have traditionally emphasized participation within a territorial political community, contemporary developments in digital governance increasingly allow certain aspects of citizenship to be exercised beyond the physical state [16]. The Tuvaluan model partially decouples citizenship from territorial residence, reframing it as a continuing legal relationship supported by digital infrastructures.

This development has implications for democratic participation, particularly in relation to diaspora engagement and remote access to public services. However, the extent to which digital platforms can support full electoral participation remains dependent on domestic constitutional arrangements and the integrity of electoral safeguards.

At the same time, the model raises significant challenges. Ensuring the security and integrity of digital identities is essential, especially where systems are connected to electoral or sensitive administrative processes. Robust authentication mechanisms and protection against identity fraud are necessary conditions for legitimacy. Furthermore, disparities in access to technology may lead to exclusion, particularly among vulnerable populations or individuals displaced by climate change with limited access to digital technology.

Addressing these challenges requires appropriate legal and institutional frameworks governing digital identity, as well as sustained investment in infrastructure and capac-

ity-building. It also raises broader questions about the extent to which citizenship can be effectively exercised in dispersed populations without undermining the principles of equality and democratic inclusion.

6. International Recognition and the Evolution of Statehood

International recognition plays a significant role in the evolving discourse on Tuvalu's digital statehood. While the theoretical debate on recognition remains divided between constitutive and declaratory approaches, its practical importance for legitimacy and participation in the international community is particularly evident in contexts of climate vulnerability. In such situations, recognition does not replace traditional criteria for statehood, but it can help sustain a state's international legal personality under conditions of existential environmental stress.

The 2025 ICJ Opinion, namely paragraph 363, is particularly relevant in this regard. The Court confirmed that international law does not provide for the automatic extinction of statehood as a consequence of territorial loss, including that resulting from climate change. It also reiterated that the continuity of the State constitutes a strong presumption in international law, and that the loss or transformation of territorial conditions does not, in itself, necessarily entail the termination of statehood.

It is important to emphasize, however, that the Court did not establish a new rule on deterritorialized statehood, nor did it suggest that recognition alone could replace the traditional elements of statehood. Rather, it left open the question of how the criteria of statehood should be applied in extreme environmental scenarios, emphasizing the continuity and legal stability within the existing framework of international law.

Against this background, the 2024 Declaration of the Alliance of Small Island States (AOSIS) reflects a coordinated political position affirming the determination of climate-vulnerable states to preserve their statehood and sovereignty in the face of climate change. Although not legally binding, such declarations may be relevant as expressions of state practice and political commitment to the broader development of international law.

Similarly, the 2023 Falepili Union establishes a bilateral framework for cooperation on climate mobility and security, expressly reaffirming Tuvalu's continued statehood and sovereignty. While this agreement does not alter the legal criteria for statehood under international law, it contributes to emerging practices in managing climate-induced displacement and preserving state continuity.

Taking together, these instruments reflect an evolving international debate on the relationship between climate change and state continuity. However, it remains to be seen whether they are sufficient to crystallize a new rule of customary international law.

7. Cyber Sovereignty, Technological Risks, and Data Jurisdiction

The digitalization of state functions introduces new and important dimensions to the exercise of sovereignty which deserve careful analysis. In a digital context, control over data, digital infrastructure, and communication networks is increasingly important for the functioning of the state, com-

plementing, rather than replacing, the traditional importance of territorial control. The concept of cyber sovereignty captures the growing assertion of state authority over digital spaces and data flows, particularly in contexts where essential governance functions are mediated by digital systems.

However, this transformation also generates new forms of dependency that can compromise the effective exercise of sovereign functions. Many digital infrastructures rely on systems located outside the state's territorial jurisdiction or operated by private entities, including cloud services, undersea cables, satellite networks, and Internet governance structures. This raises complex issues of jurisdictional control and regulatory dependency, particularly for small, climate-vulnerable states like Tuvalu.

Cybersecurity considerations further complicate this picture. Attacks on digital infrastructure can disrupt administrative continuity, compromise sensitive data, or impact democratic processes. While these risks are not exclusive to digitally oriented states, they acquire particular significance where key governmental functions are increasingly dependent on digital systems. Consequently, resilience, redundancy, and international cooperation in cybersecurity emerge as important safeguards.

In this context, sovereignty may increasingly be understood in functional and relational terms, reflecting the interdependence of global digital infrastructures. This, however, does not displace the traditional foundations of statehood under international law, which continue to be based on established criteria such as territory, population, government, and the capacity to enter into international relations.

8. Maritime Rights and Exclusive Economic Zones

The potential disappearance of Tuvalu's land territory raises complex issues regarding the law of the sea, particularly with respect to maritime entitlements under the United Nations Convention on the Law of the Sea (UNCLOS). Under UNCLOS, maritime zones such as the territorial sea, the exclusive economic zone (EEZ), and the continental shelf are generally defined by baselines drawn along the coast, typically the low-water line.

According to a strict interpretation of this framework, the submergence of coastal features could raise questions about the validity of baselines and, consequently, the spatial reference for maritime entitlements. However, the legal consequences of long-term sea-level rise for existing maritime zones remain unsettled in international law.

In response to these uncertainties, Tuvalu and other small island states have advocated a more stable approach to maritime entitlements, often referred to in the literature as the mobile baseline versus fixed baseline debate. According to the latter approach, maritime zones would remain legally stable despite physical changes in coastal geography.

This position has received increasing attention in regional legal doctrine and practice, including within the Pacific Islands Forum and the Alliance of Small Island States. These developments reflect concerns that a purely ambulatory interpretation could produce inequitable outcomes for states that have contributed minimally to climate change.

From a functional perspective, the preservation of maritime entitlements is important

for the exercise of rights and jurisdiction over marine resources, including fisheries and environmental protection. However, under international law, such entitlements derive from and are legally distinct from territorial sovereignty, and their existence does not in itself determine the statehood or legal personality of a state.

9. Human Rights, (Limited) Sovereignty and Climate Justice

The transformation of Tuvalu into a more digitally oriented state raises significant human rights implications, relevant to the design and implementation of the Digital Nation Initiative. The gradual or eventual displacement of the population affects a range of rights, including access to public services, participation in political life, preservation of cultural identity, and continuity of social and family ties under international human rights law. Population displacement also affects the exercise of sovereignty by citizens residing in different states, where different and even conflicting rules may apply simultaneously [17], raising the issue on which rule should prevail.

Digital citizenship can help mitigate some of these challenges by maintaining administrative and legal ties between the state and its dispersed population. Through systems such as national digital identification platforms, citizens residing abroad may continue to access certain government services and participate in aspects of civic life, thus fostering the continuity of relations between the state and its citizens in a transnational context.

However, digital mechanisms cannot completely replace the cultural, historical, and social significance of territorial ties. The islands of Tuvalu constitute not only a physical space, but also a place of collective identity, cultural heritage, and historical memory, which could be significantly affected by environmental degradation.

The Tuvaluan case also raises broader questions of climate justice and responsibility under international law. Tuvalu has contributed only marginally to global greenhouse gas emissions, yet it faces disproportionately severe consequences of climate change. This asymmetry is widely acknowledged in international environmental law and underpins the principle of common but differentiated responsibilities.

Mechanisms such as the "loss and damage" within the climate regime increasingly recognize the need to address climate impacts to which full adaptation is not possible. In this context, they provide a legal and political framework for international cooperation and assistance, including financial support, capacity building, and measures to facilitate adaptation and relocation of affected populations.

While these developments may support broader claims for international assistance in addressing the consequences of climate change, they do not in themselves determine questions of statehood or legal personality under international law.

10. Systemic Challenge: Climate Change and the Future of Statehood

Tuvalu is not an isolated case. Several small island developing states face similar risks from sea-level rise, including Kiribati, the Marshall Islands, the Maldives, and other low-lying coastal territories. The systemic nature of this phenomenon raises complex questions for international law regarding

the legal consequences of severe and potentially irreversible territorial changes.

These developments could stimulate further reflection on existing legal concepts, including sovereignty, jurisdiction, and liability. Sovereignty, traditionally associated with territorial authority, may need to be increasingly understood in functional terms that also take into account governance capacity and international legal personality, while remaining anchored in the established framework of statehood under international law. Jurisdiction, which has historically relied on territorial connections and nationality, may need to be adapted to address situations involving transnational populations and digitally mediated governance. Liability, both in terms of state responsibility for environmental damage and collective responsibility for climate adaptation, continues to evolve within existing principles of international environmental law.

The international legal order has demonstrated a significant capacity for adaptation in response to structural changes, including decolonization, the development of international organizations, and the emergence of human rights law. Climate change represents a further challenge to this adaptive capacity, raising complex issues of legal continuity and institutional response, while reinforcing the need to preserve stability and predictability in international relations [18,19].

11. Theoretical Implications: From Territorial to Functional Sovereignty

The emergence of digital statehood invites a broader theoretical reflection on the nature of sovereignty and the state in international legal discourse. The Westphalian model, which has shaped international relations for centuries, conceives sovereignty as fundamentally tied to territory, understood as the spatial basis for the state's exclusive authority within defined borders and the correlative principle of non-interference by other states. Despite significant developments in international law, including the rise of international organizations, globalization, and human rights regimes, this territorial conception remains a central point of reference point in contemporary legal scholarship.

Climate change and the prospect of severe territorial loss in low-lying states present a significant challenge to this framework. The question therefore arises as to whether the traditional link between territory and statehood should be understood as strictly constitutive, or whether international law allows for greater flexibility in situations of extreme environmental change. In doctrinal terms, this has led to a renewed debate on functional approaches to statehood, which emphasize the continued relevance of governance, the persistence of a political community, and international recognition, while acknowledging the structural importance of territory in the classical statehood criteria.

Different currents in international legal theory offer partial support for this functional perspective. Legal realist approaches emphasize the importance of effectiveness and recognition in the operation of international law, while constructivist interpretations highlight the socially mediated nature of state identity. At the same time, prevailing doctrine generally recognizes that the Montevideo criteria have never been applied in an entirely mechanical manner and that international practice has taken into account situations of par-

tial or temporary interruption of territorial control.

The 2025 ICJ Opinion contributes to this debate by confirming that international law does not provide for the automatic extinction of statehood following the loss of territory. However, the Court did not establish a new category of deterritorialized statehood, nor did it suggest that territory has ceased to be a relevant factor in determining statehood. Rather, its reasoning reinforces the importance of continuity and legal stability within the existing framework of international law.

Within this context, Tuvalu's experience may be seen as a case study of how states are experimenting with technological and institutional mechanisms to preserve administrative continuity and maintain ties with dispersed populations. These developments highlight the adaptability of international law in responding to new environmental and technological conditions, while remaining anchored to its founding principles. It remains to be seen whether these practices will contribute to a broader evolution of the concept of sovereignty, a question still open in contemporary international legal scholarship.

12. Future Scenarios and Conclusions

The case of Tuvalu illustrates the emerging challenges that climate change poses to existing categories of international law. It highlights how states, faced with existential environmental risks, are developing innovative legal and institutional responses aimed at preserving the continuity of governance, political identity, and international legal personality under increasingly complex conditions.

The long-term sustainability of these approaches will depend on a range of interconnected factors. These include the continued recognition of statehood by other states, the effectiveness of digital governance infrastructures, such as the Digital Ark, in maintaining administrative continuity, the ability of digital citizenship systems to support political participation and social cohesion among dispersed populations, the legal treatment of maritime entitlements under international law, and ongoing international cooperation.

The 2025 ICJ Opinion, along with agreements such as the 2023 Falepili Union, contribute to an evolving legal and political context in which questions of state continuity under climate stress are increasingly being addressed. However, these developments do not define a fully articulated legal framework for deterritorialized statehood, and significant normative and institutional questions remain.

More broadly, the Tuvalu case invites reflection on the relationship between territory, identity, and legal personality in international law. It suggests that, while territoriality remains a foundational element of the state system, contemporary developments may require a more flexible understanding of how state functions are maintained in conditions of environmental transformation and technological change. Sovereignty, in this sense, continues to operate as a central organizing principle of international law, but is increasingly challenged by new forms of vulnerability and interdependence.

It is not yet certain whether international law will be able to develop sufficiently coherent responses to these challenges. What is clear, however, is that climate change is already putting pressure on traditional legal categories, requiring careful adaptation to preserve both the stability of the international legal order and its ability to respond to new forms of risk.

Notes and References

1. IPCC (2023), *Sixth Assessment Report*, Intergovernmental Panel on Climate Change.

2. UNDP (2025), *Climate change and small island developing states*, United Nations Development Programme.

3. International Court of Justice (2025), *Advisory Opinion on climate change and statehood.*

4. Montevideo Convention on the Rights and Duties of States (1933).

5. Crawford J. (2006), *The creation of states in international law* (2nd ed.), Oxford University Press, Oxford.

6. Shaw M.N. (2017), *International law* (8th ed.), Cambridge University Press, Cambridge.

7. Burkett M. (2011), *The nation* ex-situ*: On climate change, deterritorialized nationhood and the post-climate era*, «Climate Law», 2(3), pp. 345-374.

8. Rayfuse R. (2010), *International law and disappearing states: Utilising maritime entitlements to overcome the statehood dilemma*, «University of New South Wales Law Journal», 33(1), pp. 281-299.

9. Yamamoto L., Esteban M. (2014), *Vanishing island states and sovereignty*, «Ocean & Coastal Management», 87, pp. 1-9.

10. Peters A. (2009), *Humanity as the A and Ω of sovereignty*, «European Journal of International Law», 20(3), pp. 513-544.

11. Vidas D. (2014), *Sea-level rise and international law*, «Climatic Change», 122(1-2), pp. 3-16.

12. Lauterpacht H. (1947), *Recognition in international law*, Cambridge University Press, Cambridge.

13. Talmon S. (1998), *Recognition of governments in international law*, Oxford University Press, Oxford.

14. Celeste E. (2021), *Digital constitutionalism: A new systematic theorisation*, «International Review of Law, Computers & Technology», 35(1), pp. 76-99.

15. Floridi L. (2018), *Soft ethics and the governance of the digital*, «Philosophy & Technology», 31(1), pp. 1-8.

16. Kochenov D. (2019), *Citizenship*, MIT Press, Cambridge (Mass.).

17. Population displacement and the absence of a territory impact the same possibility of enforcing criminal sentences in terms of jurisdiction, if the punishment involves deprivation of liberty. The purchase of land from other states (as Kiribati is doing with Fiji) addresses the issue of finding a home for the population, but does not resolve the jurisdictional issue unless the host state prohibits it.

18. Bodansky D. (2016), *The Paris Climate Change Agreement: A new hope?*, «American Journal of International Law», 110(2), pp. 288-319.

19. Peel J., Osofsky H.M. (2018), *Climate change litigation*, Cambridge University Press, Cambridge.

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