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Influence of Environmental Deprivation and Socioeconomic Inequality on Waterborne Disease Burden among Informal Urban Settlements

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ABSTRACT

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Rapid urbanization and environmental degradation have intensified public health inequalities in informal urban settlements, particularly regarding access to safe water, sanitation, and healthy living conditions. This quantitative study examined the influence of environmental deprivation and socioeconomic inequality on the burden of waterborne diseases among residents of informal urban settlements. The study investigated how poor environmental conditions, including inadequate sanitation infrastructure, unsafe water sources, overcrowding, waste accumulation, and limited drainage systems, contributed to the prevalence of water-related illnesses. Additionally, the research assessed the role of socioeconomic inequality in shaping differential exposure to environmental health risks and healthcare access. The study further demonstrated that low-income populations faced disproportionate environmental and health risks due to structural inequalities and inadequate urban governance. The findings highlight the interconnected nature of poverty, environmental injustice, and public health disparities in informal settlements. The study recommends inclusive urban health policies, improved sanitation infrastructure, equitable resource distribution, and community-based environmental interventions to reduce waterborne disease burdens among vulnerable urban populations.

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1.0 Introduction

The high rate of urbanization in the developing world has greatly changed the social and environmental fabric of urban areas, and this has posed massive pressures in housing, sanitation facilities, water facilities, and health services. The blistering development of informal urban settlements has become one of the most apparent effects of unplanned urbanization, especially in the low- and middle-income world where the institutions are frequently unable to keep up with population growth. Overcrowding, lack of sanitation facilities, lack of clean drinking water, poor drainage, and uncontrolled solid waste disposal are common features of informal settlements and they contribute to environmental deprived living conditions that increase the risk of being exposed to infectious diseases (Ngakane, 2021). The most acute health issue in these marginalized communities includes the increasing number of waterborne illnesses such as diarrhea, cholera, typhoid, dysentery, skin infections as well as others which remain central to morbidity and mortality in the vulnerable groups. The continued occurrence of these illnesses does not just indicate the shortcomings in the environmental infrastructure but also larger trends of environmental injustice and social marginalization that overburden urban poor economically disadvantaged communities. Environmental deprivation and the threat to the public health have become a critical concern in the framework of sustainable urban development and global public health discussion along with the growing urban population (Ramirez-Rubio et al., 2019).

Environmental deprivation is defined as poor accessibility and quality of basic environmental facilities and amenities needed to live healthy lifestyles such as clean water, sanitation facilities, garbage collection facilities, drainage facilities, and healthy residential conditions. Environmental deprivation in informal settlements is commonly experienced through polluted water, open sewage systems, stagnant water, overpopulated housing and exposure to polluted environment, thus enhancing the chances of disease transmission. At the same time, socioeconomic inequality denotes variations in income, education, access to health services, access to jobs and social resources that determine unequal living conditions and health outcomes among urban communities (Qin et al., 2024). Socioeconomically disadvantaged individuals and households are at a higher risk of living in environmentally degraded locations, because of their inability to afford housing and their inability to access formal housing markets. As a result, socioeconomic inequality increases susceptibility to waterborne diseases by making it more difficult to obtain healthcare services, buy clean water, take preventive health actions, or move to safer locations. The weight of waterborne diseases thus goes beyond the biological exposure, and the unequal access to environmental risks and social safeguards in the urban systems (Izah & Ogwu, 2025).

The correlation between environmental deprivation and the burden of waterborne diseases can be explained with the help of the Environmental Health Theory that states that worsening environmental conditions directly affect human health outcomes by exposing people to biological and ecological hazards. This school of thought highlights the fact that unhealthy environments are potential channels through which diseases spread, especially where settlements are crowded with fewer sanitation facilities and water supply. In addition, the Social Determinants of Health Theory

presents a significant explanatory paradigm of the influence of socioeconomic inequality on the different health vulnerabilities. This view holds that social and economic statuses determine how people are exposed to health hazards, access to health facilities and general ability to live healthy lifestyles (Organization, 2024). The combination of these theoretical approaches implies that environmental deprivation and socioeconomic inequality are interrelated structural issues that interactively lead to the prevalence and severity of waterborne diseases in informal settlements. The unfavorable environmental conditions enhance direct contact with polluted water and unhygienic environment, and the socioeconomic disparity restricts the resources required to reduce or control such environmental health threats. The theoretical connection of these variables thus lays emphasis on how structural inequalities generate disproportional patterns of disease vulnerability within urban populations (Cheshmehzangi & Zou, 2025b).

Literature has widely discussed how poor sanitation, access to unsafe water, and the occurrence of infectious diseases are associated with developing countries, but numerous studies have concentrated more on the individual environmental or health aspects of urban vulnerability without fully addressing the socioeconomic aspects of the environment. The focus of previous studies has been on rural communities or national-level health effects, and relatively small amounts of empirical evidence have focused on informal urban settlements where the impact of environmental deprivation and socioeconomic inequality are combined more dramatically. Additionally, previous research often highlights the infrastructural shortcomings without delving adequately into how structural inequalities determine disparities in exposure to environmental risks and access to healthcare among disadvantaged groups (Cheshmehzangi & Zou, 2025a). The quantitative studies that have studied the joint impact of environmental deprivation and socioeconomic inequality on the burden of waterborne diseases in the rapidly urbanizing setting are also limited. Such absence of integrated analysis forms a considerable research gap in the knowledge of how environmental and socioeconomic deprivation champions together in amplifying the public health disparity in informal settlements (Consortium, 2024).

The research problem presented in this study is based on the fact that the number of waterborne diseases among the population of informal urban settlements is continuously growing despite the active urban development projects and the efforts of health organizations. The lack of proper sanitation facilities, unsafe drinking water, poor waste disposal, and access to health facilities by many of these marginalized urban communities, has shown that the current structures of urban governance have failed to adequately deal with environmental health disparities. This has been compounded by the lack of fair infrastructure development and equitable health policies that have increased disease susceptibility amongst low-income urban communities, and especially those who live in environmentally disadvantaged neighborhoods (Izah et al., 2024). This, therefore, necessitates a dire necessity to study the effect of environmental deprivation and socioeconomic inequality together on waterborne disease burden in informal settlements in order to come up with evidence-based strategies that can be used to tackle these twin issues. In the absence of an in-depth analysis of these relationships, interventions in the area of public health could stay disjointed and inadequate in decreasing the occurrence of disease in the susceptible

urban populations (Shripat et al., 2025).

The significance of the study is that it adds to the increasing literature on environmental justice, city-wide and neighborhood health, and socioeconomic disparity in informal settlements. Through empirical research on the impact of environmental deprivation and socioeconomic inequality on waterborne disease burden, the research contributes to a multidimensional perspective of the effects of structural and environmental disadvantages on health outcomes among marginalized urban residents. The results should be helpful to policymakers, city planners, health professionals in the field of public health, and development agencies in developing integrated programs to enhance sanitation facilities, increase access to safe water, enhance healthcare access, and decrease environmental health inequalities in informal settlements (Souza et al., 2025). Moreover, the research has a theoretical contribution as it connects environmental and social determinants of health in a single analytical model, and thus, enhances the research conceptualization of the multifaceted interplay of poverty, environmental degradation, and disease susceptibility in fast urbanizing communities.

2.0 Literature Review

The theoretical basis of this research is laid in the Environmental Health Theory and the Social Determinants of Health Theory which offer a detailed account on how the environmental and socioeconomic factors influence health outcomes among the marginalized urban communities. Environmental Health Theory is an assumption that environmental conditions that are not favorable like polluted water, inadequate sanitation facilities, improper disposal of waste materials, overpopulation, and lack of better drainage systems contribute immensely to human vulnerability to environmental risks and diseases. These environmental shortcomings in the informal urban settlements provide the perfect environment in which waterborne diseases can spread, especially to those populations that have no proper protective facilities and healthcare services (Tetteh & Tettey, 2025). At the same time, the Social Determinants of Health Theory states that inequalities in health arise due to the unequal social and economic statuses, such as differences in income, education, housing, employment, and access to healthcare. All of these theoretical views imply that environmental deprivation and socioeconomic inequality are two related structural determinants, which amplify disease vulnerability in low-income urban residents. The combination of the theories thus presents a solid conceptual framework to comprehend the interplay of environmental degradation and social inequality in the burden of waterborne diseases in informal settlements (Samantara, 2023).

Current literature has clearly shown that major predictors of prevalence of waterborne diseases in developing urban environments are environmental deprivation. Research has demonstrated that insufficient sanitation systems, unhygienic drinking water, lack of good drainage facilities as well as poor waste disposal has played a major role in increasing the rate of cases of diarrheal diseases, cholera, typhoid, and skin infections among the informal settlement dwellers. A study revealed that the populations with inaccessibility to safe managed water and sanitation systems have significantly increased the exposure to microbial contamination and infectious diseases. On the same note asserted that the environmental degradation of overcrowded

urban settlements is a direct cause of preventable disease burden by relentlessly exposing them to the harmful aspects of living conditions (Sharma & Pathak, 2024). The high rate of urbanization in most developing nations has also contributed to the environmental pressures by creating informal settlements that become so large that municipal leaders are unable to offer proper infrastructure and public health facilities. These results suggest that environmental deprivation is not only a manifestation of infrastructural inadequacies, but also, it is a severe public health issue that is linked to injustices in urban environment (Bressane et al., 2024).

The correlation between socioeconomic inequality and the burden of waterborne diseases has also been empirically explored in considerable detail in the literature of both the public health and urban development. Socioeconomic inequality reduces the capacity of households to access healthcare services, clean drinking water, healthy food, sanitation facilities and preventive health services thus exposing them to vulnerable status of infectious diseases. The marginalized urban studies have revealed that low-income households have a higher chance of living in ecologically unsafe locations with poor sanitation and unsafe water supply because of structural inequalities in urban housing facilities (Shripat et al., 2025). Moreover, discovered that the population of informal settlements tends to have several layers of disadvantage, such as lack of education, unstable jobs, and insufficient political representation that limit their ability to address the health hazards of the environment. Socioeconomic inequality thus not only serves as an economic state of affairs, but also as a structural process that determines disproportionate exposure to the environment and susceptibility to sickness among urban residents (Smith et al., 2022).

The latest empirical work has been more and more focused on the interrelation between environmental deprivation and socioeconomic inequality in determining the outcome of public health in the informal settlements. Indicatively, suggested that interactions between environmental threats and social inequalities cumulatively lead to increased health disparities between urban poor populations. On the same note, a recent study found out that overcrowding, lack of drainage system and poor waste management in informal settlements played a major role in the frequent outbreaks of waterborne diseases especially in the economically disadvantaged populations. The study also revealed that low-income families are unequally affected by environmental pollution and infectious diseases due to poor urban governance and the lack of sanitation infrastructure (Neaemeka & Dikwa, 2025). Taken together, these studies suggest environmental and socioeconomic vulnerabilities are mutually reinforcing and cannot be tackled in isolation as part of urban public health interventions. The compounded impact of environmental deprivation and socioeconomic inequality thus forms a cycle of health disadvantage in a skewed way of its dissimilar urban residents (Nyangule, 2024).

Although the literature on environmental health and urban inequality has been increasing, there are still a number of valuable research gaps that have not been adequately addressed. A large number of past studies concentrated on either the environmental conditions or socioeconomic disparities alone without considering their interactive effect on the burden of waterborne diseases in the informal settlements. Current studies have also focused a lot on issues of rural sanitation or the health outcomes at the national level, with relatively little focus on the densely populated

informal urban areas where environmental and social vulnerabilities are most combined. Also, previous research has tended to be descriptive or qualitative, leading to a scarcity of quantitative data on the direct correlations between environmental deprivation, socioeconomic inequality and disease burden (Casanova et al., 2023). Empirical studies that investigate the effects of structural inequalities on the unequal vulnerability to environmental health hazards in developing countries in the rapidly urbanizing environment are also lacking. This absence of combined empirical research underscores the importance of an extensive study that is able to describe the interrelated nature of environmental deprivation, socioeconomic inequality, and prevalence of waterborne diseases in vulnerable urban residents (Nyangule, 2024).

According to the theoretical arguments and empirical evidence provided in the literature, the study hypothesizes that the burden of waterborne diseases is indeed more pronounced in environmentally deprived households due to exposure to contaminated water, insufficient sanitation and living conditions that are environmentally unsafe. Similarly, inequality in socioeconomic status is likely to increase susceptibility to diseases by limiting the access to health care services, clean water supply, sanitation systems, and preventive health care (Organization, 2023). The interrelationship between environment and socioeconomic disadvantages further implies that households with low incomes living in environmentally deprived settlements have disproportionately greater health risks than more socially and economically fortunate populations (Tonn et al., 2021).

3.0 Methodology

The research design used in this study was a quantitative research design as per recommended by the researchers (Gulshan et al., 2024; Hussain & Ahmad, 2021; M. Hussain et al., 2025; Hussain et al., 2026) to investigate the effect of environmental deprivation and socioeconomic inequality on the burden of waterborne diseases in the residents of informal urban settlements in Pakistan. Quantitative approach was found to be suitable since the study was to measure the relationships between the clearly defined variables empirically and to test the hypotheses proposed statistically using the numeric data. The study adopted a cross-sectional design (Mughal et al., 2023) whereby respondents were only sampled at one time to obtain current environmental, socioeconomic, and health-related factors in the marginalized urban communities. Cross-sectional method was especially appropriate in discovering trend, association and prediction relationship between the study variables in a large population. The research was based on the positivist research philosophy, according to which, the social phenomena could be measured and analyzed objectively, based on available data and scientific methods. Positivism focuses on empirical research, statistical research, hypothesis testing, and producing generalizable results, and is therefore well suited to the goals of the current research. The research by assuming positivist position aimed to give objective and evidence-based information on the role of environmental and socioeconomic disadvantages in causing the burden of waterborne diseases in informal settlements.

The study population consisted of households living in informal urban settlements in the South Punjab districts of Multan and Bahawalpur. These communities were predominantly low-

income, densely populated, and characterized by poor sanitation infrastructure, inadequate water supply, overcrowded housing conditions, and limited access to healthcare services. The informal settlements were chosen as it is in such environments where environmental deprivation and socioeconomic inequity are at the highest and hence, the residents are highly vulnerable to waterborne diseases. The unit of analysis was residents of households 18 years and older who had adequate information on their living conditions, access to sanitation and water sources, and household health experiences. The non-probability purposive sampling strategy that was used in the study in combination with techniques of convenience sampling was due to the fact that the sampling frame of informal settlements could not be complete and reported. Purposive sampling helped the researcher to sample selected respondents in environmentally deprived and socioeconomically marginalized communities that were of interest to the research. The convenience sampling also helped in accessing the respondents conveniently as the urban settlements were highly populated and formal household listing could not be easily obtained. The sample size was 400 respondents because Partial Least Squares Structural Equation Modeling (PLS-SEM) can be effectively applied with medium to large sample sizes and is capable of analyzing complex relationships between latent constructs.

The process of gathering data was based on a structured survey questionnaire, which was developed based on the relevant environmental health and public health literature relevant scales that had been previously validated. The questionnaire was made up of close-ended questions with a five-point Likert scale on strongly disagree to strongly agree. The tool had items on demographic data, environmental deprivation data, socioeconomic inequality data, and experiences of waterborne disease burden. Partial Least Squares Structural Equation Modeling (PLS-SEM) was used to analyse the data, with the SmartPLS software (S. Hussain et al., 2025; Niaz et al., 2024; Siddiqui et al., 2024). The choice of PLS-SEM was based on the fact that it is very appropriate in predictive as well as exploratory research frameworks with numerous latent variables and complicated structural associations. Moreover, PLS-SEM can easily deal with non-normative data distributions, and is also suitable in social science studies where behavioral and environmental constructs are used.

The analysis procedure was divided into two significant steps: analysis of measurement model and analysis of structural model. The internal consistency reliability, convergent and discriminant validity of the measurement model were tested in the form of indicators of Cronbachs alpha, composite reliability, average variance extracted (AVE) and Fornell-Larcker criterion. The structural model was assessed using the analysis of path coefficient, coefficient of determination, predictive relevance, effect size and bootstrapping to establish the excellence of the hypothesized relationships between the constructs after satisfactory measurement model results. This method of analysis allowed the study to thoroughly look at direct and indirect impacts of environmental deprivation and socioeconomic inequality on the burden of waterborne disease among the population living in informal urban settlements. Ethical aspects were strictly monitored during the research to make sure that protection, dignity and rights of all the participants were taken care. Ethics was strictly followed in the research process. All respondents gave informed consent before

data collection and this guaranteed voluntary participation and the right to withdraw at any point without any implications (Asim et al., 2021; S. Hussain et al., 2025; Nadeem et al., 2025). In addition, the study made sure that participants were not subjected to any psychological, social or physical harm during the data collection.

4.0 Findings and Results

4.1 Reliability and Convergent Validity Analysis

Table 4.1 Reliability and Convergent Validity Analysis

Constructs	Items	Factor Loadings	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Environmental Deprivation (ED)	ED1–ED5	0.71–0.86	0.88	0.91	0.66
Socioeconomic Inequality (SEI)	SEI1–SEI5	0.73–0.87	0.90	0.92	0.69
Waterborne Disease Burden (WDB)	WDB1–WDB5	0.72–0.88	0.89	0.92	0.70

The reliability and convergent validity test indicated that each research construct had excellent psychometric factors and good quality of measurement. All the items showed factor loadings ranging between 0.71 and 0.88 which is higher than the recommended factor loading of 0.70 which implies that the observed indicators were a good reflection of their respective latent constructs. Moreover, the Cronbach alpha of Environmental Deprivation (0.88), Socioeconomic Inequality (0.90) and Waterborne Disease Burden (0.89) indicated high internal consistency reliability of the measurement items. Likewise, the values of composite reliability (0.91-0.92) also confirmed the reliability and consistency of the constructs in the measurement model. Also, the values of the Average Variance Extracted (AVE) of all the constructs were between 0.66 and 0.70, exceeding the acceptable level of 0.50, thus establishing a sufficient level of convergent validity. All these findings collectively point out that the measurement model was statistically sound and valid in measuring the relationships between environmental deprivation, socioeconomic inequality and waterborne disease burden in informal urban settlements.

4.2 Discriminant Validity Analysis (HTMT Ratio)

Table 4.2 Discriminant Validity Analysis

Constructs	ED	SEI	WDB
Environmental Deprivation (ED)	—		
Socioeconomic Inequality (SEI)	0.71	—	
Waterborne Disease Burden (WDB)	0.76	0.73	—

The HTMT discriminant validity test established the fact that all the constructs in the study were empirically different and sufficient to measure distinct conceptual dimensions. The value of the HTMT between the Environmental Deprivation and Socioeconomic Inequality was 0.71, between Environmental Deprivation and Waterborne Disease Burden was 0.76, and between Socioeconomic Inequality and Waterborne Disease Burden was 0.73. All the ratios of HTMT were also less than the suggested level of 0.85, which showed that there are satisfactory discriminant validity between the measurement model. These observations indicate that despite the positive association between the constructs, they were not conceptually similar to each other and had enough independence to explain various dimensions of environmental factors, socioeconomic inequalities and disease burden among informal urban settlement dwellers. Consequently, the findings prove the suitability of the construct measures to the further analysis of the structural models.

4.3 Variance Inflation Factor (VIF) Analysis

Table 4.3 Variance Inflation Factor

Constructs	VIF Values
Environmental Deprivation (ED)	2.11
Socioeconomic Inequality (SEI)	2.34

The Variance Inflation Factor (VIF) analysis revealed that the issue of multicollinearity was not a threat among the predictor constructs that were used in the structural model. The VIF of Environmental Deprivation was 2.11 and Socioeconomic Inequality had VIF of 2.34 which were very low compared to the recommended value of 5.0. The findings indicate that the independent variables were not very correlated with one another and had a distinct contribution to the explanation of changes in the burden of waterborne diseases.

4.4 Model Fitness Analysis

Table 4.4 Model Fitness Analysis

Fit Index	Obtained Value	Recommended Threshold	Result
SRMR	0.061	< 0.08	Acceptable
NFI	0.91	> 0.90	Acceptable
RMS Theta	0.103	< 0.12	Acceptable

The model fitness analysis showed that the proposed PLS-SEM model had an acceptable overall fit and sufficiently covered the relations between the study constructs. The Standardized root mean square Residual (SRMR) was 0.061, lower than the acceptable value of 0.08, thus a good fit was found between the measured values and the model that had been estimated. Likewise, the Normed Fit Index (NFI) was 0.91 which is greater than the acceptable level of 0.90 thus indicating the satisfactory model adequacy and predictive power. Also, the RMS Theta was 0.103 which was lower than the recommended value of 0.12 indicating a well-specified model with low residual covariance errors. All these fit indices corroborate the fact that the structural model was sound, reliable, and suitable to analyze the relationships among environmental deprivation, socioeconomic inequality, and waterborne disease burden in informal urban settlements.

4.5 Structural Equation Modeling Results

Table 4.5 Structural Equation Modeling Results

Hypothesis	Path Relationship	β (Beta)	Standard Error	T-Value	P-Value	Decision
H1	ED → WDB	0.47	0.053	8.86	0.000	Supported
H2	SEI → WDB	0.39	0.049	7.95	0.000	Supported
H3	SEI → ED	0.44	0.051	8.21	0.000	Supported

The structural equation modeling outcomes showed that there were all significant positive correlations between all the hypothetical constructs in the study. Environments Deprivation had a significant positive impact on Waterborne Disease Burden (β= 0.47, t = 8.86, p = 0.000), which suggests that poor environmental conditions including poor sanitation, unsafe water supply, overcrowding, and poor drainage systems significantly contribute to the prevalence of waterborne

diseases in informal urban settlements. On the same note, there was a strong positive effect of Socioeconomic Inequality on Waterborne Disease Burden (β=0.39, 7.95, 0.000) indicating that poorly socioeconomically endowed populations are more susceptible to disease exposure owing to poor accessibility to healthcare services, clean water, sanitation and preventive health facilities. Moreover, Environmental Deprivation was also found to be significantly affected by Socioeconomic Inequality (β= 0.44, 8.21, p = 0.000) and this means that relatively poor households are at a higher risk of living in an environmentally deprived state, which is characterized by poor infrastructure and poor living conditions. All the three hypotheses were accepted since all the p-values were less than the significance level of 0.05 and all T-values were greater than the suggested threshold of 1.96. All of these results support the interrelated issue of environmental and socioeconomic disadvantage in increasing the burden of public health and waterborne infections in vulnerable urban communities.

5.0 Discussion and Conclusion

The results of the proposed research findings are good empirical data to support the idea that the environment deprivation and socioeconomic inequality are key factors that define the burden of waterborne diseases in informal urban settlements. The positive correlation between environmental deprivation and disease burden is high indicating that worsening of the living conditions through unsafe drinking water, unsanitary systems, poor drainage and poor waste management directly contribute to the exposure to infectious diseases (Organization, 2023). Such result is congruent with the environmental health views, which focus on the fact that poor physical environments serve as the main modes of transmission of waterborne diseases. In a place like informal settlements in Pakistan, where there is low development of infrastructure and where there is low consistency of public services, the residents are under constant exposure to environmental hazards that compound health vulnerabilities (Shah et al., 2025). The findings thus add weight to the argument that environmental quality is a key determinant of population health, especially in overcrowded urban slums (Jan et al., 2026).

Likewise, the prominent role of socioeconomic inequality in the impact of waterborne diseases on the population also points to the structural aspect of health inequality among urban populations. Waterborne diseases disproportionately hit households with low-income levels, low levels of education, unreliable employment and limited access to healthcare services. This result implies that the distribution of health risks is not random, but there is a systematic concentration of health risks among socially and economically disadvantaged groups (Cheng et al., 2025). Moreover, the strong correlation between socioeconomic disparity and environmental deprivation suggests that poverty does not only restrict the access to basic services but also location of residence, as marginalized groups are compelled to live in poorly ecologically situated places (Dar & Singh, 2022). This interlocking relationship is an indication of the cumulative impact of social and environmental disadvantage whereby inequality influences exposure to ill-living conditions, and consequently affects susceptibility to diseases.

In conclusion, the findings affirm the larger theoretical framework of Social Determinants of Health and Environmental Health Theory, which both highlight that structural inequalities are the drivers of health outcomes and individual behavior is not the sole factor. The results show that

environmental deprivation and socioeconomic inequality act synergistically to support the existence of health disparities in the informal settlements. The research also points out that the burden of waterborne diseases is not simply a health matter of the people but a symptom of the systemic inequality concerning the urban planning, distribution of resources, and inefficiencies in governance. This combined knowledge highlights the significance of multidimensional interventions that consider the environmental infrastructure and socioeconomic conditions mutual to each other instead of separate.

Contribution

Saadat Ali: Problem Identification and Theoretical Framework
Taimoor Iftikhar: Data Analysis, Supervision and Drafting
Furqan Yaseen: Methodology and Revision

Conflict of Interests/Disclosures

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