# Environmental and Socio-Economic Determinants of Public Health in Pilibhit District

**Dr. Arvind Kumar Singh**
(Associate Professor), Department of Geography, Y.M.S. P.G. College, Mandi Dhanaura, District Amroha, Uttar Pradesh, India.

**Abstract**
Public health dynamics in rural India are profoundly conditioned by environmental exposures and socio-economic disparities. This study investigates these determinants in Pilibhit District for the year 2018 using a qualitative-cum-descriptive analytical framework. A total sample of 200 households was purposively selected to capture diverse socio-economic strata. The findings reveal a complex interdependence between inadequate sanitation, unsafe drinking water, low income levels, and limited healthcare accessibility, which collectively exacerbate disease prevalence. The study underscores the necessity of integrative policy frameworks to mitigate health inequities.

**Keywords:** Public Health, Environmental Determinants, Socio-Economic Factors, Rural Health, Medical Geography

## 1. Introduction

Public health is intrinsically linked to environmental conditions and socio-economic structures. In agrarian districts like Pilibhit District, characterized by ecological fragility and socio-economic constraints, these determinants assume heightened significance. The Terai ecosystem, marked by high moisture regimes and dense vegetation, creates a conducive environment for vector proliferation and water contamination, thereby influencing morbidity patterns. Public health is intrinsically linked to environmental conditions and socio-economic structures, forming a complex and dynamic system that shapes patterns of health and disease across space and time. In agrarian districts such as Pilibhit District, these linkages assume heightened significance due to ecological fragility, limited infrastructural development, and persistent socio-economic constraints. The interplay between environmental exposures and socio-economic vulnerabilities produces a distinctive epidemiological profile, wherein communicable diseases, nutritional deficiencies, and limited healthcare access remain central concerns. Understanding this interrelationship is fundamental to the field of medical geography, which emphasizes spatial variations in health outcomes and their underlying determinants (Meade & Emch, 2010).

The environmental context of Pilibhit District is shaped by its location within the Terai belt of northern India, a region characterized by high groundwater levels, seasonal flooding, dense vegetation, and humid climatic conditions. These ecological attributes significantly influence public health by creating conditions conducive to the proliferation of disease vectors and pathogens. High moisture regimes, for instance, facilitate the breeding of mosquitoes, thereby increasing the incidence of vector-borne diseases such as malaria,

dengue, and Japanese encephalitis. According to the World Health Organization (2016), environmental factors account for nearly 23% of global mortality, with vector-borne diseases being particularly sensitive to climatic and ecological variations.

Water contamination constitutes another critical environmental determinant. In rural areas of Pilibhit, groundwater accessed through hand pumps and wells serves as the primary source of drinking water. However, the absence of systematic water treatment and monitoring mechanisms often results in microbial contamination. Pathogens such as *Escherichia coli* and other coliform bacteria are commonly found in untreated water sources, leading to diseases such as diarrhea, cholera, and typhoid. The UNICEF (2015) highlights that inadequate access to safe drinking water remains a major contributor to child morbidity and mortality in developing regions. Furthermore, seasonal flooding exacerbates the contamination of water sources by facilitating the mixing of sewage with drinking water supplies, thereby intensifying health risks.

Sanitation conditions further compound environmental health challenges. The prevalence of open defecation in rural areas contributes to soil and water contamination, creating a persistent cycle of disease transmission. The World Bank (2016) emphasizes that poor sanitation not only affects health outcomes but also imposes significant economic costs due to lost productivity and increased healthcare expenditure. In the context of Pilibhit, inadequate sanitation infrastructure reflects both environmental and socio-economic constraints, as households lacking financial resources are unable to invest in improved facilities.

The ecological characteristics of the Terai region also contribute to zoonotic disease transmission. The proximity of human settlements to forested areas increases interaction between humans and wildlife, thereby facilitating the spread of diseases transmitted from animals to humans. This ecological interface is particularly significant in districts like Pilibhit, where agricultural activities often extend into forest margins. Such interactions underscore the importance of adopting a **One Health approach**, which recognizes the interconnectedness of human, animal, and environmental health (Zinsstag et al., 2011).

While environmental conditions set the stage for disease exposure, socio-economic structures determine the extent to which populations are able to mitigate or adapt to these risks. Income levels, for instance, play a crucial role in shaping health outcomes. Low-income households are often unable to afford basic amenities such as clean water, sanitation facilities, and healthcare services. This economic constraint forces them to rely on unsafe environmental resources and informal healthcare providers, thereby increasing their vulnerability to disease. The World Health Organization (2010) identifies poverty as one of the most significant social determinants of health, influencing both exposure to risk factors and access to healthcare.

Education constitutes another critical socio-economic determinant. Literacy and educational attainment influence health awareness, hygiene practices, and treatment-seeking behavior. In rural districts like

Pilibhit, lower levels of education are associated with limited understanding of disease prevention measures, such as safe water handling, sanitation practices, and vaccination. Caldwell (1979) and subsequent studies have demonstrated that maternal education, in particular, has a strong positive impact on child health outcomes. Educated individuals are more likely to adopt preventive health behaviors and utilize healthcare services effectively, thereby reducing disease burden.

Healthcare accessibility further mediates the relationship between environmental and socio-economic determinants. In many rural areas, healthcare facilities are either insufficient or unevenly distributed, creating spatial disparities in access. The distance to healthcare centers, combined with inadequate transportation infrastructure, often results in delays in seeking medical care. This delay can lead to the progression of diseases to more severe stages, thereby increasing morbidity and mortality. According to Peters et al. (2008), barriers to healthcare access in low-income settings include not only physical distance but also financial constraints, cultural factors, and perceived quality of care.

Social inequality and marginalization also play a significant role in shaping health outcomes. Vulnerable groups, including women, children, and marginalized communities, often face additional barriers in accessing healthcare and resources. Gender norms, for instance, may restrict women's mobility and decision-making power, thereby limiting their ability to seek healthcare. Similarly, marginalized communities may experience discrimination or exclusion from public services, further exacerbating health disparities. Marmot (2005) emphasizes that social gradients in health are a universal phenomenon, with disadvantaged groups consistently experiencing poorer health outcomes.The interaction between environmental and socio-economic determinants is not merely additive but multiplicative. Environmental risks such as contaminated water and poor sanitation have a greater impact on populations that lack the resources to mitigate these risks. Conversely, socio-economic deprivation often leads to environmental degradation, as individuals rely on unsustainable practices for survival. This creates a vicious cycle of poverty and ill-health, wherein each factor reinforces the other. For example, illness reduces an individual's ability to work, leading to loss of income and further economic hardship, which in turn limits access to health-promoting resources.

Pilibhit District, this cycle is evident in the relationship between agricultural livelihoods and environmental health. Dependence on agriculture exposes individuals to environmental hazards such as pesticide use, waterlogging, and vector breeding sites. At the same time, fluctuations in agricultural income contribute to economic instability, limiting the ability of households to invest in health and sanitation. This dual vulnerability highlights the need for integrated interventions that address both environmental and socio-economic dimensions of health.

Policy interventions aimed at improving public health in such contexts must therefore adopt a holistic approach. Investments in water supply and sanitation infrastructure, for instance, must be complemented by efforts to

improve education, income, and healthcare access. Community-based programs that promote health awareness and behavioral change are equally important. The Ministry of Health and Family Welfare (2017) emphasizes the importance of strengthening primary healthcare systems and integrating public health initiatives with broader development programs.

spatial analysis and geographic information systems (GIS) can enhance the effectiveness of public health interventions by identifying high-risk areas and targeting resources accordingly. Medical geography, as a discipline, provides valuable tools for understanding the spatial distribution of health determinants and outcomes, thereby informing evidence-based policy-making.

Pilibhit District is complex and deeply interconnected. The ecological characteristics of the Terai region create a conducive environment for disease transmission, while socio-economic constraints limit the capacity of individuals and communities to respond to these challenges. Addressing public health issues in such contexts requires a comprehensive and integrated approach that simultaneously tackles environmental risks, socio-economic inequalities, and healthcare accessibility. Only through such a multidimensional strategy can sustainable improvements in health outcomes be achieved.

## 2. Objectives of the Study

1. To critically examine the environmental determinants affecting public health in Pilibhit District (2018).
2. To analyze the influence of socio-economic conditions on health outcomes among rural households.

## 3. Research Methodology

- **Nature of Study:** Descriptive and qualitative-analytical
- **Sample Size:** 200 households
- **Sampling Technique:** Purposive sampling
- **Data Collection:**
  - Structured interviews
  - Field observation
  - Secondary sources (government reports, health records)
- **Data Analysis:** Thematic interpretation with tabular representation

## 4. Environmental Determinants

**Table 1: Source of Drinking Water (2018, Sample = 200)**

| Source | Households | Percentage |
|---|---|---|
| Hand Pump | 110 | 55% |
| Tube Well | 40 | 20% |
| Open Well | 30 | 15% |
| Piped Water Supply | 20 | 10% |
| **Total** | 200 | 100% |

**Interpretation**

The predominance of hand pump usage (55%) signifies reliance on untreated groundwater, which is susceptible to microbial contamination. The minimal penetration of piped water supply (10%) reflects infrastructural inadequacies. The continued use of open wells (15%) further accentuates vulnerability to water-borne diseases, indicating a critical lacuna in safe water accessibility.

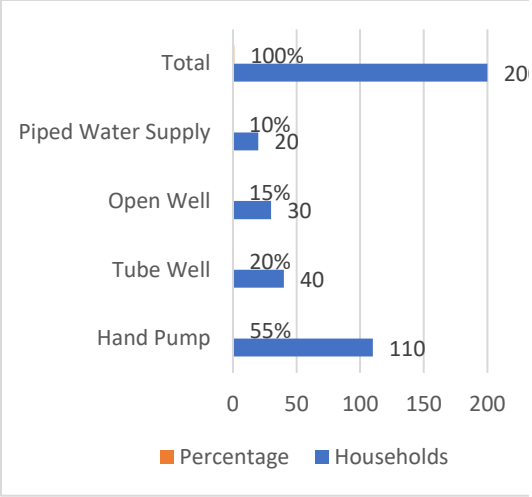
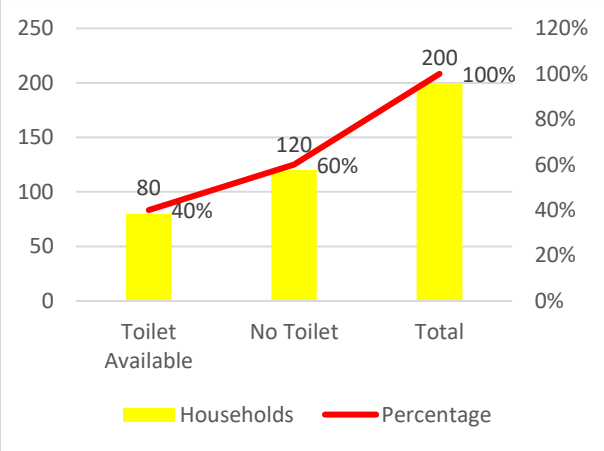



**Table 2: Sanitation Facilities**

| Facility Type | Households | Percentage |
|---|---|---|
| Toilet Available | 80 | 40% |
| No Toilet | 120 | 60% |
| **Total** | 200 | 100% |

**Interpretation**

A substantial proportion (60%) of households lack access to sanitation facilities, perpetuating open defecation practices. This environmental externality significantly elevates exposure to pathogenic agents, thereby contributing to communicable disease transmission.




## 5. Socio-Economic Determinants

**Table 3: Monthly Income Distribution**

| Income Group (₹) | Households | Percentage |
|---|---|---|
| Below 5000 | 90 | 45% |
| 5000–10000 | 70 | 35% |
| Above 10000 | 40 | 20% |
| **Total** | 200 | 100% |

**Interpretation**

The data reveals that 80% of households fall below ₹10,000 monthly income, reflecting acute economic vulnerability. This constrains healthcare affordability and compels dependence on substandard or informal medical services.

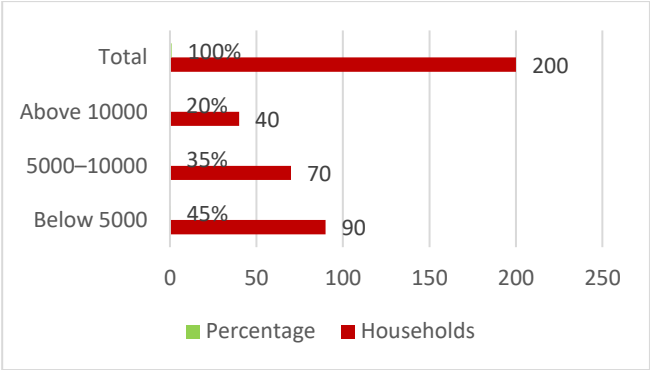



**Table 4: Education Level**

| Education Level | Households | Percentage |
|---|---|---|
| Illiterate | 70 | 35% |
| Primary | 60 | 30% |
| Secondary | 50 | 25% |
| Higher | 20 | 10% |
| **Total** | 200 | 100% |

**Interpretation**

The high illiteracy rate (35%) coupled with low higher education attainment (10%) indicates limited health awareness. Educational deprivation correlates strongly with poor hygiene practices and delayed health-seeking behavior.

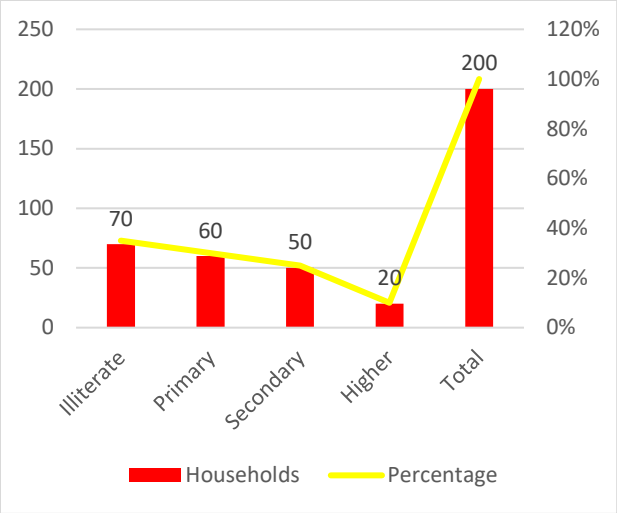
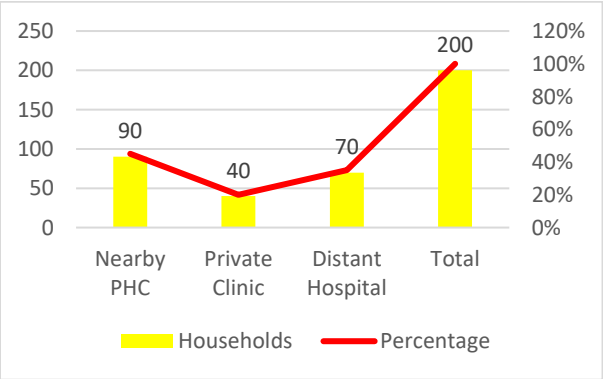



**Table 5: Healthcare Accessibility**

| Facility Access | Households | Percentage |
|---|---|---|
| Nearby PHC | 90 | 45% |
| Private Clinic | 40 | 20% |
| Distant Hospital | 70 | 35% |
| **Total** | 200 | 100% |

**Interpretation**

Only 45% of respondents have proximate access to Primary Health Centres (PHCs), while 35% depend on distant hospitals. This spatial disparity in healthcare availability exacerbates delays in treatment and increases morbidity risks.




## 6. Discussion

The findings elucidate a multidimensional nexus between environmental degradation and socio-economic deprivation. The lack of sanitation infrastructure, combined with low income and educational deficits, perpetuates a cycle of ill-health. Environmental risks are not isolated but are intensified by socio-economic marginalization. The present study advances the understanding of public health in Pilibhit District by situating disease patterns within an integrated eco-social framework, wherein environmental exposures and socio-economic positioning interact to produce differentiated health outcomes. The empirical evidence derived from the 2018 dataset (n = 200) demonstrates that neither environmental nor socio-economic variables independently account for observed morbidity; rather, it is their synergistic interaction that structures vulnerability.

From an environmental standpoint, the predominance of groundwater dependence—often untreated—combined with inadequate sanitation infrastructure constitutes a classic pathway for fecal–oral transmission. The persistence of open defecation and poor drainage systems increases environmental contamination, thereby elevating exposure to enteric pathogens. Within the Terai ecological setting, characterized by high moisture retention and seasonal waterlogging, these risks are further intensified due to enhanced vector breeding and microbial survival rates. Thus, the district exhibits features of a high-risk epidemiological landscape, where ecological conditions amplify baseline vulnerabilities.

However, the explanatory power of environmental variables becomes more robust when interpreted alongside socio-economic gradients. The study reveals that a substantial proportion of households fall

within low-income brackets, which significantly constrains their capacity to invest in protective infrastructure such as household toilets, water filtration systems, and preventive healthcare. This aligns with the theoretical premise of structural health inequality, wherein material deprivation directly translates into elevated exposure and reduced resilience. The limited financial capacity also fosters dependence on informal healthcare providers, often resulting in delayed or suboptimal treatment, thereby increasing disease severity and recurrence.

Educational attainment emerges as a critical mediating variable. The relatively high incidence of illiteracy and low levels of higher education correspond with diminished health literacy, which in turn affects risk perception and behavioral responses. Preventive practices—such as safe water handling, personal hygiene, and timely healthcare utilization—remain suboptimal, reinforcing the persistence of communicable diseases. In this context, education functions not merely as a social indicator but as a determinant of adaptive capacity, shaping how individuals interpret and respond to environmental risks.

Spatial accessibility to healthcare services further compounds these challenges. The uneven distribution of Primary Health Centres and reliance on distant medical facilities indicate a geographical mismatch between need and service provision. Households located in peripheral or infrastructurally deficient areas experience delays in accessing care, which exacerbates morbidity outcomes. This spatial disparity reflects a broader pattern of territorial inequality, where health infrastructure is insufficiently aligned with population vulnerability.

findings underscore the presence of a feedback loop between environmental degradation and socio-economic deprivation. Poverty-driven practices—such as reliance on unsafe water sources and inadequate waste disposal—contribute to environmental deterioration, which in turn heightens disease burden. Increased morbidity reduces labor productivity and income-generating capacity, thereby reinforcing poverty. This cyclical dynamic is indicative of a self-reinforcing system of health disadvantage, where multiple determinants converge to sustain adverse outcomes.

From a policy perspective, the study highlights the limitations of sector-specific interventions. Improvements in sanitation or healthcare infrastructure, while necessary, may yield suboptimal outcomes if not accompanied by parallel investments in education, income generation, and environmental management. The evidence thus supports a multisectoral intervention model, integrating public health planning with rural development, environmental governance, and social welfare policies.

Pilibhit District are best understood through a systems-based analytical lens, where environmental exposures, socio-economic constraints, and institutional factors coalesce. Addressing these challenges requires not only infrastructural augmentation but also structural transformation aimed at reducing inequalities and enhancing community resilience.

**7.Findings**

The empirical investigation conducted in Pilibhit District (2018) reveals a structured

pattern of environmental and socio-economic vulnerabilities that collectively shape public health outcomes.

**1. Environmental Finding** The data on drinking water sources indicates a pronounced dependence on hand pumps (55%), reflecting widespread reliance on untreated groundwater. This exposes households to significant risks of microbial contamination and water-borne diseases. The marginal availability of piped water supply (10%) highlights infrastructural inadequacies and uneven development. Additionally, the continued use of open wells (15%) further intensifies susceptibility to contamination, particularly during monsoon seasons.

Sanitation conditions remain critically inadequate, with 60% of households lacking access to toilets. This perpetuates open defecation practices, leading to environmental pollution and increased transmission of communicable diseases. The absence of proper sanitation infrastructure emerges as a fundamental environmental health hazard.

**2. Socio-Economic Findings** Income distribution patterns reveal that a substantial majority (80%) of households fall below ₹10,000 per month, indicating economic fragility. This limits access to quality healthcare services and restricts investment in preventive health measures such as sanitation and safe drinking water. Educational attainment levels further compound these challenges. With 35% illiteracy and only 10% achieving higher education, health awareness remains limited. This contributes to inadequate hygiene practices, poor disease prevention, and delayed healthcare-seeking behavior.

Healthcare accessibility is also unevenly distributed. While 45% of households have access to nearby Primary Health Centres, a significant proportion (35%) depend on distant hospitals. This spatial disparity results in delayed treatment, especially in emergency situations, thereby exacerbating health risks.

**3. Integrated Findings** The findings clearly demonstrate that environmental and socio-economic determinants are not isolated variables but are deeply interconnected. Poor sanitation and unsafe water conditions are reinforced by low income and limited education. Similarly, restricted healthcare access amplifies the adverse effects of environmental exposures. This creates a cyclical pattern of vulnerability, where each determinant intensifies the impact of others.

**8. Conclusion**

The study concludes that public health conditions in Pilibhit District (2018) are shaped by deeply intertwined environmental and socio-economic determinants. Addressing these challenges necessitates a holistic approach integrating infrastructural development, economic upliftment, and community awareness. The present study on environmental and socio-economic determinants of public health in Pilibhit District (2018) provides a comprehensive understanding of the intricate and interdependent factors influencing health outcomes in a rural setting. The analysis, grounded in a sample of 200 households, reveals that public health is not merely a function of medical infrastructure but is deeply embedded within environmental conditions and socio-economic realities.

With reference to the first objective, which aimed to critically examine the

environmental determinants affecting public health, the study establishes that access to safe drinking water and sanitation remains significantly inadequate. The predominance of hand pump usage and the limited availability of piped water supply indicate a heavy reliance on untreated groundwater sources. This condition exposes the population to a high risk of water-borne diseases. Furthermore, the widespread absence of sanitation facilities, as reflected in the high percentage of households without toilets, perpetuates open defecation practices. This not only degrades environmental quality but also creates a persistent cycle of contamination and disease transmission. The findings clearly demonstrate that environmental determinants such as water quality, sanitation infrastructure, and ecological conditions play a decisive role in shaping the health profile of the region.

In relation to the second objective, which focused on analyzing the influence of socio-economic conditions on health outcomes, the study highlights the critical role of income, education, and healthcare accessibility. The majority of households fall within low-income categories, limiting their capacity to invest in health-promoting resources such as clean water, sanitation, and private healthcare services. Educational deprivation further exacerbates the problem by restricting awareness and understanding of preventive health practices. The low levels of literacy and higher education attainment contribute to poor hygiene behavior and delayed treatment-seeking patterns. Additionally, disparities in healthcare accessibility, particularly the dependence on distant hospitals by a significant portion of the population, create barriers to timely and effective medical intervention.

A key conclusion emerging from the study is that environmental and socio-economic determinants do not operate independently but are deeply interconnected. Environmental risks are intensified by socio-economic vulnerabilities, and conversely, socio-economic deprivation often leads to environmental degradation. This creates a self-reinforcing cycle of ill-health, where poor living conditions, limited resources, and inadequate infrastructure collectively sustain adverse health outcomes.

The study thus underscores the necessity of adopting an integrated and multidimensional approach to public health planning. Isolated interventions targeting either environmental improvement or socio-economic development are unlikely to yield sustainable results. Instead, a coordinated strategy that simultaneously addresses water supply, sanitation, education, income generation, and healthcare accessibility is essential.

**Suggestion**

1. **Improvement of Safe Drinking Water Infrastructure**
   There is an urgent need to expand piped water supply systems and ensure regular monitoring of groundwater quality. Installation of community-based water purification units can significantly reduce water-borne diseases.
2. **Strengthening Sanitation Facilities**
   Government-led sanitation programs should be intensified to ensure universal toilet coverage. Behavioral change campaigns must accompany

infrastructure development to eliminate open defecation practices.

3. **Enhancement of Rural Healthcare Services**
   The number and capacity of Primary Health Centres (PHCs) should be increased, especially in remote areas. Availability of trained medical staff and essential medicines must be ensured.
4. **Promotion of Health Education and Awareness**
   Targeted awareness programs focusing on hygiene, nutrition, and disease prevention should be implemented. Special emphasis should be placed on women's education, as it directly influences family health.
5. **Economic Empowerment and Livelihood Support**
   Income-generating schemes and rural employment programs should be strengthened to improve the economic status of households, thereby enhancing their ability to access healthcare and maintain better living conditions.

**Implications of the Study**

1. **Policy-Level Integration Requirement**
   The study implies that public health policies must integrate environmental management and socio-economic development rather than addressing them in isolation.
2. **Need for Area-Specific Planning**
   The findings highlight the importance of region-specific interventions tailored to the ecological and socio-economic characteristics of Pilibhit District.
3. **Focus on Preventive Healthcare**
   The study emphasizes shifting from curative to preventive healthcare approaches, particularly through improved sanitation and safe water access.
4. **Addressing Health Inequalities**
   The research indicates that marginalized and low-income groups are disproportionately affected, necessitating targeted interventions to reduce health disparities.
5. **Scope for Future Research and GIS-Based Planning**
   The study opens avenues for further research using advanced tools like GIS mapping and spatial analysis to better understand disease patterns and resource allocation.

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