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Village Transformation and Emerging Health Challenges: A Comprehensive Review of Rural Urbanization and Its Public Health Impact in India

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ABSTRACT

Background

Rural urbanization—the transformation of rural areas into urban-like settlements—is accelerating in India due to demographic shifts, government initiatives (e.g., PMAY-G, Rurban Mission), infrastructural development, and remittance-driven investments. This systematic review explores how rural urbanization influences public health, focusing on emerging health impacts and determinants. Two distinct models of urbanized rural areas (URAs) were identified: proximity-based and remittance-driven. While these areas experience improved housing, sanitation, and healthcare access compared to traditional rural areas, they also face a dual burden of disease—rising non-communicable diseases (NCDs) alongside persistent communicable diseases—due to inadequate infrastructure planning, environmental degradation, and lifestyle transitions. Health determinants were analyzed using the WHO social determinants framework, revealing significant differences from traditional rural areas across physical, economic, behavioral, and environmental dimensions. A fishbone analysis was used to illustrate interconnected causes of health issues, including air and water pollution, dietary shifts, poor ventilation, and socioeconomic disparities. The review concludes that rural urbanization requires differentiated health planning, including the upgradation of PHCs, NCD screening programs, environmental monitoring, and targeted health education. Addressing these needs with context-specific strategies is vital to ensuring equitable and sustainable public health in transitioning rural landscapes.

Keywords: Health determinants, Peri-urban health, Public health India, Rural transformation, Urbanized rural areas.

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INTRODUCTION

Urbanization has long been recognized as a powerful force shaping population health and development. Traditionally, urbanization was considered a phenomenon associated with cities. However, a growing trend is the transformation of rural areas into urban or peri-urban settlements—a process known as rural urbanization. The rapid growth of urban features in rural settings is being driven by a confluence of structural, economic, and demographic factors. Key drivers include government programs and policies such as India's Shyama Prasad Mukherji Rurban Mission and Pradhan Mantri Awas Yojana Gramin (PMAY-G), which are designed to create urban-like amenities in rural clusters by improving infrastructure, sanitation, housing, and connectivity [1]. The development of roads, electricity, internet connectivity, and public services has also contributed to a rising urban footprint in previously rural zones. Additionally, the movement of populations within rural areas and from cities back to semi-urban zones leads to increased population density and urban characteristics. Private sector investments in agro-processing, textiles, small-scale manufacturing, and service industries have further fueled economic activity and employment in these transitioning areas [2]. However, these areas are frequently unprepared for the health challenges that emerge with this transformation, including increased exposure to environmental pollutants, lifestyle-related illnesses, and inadequate healthcare systems to support changing health needs [3]. The implications of rural urbanization extend far beyond economic dimensions, encompassing significant impacts on public health that are often understudied or underestimated. In this context, some research questions emerged, including: What are the potential public health problems and what are the health determinants in rural areas undergoing urbanization? To address these questions, a systematic literature review was undertaken with the objective of exploring the pathways through which rural urbanization influences health and emphasizing the importance of integrated, evidence-based public health interventions. The review was structured around two key themes: (1) the public health impacts of rural urbanization and (2) the determinants of public health in Urbanized Rural Areas (URA). Literature review was conducted using PubMed, Scopus, and Indian public health repositories. Recent studies conducted in the last 20 years focused on rural or semi-urban areas undergoing urbanization and assessment of one or more social determinants of health were included. Keywords used for searching literature are urbanized rural areas, health determinants, peri-urban health, rural transformation, public health India.

2. Health Impacts of Rural Urbanization

The health impacts of rural urbanization were systematically examined by analyzing several key dimensions: the demographic profile of populations residing in these transitioning areas, the environmental changes accompanying the urbanization process, the health benefits emerging from improved infrastructure and services, the health risks and challenges faced by the residents, and the underlying determinants contributing to these health issues.

2.1 Demographic profile of people living in urbanized rural areas: Urbanised rural areas (URA) in India can broadly be classified into two categories. The first category includes villages located in close proximity to major urban centres, which are gradually undergoing functional and spatial transformation due to urban sprawl, improved connectivity, and economic integration. These villages progressively acquire urban characteristics such as diversified employment, higher literacy, and improved housing [4,5]. The second category comprises villages where a significant proportion of residents have migrated to larger cities or abroad, and subsequently invest remittances to develop local infrastructure—such as roads, housing, schools, and health centres—thus inducing a process of urbanisation from within [6,7]. While both types exhibit shifts away from agriculture, with a growing reliance on non-agricultural and informal sector employment, their demographic profiles reveal both convergence and divergence. In both groups, pucca housing is commonly observed due to improved incomes and access to building materials. However, villages in the first group typically have a higher proportion of younger working-age population due to their proximity to employment hubs, whereas the second group often experiences a demographic

imbalance, with youth migrating out and leaving behind an ageing population [8,9]. Additionally, literacy rates tend to be higher in the first group due to better access to educational institutions and urban exposure, while the second group may lag in educational attainment despite improved infrastructure [10,11].

2.2 Environmental conditions in Urbanized rural areas: Environmental conditions in urbanized rural areas differ significantly from those in traditional rural settings. Variations in air quality, water supply, sanitation, and housing are observed across proximity-based urbanized rural areas, remittance-driven urbanized rural areas, and traditional rural areas, as illustrated in Table 1.

Table no.1 Differences in Environmental conditions among three types of rural areas

Feature	Proximity-based Urbanised Rural Areas	Remittance-driven Urbanised Rural Areas	Traditional Rural Areas
Air Quality	Degraded due to nearby traffic, industrial zones, construction; PM2.5 and PM10 levels often high	Relatively better, but open burning and diesel use may cause local pollution	Generally better air quality, though biomass cooking contributes to indoor pollution
Water Supply	Commonly connected to municipal or peri-urban piped water supply, which is intermittent but of improved quality; residents often rely on purchasing reverse osmosis (RO) purified water.	Borewells and overhead tanks installed using remittance money; access varies. residents often rely on purchasing reverse osmosis (RO) purified water.	Mostly dependent on open wells, handpumps, or seasonal sources
Sanitation	Growing access to individual toilets and septic systems, though drains may be open	Improved household toilets, but limited public waste management systems	Poor sanitation coverage, high open defecation in many villages
Housing	Pucca houses with Reinforced Cement Concrete (RCC) roofs; higher use of cement, tiles, water tanks	Modern homes constructed with remittance, often oversized but underused	Semi-pucca or kutcha houses using mud, thatch, or bricks

2.3 Health benefits in urbanized rural areas: People living in urbanized rural areas will enjoy several health benefits when compared to people living in traditional rural areas. They will have improved access to health care services. Government Primary Health Centers (PHC) will have consistent staff. It leads to early diagnosis and treatment of both communicable and non-communicable diseases, increased antenatal coverage and institutional deliveries [12]. Similarly, urbanised rural populations are more likely to have higher exposure to health promotion messages via digital media, schooling, and government outreach. These areas often have improved sanitation infrastructure (toilets, waste disposal, piped water), reducing communicable disease burden [13]. Due to increased income, market proximity, and exposure to urban dietary trends, people in urbanized rural areas tend to consume more diverse diets—including fruits, dairy, and fortified foods [14].

2.4 Health risks in urbanized rural areas:

2.4.1 Epidemiological Transition Urbanization

alters patterns of morbidity and mortality. Semi-urban populations experience a dual burden of disease: - Rise in **non-communicable diseases (NCDs)** such as diabetes, cardiovascular disease, and obesity, associated with increased consumption of processed foods, sedentary behavior, and stress [15,16]. Continued presence of **infectious diseases** like tuberculosis, diarrheal diseases, and respiratory infections due to poor sanitation and crowded living conditions [17].Studies from rural Gujarat and Andhra Pradesh highlight a steep rise in NCD risk factors in populations traditionally engaged in agriculture but now working in informal sectors like transport and construction [18]. The state of Gujarat saw a 42% increase in hypertension prevalence in semi-urban areas from 2008 to 2020 [18].

2.4.2 Environmental Health Hazards Environmental risks intensify with the introduction of urban infrastructure without adequate planning: - **Air Pollution**: Increased vehicular traffic, biomass burning, and local industries contribute to PM2.5 pollution [19]. **Water Contamination**: Insufficient sewage systems and industrial effluents degrade water quality, leading to outbreaks of waterborne diseases [20]. **Vector Breeding**: Stagnant water from poor drainage supports mosquito breeding, leading to diseases like dengue, chikungunya, and malaria. In Tamil Nadu, environmental degradation around industrial corridors led to higher asthma and bronchitis cases [21].

2.4.3. Occupational Health Risks The shift from farming to unregulated labor in construction, mining, or small industries leads to increased occupational injuries and diseases: - **Respiratory and musculoskeletal disorders** due to lack of safety equipment [22]. **Chemical exposure** from unregulated use of industrial solvents and pesticides [23]. - Lack of employer accountability and labor law enforcement further worsens health outcomes.

2.4.4. Comparison of health problems in urbanized rural areas:

Health problems in proximity-based urbanized rural areas differ from those in remittance-driven urbanized rural areas. Each type of area exhibits distinct physical, psychological, and social health issues. A comparative overview of these health problems is presented in Table 2.

Table no. 2 Comparison of health problems in different urbanized rural areas

Health Domain/ Type of urban area	Proximity-Based Urbanised Rural Areas	Remittance-Driven Urbanised Rural Areas
Physical Health	Higher NCD burden (obesity, diabetes, hypertension) due to sedentary lifestyle and urban diet - Respiratory issues from air pollution spillover [24]	Overnutrition and lifestyle diseases from high processed food intake - Poor sanitation causing waterborne diseases [25]
Psychological Health	Stress and dissatisfaction due to urban-rural status comparison - Youth mental health issues due to high competition [26]	Mental health burden on elderly and women due to male out-migration - Youth facing identity conflict [27]
Social Health	Breakdown of traditional networks - Increase in alcohol, tobacco use [28]	Rising intra-village inequality and social tension and Intergenerational value conflicts [29]

2.5 Health determinants in urbanized rural areas:

The World Health Organization (WHO) proposed a comprehensive model for social determinants of health encompassing physical, economic, social, behavioral, and environmental components [30].

This model was utilized to review the health determinants in Urbanized Rural Areas. A fishbone analysis diagram was developed to illustrate the cause-and-effect relationships underlying health problems in Urbanized Rural Areas.

2.5.1 Physical determinants: Physical determinants include housing, sanitation, air quality and availability of health care services. Housing quality in URAs has shifted from mud huts to concrete homes, however often with poor ventilation and overcrowding, increasing respiratory illness risk [31]. Sanitation infrastructure has expanded under programs like Swachh Bharat, with >70% toilet coverage in some URAs by 2020 [31], but sewage disposal and solid waste management remain underdeveloped [32]. Proximity to highways and industrial corridors exposes these populations to rising air and noise pollution—levels comparable to peri-urban towns [33].

PHCs and sub-centers exist in many URAs, but specialist services and diagnostics are lacking. Informal providers and medical pluralism dominate initial care-seeking behavior [34]. While government schemes like Ayushman Bharat aim to bridge the gaps but enrollment remains low due to lack of awareness or documentation [35].

2.5.2 Economic determinants: Remittances improve purchasing power but create economic inequalities. Households receiving income from abroad invest in better homes and private healthcare, while others remain vulnerable [34,36]. URAs are shifting from agrarian to service and industrial employment, exposing workers to new occupational hazards without safety nets [33].

2.5.3 Social determinants: Female literacy in URAs stands higher (68%) than the rural average (57%) as per NFHS-5 [31], reflecting improved educational access. However, deep-rooted gender roles and caste-based discrimination still restrict health access and social mobility [32].

Seasonal or permanent migration often disrupts family structures, weakening traditional care systems and increasing mental health issues, especially among elderly and left-behind children [33,34].

2.5.4 Behavioral determinants: Dietary transitions are a hallmark of urbanization. URAs see increased intake of packaged, high-sodium foods, contributing to rising rates of obesity and Type 2 diabetes [33,37]. Tobacco and alcohol use remain prevalent among adult males—over 30% in multiple URAs [31,34]. Reduced physical activity due to mechanization and digital engagement further accelerates sedentary lifestyle and NCD risks [36,37].

2.5.4 Environmental determinants: Unregulated growth in URAs leads to stagnant water bodies and poor waste disposal which are ideal breeding grounds for mosquitoes. Dengue and malaria outbreaks are increasingly reported in formerly low-risk rural zones [34]. Industrial runoff pollutes local water supplies, raising gastrointestinal disease burdens [33,36].

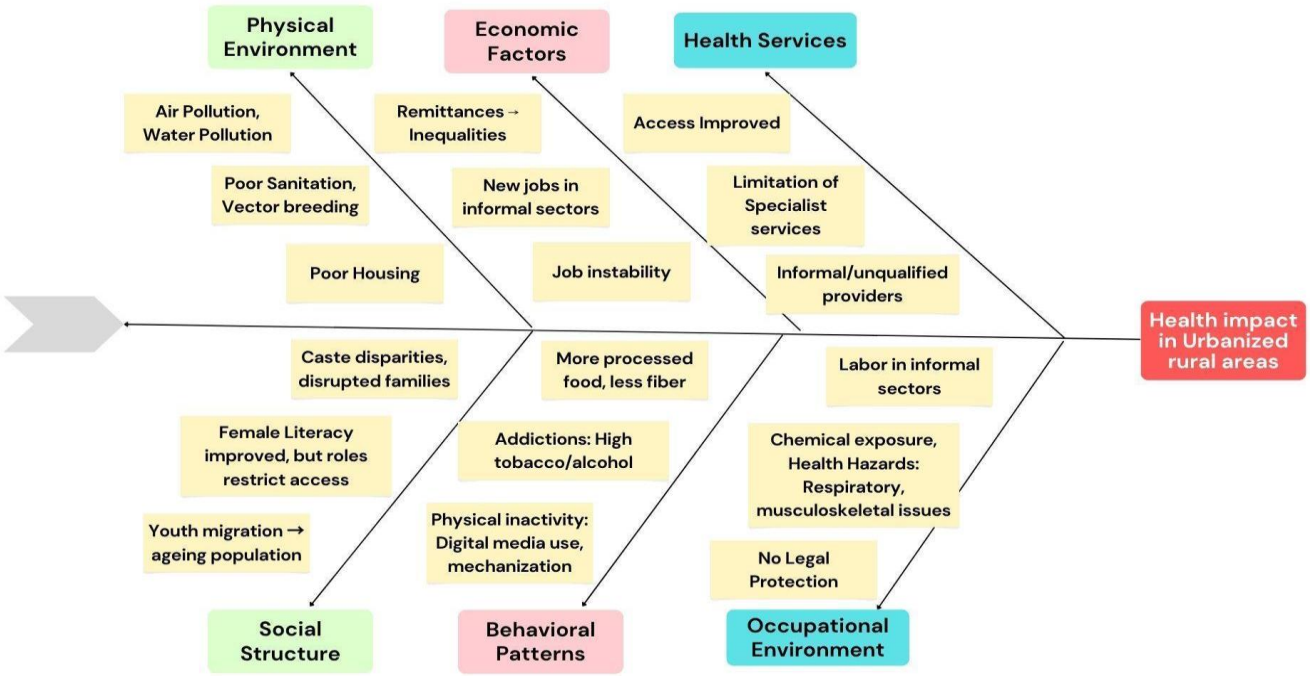
2.5.5 Differences in health determinants between urbanized rural areas and traditional rural areas: Health determinants in urbanized rural areas differ significantly from those in traditional rural areas across all components of the WHO's health determinants model. These differences are detailed in Table 3.

Table no 3 Differences in health determinants among Urbanized rural areas and Traditional rural areas

Domain	Urbanized Rural Areas (URAs)	Traditional Rural Areas (TRAs)
Physical Environment	Better housing structures (concrete)- Higher but incomplete sanitation coverage- Higher air and noise pollution due to roads, industry	Kachha houses, poor ventilation- Low sanitation/toilet coverage- Cleaner air, minimal noise pollution
Healthcare Access	Proximity to private clinics and pharmacies- Some PHCs upgraded- More informal providers	Limited PHCs/sub-centres- Long travel distance to care- High dependence on untrained practitioners

Economic Conditions	Income from local non-farm work and remittances- Growing inequality- Informal industrial jobs	Dependence on agriculture- Low income stability- Limited remittance flow
Social Determinants	Higher literacy, especially among females (NFHS-5: ~68%)- Disruption of traditional family networks due to migration- Growing youth unemployment	Lower female literacy (~57%)- Strong family and caste-based networks- Seasonal or no migration
Behavioral Patterns	Increasing fast food, tobacco, alcohol consumption- Decline in physical activity- Exposure to mass media	Traditional diets- Physically active lifestyle (manual labor)- Limited media exposure
Environmental Risks	Poor waste disposal- Industrial runoff polluting water- Frequent vector-borne outbreaks (e.g., dengue)	Fewer industrial pollutants- Open defecation and groundwater contamination- Seasonal malaria risk
Health Insurance /Coverage	Partial access to schemes like PMJAY- Low awareness /poor documentation	Very low coverage- Dependence on public services or out-of-pocket spending
Health-Seeking Behavior	Preference for private /informal providers- Delay in accessing quality care- Self-medication common	High reliance on local healers- Poor follow-up /compliance- Cost-sensitive behavior

2.5.6. Fish bone analysis of Health problems in Urbanized rural areas:



The fishbone analysis depicted in figure no.1, highlights a comprehensive range of direct and indirect causes contributing to health problems in urbanized rural areas. Many of these causes are interrelated. For instance, economic factors are closely linked to behavioral patterns. In the physical environment, despite the construction of pucca houses, lack of awareness often results in

inadequate ventilation and lighting, which can adversely affect health. Environmental pollutants such as air and water contamination tend to produce slow and long-term health effects. Remittance inflows, while beneficial economically, may lead to financial inequalities, contributing to social health problems. Similarly, disparities based on caste and income can exacerbate social health challenges. The migration of youth to urban areas often leaves elderly population behind, increasing the prevalence of psychological health issues among the aged. Although female literacy has improved in some areas, women's participation in household decision-making remains limited, affecting overall family health outcomes. The adoption of new dietary habits and sedentary lifestyles is contributing to a rise in non-communicable diseases (NCDs) such as hypertension, diabetes, and cancer. Occupational transitions have also led to an increase in respiratory and musculoskeletal disorders. The growing burden of NCDs necessitates more frequent healthcare visits, particularly for regular check-ups. This increased demand often leads to greater dependence on private healthcare providers, resulting in higher out-of-pocket expenditure. Furthermore, awareness about health insurance remains low, impacting both the health and financial security of residents in urbanized rural areas.

Conclusion

Rural urbanization is a double-edged sword. On one hand, it brings economic vitality, better connectivity, and potential access to modern services. On the contrary, it introduces new and complex health challenges that strain existing rural health systems. The health needs and health determinants are different for urbanized rural areas when compared to traditional rural areas. To address these health needs, separate rural planning, proactive policy alignment, and public health research tailored to transitioning regions are necessary. These are some of the interventions that can be used to address these health needs in urbanized rural areas. **Integrated Health Hubs**: Upgrading PHCs into Integrated Primary Health Centers with diagnostic labs and telemedicine [35]. **Environmental Monitoring**: Regular water and air quality assessments through gram panchayat-level systems [32]. **NCD Screening Programs**: Annual or Biannual population-based screening and behavior change communication in URAs [37]. **Targeted Health Education**: Use of Accredited Social Health Activist (ASHA) workers and local influencers to promote health literacy, especially among youth and migrants [2]. **Insurance Inclusion**: Simplifying enrollment in government insurance programs like Pradhan Mantri Jan Arogya Yojana (PMJAY) for URA populations [35]. In addition, the monitoring of Primary Health Centres should distinguish between PHCs in urbanized rural areas and those in traditional rural areas. This differentiation will enable a more targeted response to the emerging health needs and demands specific to urbanized rural populations.

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