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Study on Health Inequality and Intervention Strategies of Population from the Perspective of Public Health

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Abstract: Significant and stable gradient differences in life expectancy, disease burden, health service utilization, and disaster response capacity exist among populations across different countries and regions, as well as within the same society. Health inequality has become a critical issue constraining global sustainable development. From a public health perspective, this paper explores the core dimensions of population health inequality through three analytical threads: "manifestations-causes-interventions." It examines the mechanisms of interwoven interactions among social structures, policy systems, public health service systems, and individual/family resources, and constructs a comprehensive intervention pathway that integrates social policies, health services, and individual empowerment. Furthermore, the article proposes actionable strategies based on international organizations and transnational research, emphasizing the need to reshape governance logic by focusing on health determinants, strengthening primary health care and community public health functions, promoting multi-sector collaboration and community participation, and providing a replicable public health action framework for narrowing health disparities across countries and regions.

Keywords: Health equity; Social determinants; Public health intervention

As the global disease spectrum and demographic structure continue to evolve, health disparities among populations have not naturally narrowed with advances in medical technology. Phenomena such as life expectancy gaps, differences in chronic disease burdens, and excessive harm during infectious disease outbreaks persist, with health inequity gradually shifting from a medical issue to one of public policy and social justice. Extensive research demonstrates that socioeconomic determinants—including income, education, occupational status, living environment, gender, and ethnic identity—deeply influence disease exposure, health behavior choices, and healthcare utilization, thereby shaping intergenerational health gradients[1]. Against this backdrop, the field of public health is increasingly focused on how to address structural inequities through institutional design, service system restructuring, and community action. This article does not focus on any single country context but adopts a broad international perspective to systematically examine the manifestations, causes,

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and intervention strategies of health inequity from a public health standpoint, aiming to provide a transferable analytical framework and actionable recommendations for health equity practices across various institutional models.

1 Core Dimensions of Population Health Inequality

1.1 Health Inequality Based on Population Characteristics

When examining health disparities based on demographic characteristics, socioeconomic status, education level, occupational category, gender, ethnicity, and immigration status often overlap, forming a distinct health gradient: individuals with lower income and education levels face higher risks of early-onset chronic diseases, psychological distress, and comorbidities, along with shorter life expectancy and healthy life expectancy. Vulnerable occupational groups, due to high-risk occupations, imbalanced working hours, and inadequate labor protection, are more prone to accumulating long-term health burdens such as cardiovascular diseases and musculoskeletal injuries. Women, ethnic minorities, and undocumented or vulnerable immigrants, in particular, exhibit higher unmet needs in areas such as reproductive health services, cancer screening, and mental health services. These disparities emerge early in life and continue to intensify as educational and employment trajectories become more entrenched.

1.2 Health Inequality Based on Spatial and Service Accessibility

When examining health inequalities from a spatial perspective, disparities among countries, between urban and rural areas, and within different communities within the same city become particularly pronounced. Remote rural areas or urban fringe communities often face challenges such as inadequate healthcare infrastructure, poor transportation access, and insufficient density of medical facilities. Early intervention for acute illnesses and sustained management of chronic conditions are frequently delayed due to long distances and prolonged waiting times. Within cities, the phenomenon of "postal codes determining health" persists, with low-income communities often disadvantaged in terms of air pollution, noise exposure, food safety, and public security conditions. Residents have limited options for affordable healthy food, exercise spaces, and safe walking environments. Insufficient promotion of digital health services or designs lacking inclusivity further marginalize populations in areas with weak internet coverage and those with low digital literacy from accessing new health resources.

1.3 Health Inequality Based on Health Outcomes and Coverage Levels

Health inequalities ultimately manifest in disease outcomes and economic consequences, with significant disparities often observed among different groups within the same society in terms of infant mortality, early cancer detection rates, survival rates for cardiovascular events, and the incidence of functional disabilities. Vulnerable populations frequently delay seeking medical care during the early stages of illness due to insufficient information and financial concerns, leading to more frequent passive "remediation" in emergency and critical care settings, thereby limiting access to continuous and systematic preventive and follow-up management. Concurrently, uneven financial security levels render low-income families more susceptible to the cycle of "poverty caused by illness" or "poverty caused by care" when fac-

ing hospitalization costs, out-of-pocket medication expenses, and long-term care expenditures. The complexity of health insurance coverage, benefit ratios, and reimbursement processes amplifies or mitigates these disparities in financial burden, further transforming health outcome inequalities into intergenerational economic inequalities[2].

2 Analysis of Causes of Health Inequality Among Populations from a Public Health Perspective

2.1 Systematic Constraints of Social Structure and Policy Environment

Social structures and policy environments largely "set the starting line" for health inequalities. Factors such as income and wealth distribution patterns, tax and transfer payment systems, education and housing policies, and legislation on gender and ethnic equality collectively determine access opportunities for different populations to secure housing, stable employment, quality education, and social protection. When labor markets are highly unstable, minimum wage levels are low, and social security coverage is shallow and fragmented, vulnerable groups are more susceptible to compounded shocks from economic fluctuations and public health crises. Decisions in urban planning and infrastructure investment in some countries may inadvertently solidify spatial segregation, leaving impoverished communities in long-term areas with concentrated environmental risks. Research on health determinants consistently highlights that public health interventions can realistically narrow health disparities only when the distribution of power, resources, and opportunities is more equitable.

2.2 Functional Deficiencies of the Public Health Service System

Public health and primary health care systems often struggle to address health disparities when facing chronic underfunding, resource allocation imbalances, or fragmented governance. In some countries, excessive reliance on high-cost hospital-based treatment models has left primary prevention services, health promotion, and community follow-up in a state of "few personnel, heavy workload, and limited support." Coverage of health education, vaccination, maternal and child health care, and chronic disease management remains significantly inadequate in vulnerable communities. The lack of data sharing and process integration between public health institutions and medical facilities hinders the formation of a closed loop for infectious disease surveillance, chronic disease screening, and health risk early warning. Furthermore, insufficient cultural adaptation and weak trust relationships may reduce the willingness of minority groups, immigrants, and low-income populations to access public health services, even within service coverage areas, due to language barriers, perceived discrimination, or past negative experiences[3].

2.3 Multiple Influencing Factors of Individuals and Families

Beyond structural constraints, disparities in resources at the individual and household levels also shape the nuanced trajectory of health inequalities. Household income, caregiving capacity, education level, and health literacy determine the depth of understanding and coping strategies when individuals encounter symptoms, risk information, and service options: some families are familiar with preventive service pathways and are willing to allocate budgets for vaccination, dental care,

and regular health check-ups; others, due to limited health knowledge or chronic stress, tend to adopt passive coping mechanisms until the disease progresses to an acute stage, forcing them to seek medical attention. Gender role division and caregiving responsibility allocation may lead to long-term imbalances between health care and self-care among some family members, while adverse childhood experiences, discrimination, and social isolation continue to erode psychological and behavioral resilience. These factors do not exist in isolation but are intertwined with limitations in social structures and service systems, creating a complex adverse situation that cannot be easily reversed by individual willpower alone.

3 Intervention Strategies for Health Inequality in Population from a Public Health Perspective

3.1 Building a Fair-Oriented Social and Policy System

At the institutional level, public health departments are well-positioned to establish regular collaboration mechanisms with finance, education, housing, and transportation sectors, embedding "health impact and health equity assessment" throughout the policy-making process. Specific approaches include: incorporating health impact assessment tools in the formulation of large-scale infrastructure projects, urban renewal initiatives, industrial planning, and tax policies to evaluate the potential impacts of different options on low-income households, children, the elderly, and minority groups; establishing health equity indicators during budget negotiations and performance evaluations to make reducing health disparities a shared responsibility across departments. Governments at all levels can also leverage the "Health in All Policies" framework to promote policies such as housing subsidies, transportation fares, and educational resource allocation to moderately tilt toward areas with concentrated health risks, ensuring that improvements in living conditions and reductions in health risks are implemented simultaneously.

In the realm of social protection and labor policies, equity-oriented approaches require concrete implementation. Tax systems and social transfer payments can enhance redistribution without increasing overall tax burdens. For instance, progressive tax rates could be applied to high-income groups, with newly allocated fiscal resources prioritized for expanding basic healthcare coverage, disability benefits, and long-term care support. For those on the employment edge, measures like paid sick leave, flexible yet minimum-standard employment contracts, and occupational health protection standards can reduce income disruptions and career derailments caused by illness. Social policies may also encourage employers to provide health-promoting work environments, including reasonable working hours, psychological support services, and continuing vocational training, enabling workers to maintain income while sustaining relatively healthy lifestyles and mental well-being.

3.2 Enhancing Equalized Provision of Public Health Service Systems

To truly position public health as the frontline in narrowing health disparities, targeted adjustments are required in resource allocation and service models. On one hand, the health resource distribution formula should incorporate "demand weighting," integrating indicators such as poverty levels, disease burden, and geographic accessibility alongside population size. This ensures that funds,

human resources, and infrastructure are appropriately allocated to regions with concentrated health risks under conditions of overall stability or even limited growth. The network of primary healthcare institutions should be strategically laid out around the principle of "walkable or short commutable access," supplemented by mobile clinics, mobile vaccination teams, and mobile screening vehicles to cover remote communities. On the other hand, public health and primary care teams require stable staffing and continuous training, with time and tools allocated for data collection, risk communication, chronic disease management, and health promotion, rather than being overwhelmed by administrative tasks[4].

In the design of service content and pathways, the concept of equalization does not mean "offering identical packages to everyone," but rather implementing proportional inclusiveness based on the risk levels and resource endowments of different groups. Vulnerable communities are better suited to receive more intensive home visits, targeted health education, and multidisciplinary joint clinics. For instance, dedicated time slots and green channels can be established for pediatric vaccination, maternal and child health safety, mental health, and chronic disease follow-up. Public health institutions can collaborate with schools, community organizations, religious venues, and non-profit organizations to integrate health services into daily life scenarios. In the realm of digital health, applications with user-friendly interfaces, multilingual support, and compatibility with low-end devices and slow networks should be developed. Additionally, "digital health counseling points" can be provided in physical communities to assist the elderly, individuals with lower education levels, and new immigrants in acquiring basic online appointment and remote consultation skills, thereby preventing digital transformation from exacerbating the health gap.

3.3 Health Capacity Building for Empowered Individuals and Families

In public health practice, individuals and families are often regarded as "intervention targets," yet their role as "co-actors" is indispensable for mitigating health inequalities. Community-level health education should shift from "informative lectures" to "dialogic co-creation," designing small-scale, highly interactive activities around residents 'actual concerns. Examples include demonstrating low-cost healthy diets in community kitchens, organizing walking groups in local parks combined with chronic disease self-management workshops, and discussing children's screen time and sleep schedules during parent gatherings. Community health workers and peer supporters can bridge the gap between medical institutions and residents by helping interpret test results, treatment plans, and follow-up requirements, thereby reducing barriers caused by technical jargon. For groups with significant language and cultural differences, community "health ambassadors" can be invited to participate in educational material development and outreach activities, making health information more aligned with life experiences and values[5].

Family-level health capacity building requires coordinated support in economic, time, and psychological resources. For patients requiring frequent medical visits or long-term medication, public health programs can collaborate with social welfare agencies to provide transportation subsidies, caregiving leave guidance, and workplace negotiation toolkits, helping families achieve a more sustainable balance between caregiving responsibilities and livelihood pressures. Chronic disease and mental health programs can design

structured family engagement modules, such as co-developing medication and exercise plans, family-level smoking cessation agreements, stress management, and emotional communication exercises, ensuring that health behavior changes are no longer isolated actions by individual family members. Public health institutions can also establish "health navigation" services to integrate resource lists from various departments for vulnerable families, assisting them in organizing available welfare, legal aid, and mutual support networks, thereby eliminating information asymmetry as a hidden barrier to health inequality.

4 Conclusion

Examining the multifaceted dimensions of population health inequities, it becomes evident that health disparities are not merely the sum of individual choices, but rather systemic consequences accumulated over time in a reality marked by unequal distribution of power, resources, and opportunities. Addressing this issue necessitates responses that transcend piecemeal interventions by individual sectors or projects. From a public health perspective, the focus should be on social determinants, using health equity as a benchmark to reshape policy logic. This approach aims to mitigate the accumulation of adverse exposures during early life stages while leveraging resilient primary health care and community public health networks to support vulnerable populations. Health education, risk communication, and capacity-building for self-management should be embedded into daily life. Future practices for health equity must establish a virtuous cycle among institutional reforms, service innovation, and individual empowerment, while continuously evaluating the real impacts of actions on different groups through monitoring and assessment. Through such efforts, health disparities can be gradually narrowed across generations, laying the foundation for more inclusive social development.

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