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Economic implication of non-communicable diseases: An insight

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Abstract
Non Communicable Diseases (NCDs) pose a substantial and increasing economic burden worldwide. Conditions such as cardiovascular diseases, cancer, diabetes, and chronic respiratory ailments incur significant direct and indirect expenses for healthcare systems, individuals, and communities. The combination of high treatment costs and diminished productivity from absenteeism and presenteeism heightens economic pressures on both personal and societal levels. Disparities in healthcare access exacerbate these challenges, perpetuating economic inequalities. Effective strategies to address the economic implications of NCDs must encompass prevention, early detection, and efficient management. Policymakers and healthcare providers should prioritize investments in healthcare infrastructure, public health initiatives, and socio-economic support mechanisms to alleviate the mounting economic impact of NCDs and foster sustainable economic progress. This review consolidates current literature on the economic impact of NCDs, examining healthcare costs, productivity losses, household financial strain, and broader economic consequences.

Keywords: Non-communicable diseases, economic implications, healthcare costs, productivity loss, inequality

Introduction
Non-communicable diseases (NCDs), also termed chronic diseases, are characterized by their prolonged duration and result from a combination of genetic, physiological, environmental, and behavioural factors [1]. The primary types of NCDs include cardiovascular diseases (Such as heart attacks and stroke), cancers, chronic respiratory diseases (Like chronic obstructive pulmonary disease and asthma), and diabetes [2]. These diseases disproportionately affect individuals in low- and middle-income countries, where over three-quarters of global NCD deaths, totalling 31.4 million, occur [3]. Despite the common association of NCDs with older age groups, evidence indicates that 17 million NCD deaths occur before the age of 70 years, with 86% of these premature deaths happening in low- and middle-income countries [4]. People of all age groups, regions, and countries are vulnerable to NCDs due to risk factors such as unhealthy diets, physical inactivity, and exposure to tobacco smoke, harmful alcohol use, and air pollution. These risk factors are exacerbated by factors such as rapid unplanned urbanization, globalization of unhealthy lifestyles, and population aging [5]. Unhealthy diets and physical inactivity contribute to metabolic risk factors such as raised blood pressure, increased blood glucose, elevated blood lipids, and obesity, which are major contributors to cardiovascular diseases, the leading cause of premature deaths from NCDs [6]. Behavioural risk factors that can be modified significantly contribute to the prevalence of NCDs. For example, tobacco use alone causes over 8 million deaths annually, including those from second-hand smoke exposure [7]. Excessive salt/sodium intake leads to 1.8 million deaths yearly, while alcohol use, primarily linked to NCDs such as cancer, accounts for more than half of the 3 million deaths attributed to it annually. Insufficient physical activity results in 830,000 deaths annually [8]. Metabolic risks like high blood pressure, obesity, high blood sugar, and elevated lipids are widespread globally. High blood pressure alone accounts for 19% of deaths, followed by high blood sugar and obesity [9]. Air pollution contributes to 6.7 million deaths annually, with 5.7 million attributed to NCDs. In low-and middle-income countries, NCDs cause 15 million premature deaths each year, constituting 58% of Disability Adjusted Life Years [10].

Limited public funding in these countries results in high out-of-pocket expenses posing a financial crisis for households and impacting income, food security, and education [11]. Furthermore, NCDs diminish workforce productivity and economic output; a 10% rise in NCD mortality correlates with a 0.5% decrease in annual economic growth [12]. This underscores the macroeconomic implications, particularly in countries like India and others with similar economic profiles. Addressing these challenges requires robust health financing mechanisms to ensure equitable access to healthcare and protect individuals from financial strain [13]. Efforts to mitigate NCD impacts not only improve health outcomes but also contribute to sustainable economic development and broader developmental goals [14]. The rising issue of out-of-pocket expenses highlights the critical importance of Universal Health Coverage, ensuring all individuals can access essential healthcare services without financial hardship [15]. Moreover, addressing the burden of NCDs is crucial for achieving Sustainable Development Goal (SDG) 3.4, which aims to reduce premature mortality from NCDs by one-third [16]. The health financing system must prioritize equity and provide sufficient financial protection for disadvantaged groups to alleviate socio-economic inequalities exacerbated by NCDs and foster inclusive development. Adequate budg*et al*location for healthcare spending is critical to mitigate the severe impact of NCDs on households [17]. In India, the burden of NCDs is increasing amid limited healthcare access and social security, necessitating comprehensive strategies to promote healthier lifestyles and ensure universal access to quality healthcare services. NCDs pose significant challenges to both health and economic sectors worldwide, with profound implications for productivity and economic growth [18].

These diseases, encompassing conditions like cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes, not only incur direct healthcare costs but also exert substantial indirect costs through reduced workforce productivity and diminished economic output [19]. Research underscores that the onset of NCDs significantly reduces individuals' ability to work effectively, leading to a decline in productivity [20]. This reduction varies depending on the type of NCD and is further influenced by demographic factors such as age and gender. Despite growing awareness and efforts to address NCDs, there remains a notable gap in research, particularly in low- to middle-income countries, regarding the broader economic impacts of these diseases, especially on labour market outcomes such as work hours and hourly wages [21]. Many studies tend to isolate NCDs from other socio-economic and demographic factors, potentially leading to biased estimations of their true economic burden. To address this gap, ongoing research employs advanced methodologies like propensity score matching and difference-in-difference analysis [22]. These methods help to better understand how NCDs influence individual incomes, employment patterns, and overall labour market behaviours, thereby providing more accurate assessments of their economic consequences. The economic burden of NCDs extends beyond healthcare expenditures to include lost productivity and reduced economic output, which can collectively hinder national economic growth and exacerbate social inequalities. Mitigating these impacts requires comprehensive strategies that encompass prevention, early detection, and effective management of NCDs. Investments in public health initiatives, healthcare infrastructure, and health promotion programs are crucial to reducing the incidence of NCDs and alleviating their economic burden on societies. Furthermore, targeted policies aimed at reducing out-of-pocket expenses, enhancing healthcare accessibility, and promoting healthier lifestyles are essential components of a holistic approach to tackling NCDs [23].

By ensuring equitable access to healthcare services and fostering healthy behaviours, governments can promote sustainable economic development and improve overall societal well-being. Addressing these challenges comprehensively not only supports equitable healthcare access but also enhances economic resilience globally, contributing to the achievement of broader developmental goals and sustainable development targets [24].

Discussion

NCDs have become a primary health concern for most countries around the world. The Indian Council of Medical Research has highlighted a notable increase in Disability Adjusted Life Years attributed to NCDs in India, escalating from 30.5% to 55.4% between 1990 and 2016 [25]. This trend underscores the mounting burden of NCDs on public health and the economy [26]. Out-of-pocket expenses constitute a significant 58.7% of total health spending in India, while the country allocates merely 1.2% of its Gross Domestic Product to healthcare as of 2016-17 [27]. This financial strain has exacerbated the number of households falling below the poverty line, rising from 8.50% in 2014 to 12.43% in 2017-18, thus emphasizing the urgent need for enhanced financial mechanisms to effectively manage the costs associated with NCD treatment [28]. Direct costs such as treatment, medications, hospitalizations, and long-term care strain both public and personal finances, constituting a substantial portion of national healthcare expenditures. These expenditures not only burden households with increased debt and diminished savings but also curtail socioeconomic mobility. NCDs impose significant economic ramifications on individuals, households, healthcare systems, and national economies. These diseases, encompassing conditions like cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes, not only incur direct healthcare costs but also exert substantial indirect costs through reduced workforce productivity and diminished economic output [29].

The economic impact of NCDs stems from multiple factors, including absenteeism, presenteeism, premature mortality, and disability-related exits from the workforce. These factors collectively contribute to decreased labour productivity and lower income levels for individuals affected by NCDs [30]. Moreover, as NCDs progress, individuals may face increasing challenges in maintaining full-time employment, impacting their earning potential and economic stability over time. Investments in public health initiatives, healthcare infrastructure, and health promotion programs are crucial to reducing the incidence of NCDs and alleviating their economic burden on societies [31]. In addition to globalization and urbanization, demographic changes are also driving the rise in NCDs. Life expectancy in India is currently 66 years, but is expected to climb to 73 by 2050 (United Nations Population Division, 2012) [32]. The proportion of individuals aged 50 and older in India is set to nearly double by 2050, from 16% to over 31% of the population, with the elderly aged 60 and above expected to increase from 8% to 18% [33]. Concurrently, those aged 80 and older will rise notably from 1% to 2.3%. NCDs are already the leading cause of death and illness among the elderly globally, including in India, and this burden is anticipated to escalate with the aging population [34].

Targeted policies focusing on reducing out-of-pocket expenses, improving healthcare access, and promoting healthier lifestyles are vital components of a comprehensive approach to addressing NCDs. By ensuring fair access to healthcare services and encouraging healthy behaviours, governments can foster sustainable economic development and enhance overall societal well-being [35]. A comprehensive response to these challenges not only promotes equitable healthcare access but also strengthens global economic resilience, contributing to the attainment of broader developmental and sustainable development objectives. In cardiovascular diseases: Several systematic reviews highlighted socioeconomic disparities in Cardio Vascular Disease risk, despite methodological limitations.

Reviews with unclear bias risks focused on disparities in stroke and acute myocardial infarction incidence [36]. Other reviews, despite high bias risks, examined Cardio Vascular Disease prevalence, including peripheral artery disease and stroke, consistently revealing elevated risk among lower Socio Economic Status groups. Kerr *et al*. found higher stroke risk (Hazard Ratio 1.31) in low Socio Economic Status groups in high-income countries [37]. Sposato and Saposnik linked lower macro-socioeconomic indicators to increased stroke risk, while Manrique-Garcia *et al*. reported elevated acute Middle Income risk in low Socio Economic Status groups by income (Risk Ratio 1.71), occupation (Risk Ratio 1.34), and education (Risk Ratio 1.35), particularly in high-income countries [38]. Feigin *et al*. noted declining stroke rates in high-income countries and rising rates in low- and middle-income countries [39]. Reviews with high Risk of Bias generally supported findings on other Cardio Vascular Disease subtypes, but reviews on childhood socioeconomic inequalities and adult Cardio Vascular Disease risk showed mixed results, often attenuated when adjusting for risk factors or adult Socio Economic Status. Four systematic reviews on socioeconomic inequalities in cancer incidence noted biases across lung cancer, gastric cancer, and childhood leukemia [40]. Three reviews had unclear risk of bias, while one had high risk. Sidorchuk *et al.* comprehensive review of 64 studies on Socio Economic Status and lung cancer found a statistically significant 1.37 to 1.61 higher Risk Ratio for lung cancer in low Socio Economic Status groups compared to high Socio Economic Status groups, adjusted for smoking [41]. Slatore *et al.* Review of two U.S. studies on insurance status and lung cancer risk showed conflicting results. Evidence on Socio Economic Status and gastric cancer incidence is limited to an unclear-risk systematic review of 36 studies from middle-income and high-income countries [42].

Meta-analyses indicated consistent results with lung cancer, showing a Relative Index of Inequality ranging from 2.97 to 4.33 for gastric cancer risk in individuals from the lowest Socio Economic Status group compared to the highest [43]. Subgroup analysis by country income level showed mixed results, likely due to varying study distributions. A high-risk systematic review on Socio Economic Status and childhood leukemia found heterogeneous results, providing no clear evidence of an association [44]. Agardh *et al*., with unclear Risk of Bias, explored global associations between type 2 diabetes incidences and Socio Economic Status across different country income levels [45]. They pooled data from 23 studies and identified higher risks of type 2 diabetes in individuals with lower education (Risk Ratio 1.41), occupation (Risk Ratio 1.31), and income (Risk Ratio 1.40) compared to higher Socio Economic Status groups. Despite most studies being from High Income Countries, subgroup analyses across income levels showed consistent effects in Low Income, Middle Income, and High Income Countries. Tamayo *et al*., with high Risk of Bias, focused on childhood Socio Economic Status and type 2 diabetes risks specifically in High Income Countries [46]. They reviewed ten studies, six of which indicated an association between childhood socioeconomic inequalities and later-life type 2 diabetes risk. Chronic respiratory diseases. For chronic respiratory diseases, we identified one systematic review with low Risk of Bias [47]. Gershon *et al*. reviewed eight studies, finding significantly increased risks of Chronic Obstructive Pulmonary Disease among individuals from the lowest Socio Economic Status group compared to those from the highest Socio Economic Status group in High Income Countries. Adverse outcomes from non-communicable diseases Systematic reviews show that low Socio Economic Status increases the risk of mortality from lung cancer, Chronic Obstructive Pulmonary Disease, and reduces breast cancer survival in High Income Countries [48].

Early case fatalities of stroke are suggested to be lower and survival of retinoblastoma higher in Middle Income Countries compared with Low Income Countries. Ten systematic reviews were identified that examined associations between Socio Economic Status and adverse outcomes of NCDs [49]. Among the ten systematic reviews analyzed, five investigated socioeconomic disparities in cardiovascular disease mortality, three examined Socio Economic Status and adverse cancer outcomes, and one addressed Socio Economic Status and chronic respiratory disease mortality [50]. One comprehensive review covered all these outcomes. Only two reviews compared adverse outcomes across different country income levels, with no evidence found regarding socioeconomic inequalities in adverse outcomes from type 2 diabetes [51]. Regarding cardiovascular diseases, among the six systematic reviews meeting eligibility criteria, three with unclear risk of bias differed in findings from the three with high Risk of Bias. Notably, Feigin *et al*. reported 25% higher early stroke case fatality rates in Low Middle Income Countries compared to High Income Countries (26.6% vs 19.8%) [52]. Lower country macro-socioeconomic status indicators correlated with higher 30-day stroke case-fatality rates and more intra-cerebral haemorrhages in another review [53]. For cancers, four reviews on Socio Economic Status and adverse cancer outcomes showed heterogeneous study populations but consistent results [54]. Survival rates for retinoblastoma were significantly lower in Low Income Countries compared to Middle Income Countries (40% vs 77-79%) [55]. High lung cancer mortality was indicated among patients on social health care programs compared to others, and adult Socio Economic Status explained associations between low childhood Socio Economic Status and increased lung cancer mortality. Chronic respiratory diseases were addressed in two systematic reviews, one of which reported significantly higher Chronic Obstructive Pulmonary Disease mortality among individuals of lowest socio economic status in high income countries.

These reviews underscore the complex relationship between Socio Economic Status and adverse NCD outcomes, highlighting the need for targeted interventions to mitigate disparities and improve health outcomes across different socioeconomic strata [56].

Conclusion

NCDs significantly impact economic productivity through absenteeism, presenteeism, and premature exits from the

workforce, reducing overall economic output and exacerbating societal inequities. Addressing NCDs requires a comprehensive approach integrating prevention, early detection, and effective management. Investments in public health initiatives and healthcare infrastructure are crucial to alleviate this burden, promoting healthy lifestyles and supportive environments. Governments must implement proactive policies, including tailored health insurance packages, to ensure equitable access to healthcare and mitigate economic challenges associated with NCDs. Effective interventions are essential for sustainable development, health equity, and enhanced economic productivity globally.

Conflict of Interest
Not available

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Not available

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