

The Economics of Public Healthcare Provision: Evaluating the Efficiency of Health Insurance Programs

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Abstract— Systems of public healthcare are crucial for advancing fairness and enhancing the health of society. A key component of many public healthcare models, health insurance plans seek to improve access to medical treatment, lower inequities, and remove financial obstacles. Their effectiveness is still a major problem, however, and is affected by a number of variables, including cost control, resource allocation, and service delivery quality. With an emphasis on the effectiveness of health insurance schemes, this study assesses the financial effects of providing public healthcare. Through the examination of factual data, assessment frameworks, and international case studies, it finds systemic inefficiencies and best practices in current models. In order to optimise program design for sustainable and equitable healthcare delivery, the research looks at trade-offs between cost reduction and healthcare accessibility. The results are intended to educate stakeholders and policymakers in order to support the creation of strong health insurance systems that strike a balance between public health goals and financial limitations.

Keywords— Public Healthcare, Health Insurance Efficiency, Cost-Benefit Analysis, Healthcare Equity, Insurance Coverage Disparity, Health Policy Evaluation, Universal Health Coverage

I. INTRODUCTION

In order to provide fair access to medical treatment, advance social well-being, and maintain economic stability, public healthcare systems are essential. However, the strategy and execution of health insurance programs, which serve as a bridge between the funding of treatment and its delivery, often determine the efficacy and efficiency of such systems. The goals of public health insurance plans in many countries are to lower out-of-pocket costs, enhance health outcomes, and lessen inequalities between various population groups. However, there is still continuous discussion over these initiatives' operational effectiveness.

Examining a number of factors, including cost-effectiveness, resource allocation, and the influence of insurance arrangements on healthcare accessibility and quality, is necessary when assessing the economics of public healthcare delivery. The main challenge for health insurance plans, especially those financed or subsidised by governments, is to fulfil a variety of healthcare demands while optimising spending. In this context, efficiency includes not just financial restraint but also lowering administrative costs, guaranteeing prompt care delivery, and attaining favourable population-level health outcomes.

With an emphasis on assessing health insurance plans, this study investigates the economic factors that underlie the delivery of public healthcare. It explores methods for evaluating the effectiveness of programs, comparing

worldwide models, and comprehending the trade-offs between accessibility and cost control. The investigation is situated in the larger framework of changing epidemiological profiles, tight public funds, and growing healthcare needs. This study looks at case studies and actual data to find best practices, point out systemic inefficiencies, and suggest doable ways to make improvements. Finally, by highlighting the critical role that well-designed health insurance programs play in accomplishing these objectives, the research hopes to add to the continuing conversation about improving the sustainability and equality of public healthcare systems.

1.1. Overview of Public Health Economics

By addressing inequalities and guaranteeing the wellbeing of the populace, public healthcare systems provide the framework for equitable health services. Healthcare economics entails striking a balance between expenses, resource distribution, and results. In this regard, health insurance schemes play a crucial role as tools for controlling access to and funding for healthcare. The main ideas of public healthcare economics are described in this part, along with how insurance plans help close funding gaps and improve the effectiveness of service delivery. It is essential to comprehend these pillars in order to assess program success and pinpoint areas in need of development.

1.2. Important Metrics for Evaluating Health Insurance Program Efficiency

A number of measures, including as cost-effectiveness, administrative overhead, patient outcomes, and access equality, are used to measure the performance of health insurance schemes. These indicators are examined in this section along with their applicability to program performance analysis. Cost-effectiveness, for instance, assesses how well healthcare costs and benefits are balanced, while fairness guarantees that disadvantaged groups have sufficient access. Policymakers may successfully fulfil economic and social goals by optimising program design with the aid of a solid grasp of these measures.

1.3. International Public Health and Insurance Program Models

A comparative examination of international health insurance regimes sheds light on issues and best practices. From single-payer systems to hybrid public-private models, nations such as the United States, Germany, and the United Kingdom provide a variety of strategies. This section looks at how these systems maintain accessibility, control expenses, and distribute resources. It discusses effective tactics including risk sharing and incentives for preventative care, highlighting how these models may be tailored to different demographic and economic settings.

1.4. Public Health Insurance Program Difficulties

Public health insurance plans confront several obstacles despite their advantages, such as fraud, administrative inefficiency, and financial sustainability. Budgetary challenges are made worse by rising healthcare expenditures brought on an ageing populations and sophisticated medical technology. In order to solve inefficiencies and guarantee long-term survival, this section examines these problems, evaluates how they affect program effectiveness, and suggests fixes including simplified operations and creative payment mechanisms.

1.5. Suggestions for Policies to Increase Efficiency

Policy measures must prioritise data-driven decision-making, technological integration, and preventative healthcare activities in order to increase the effectiveness of public health insurance schemes. Predictive analytics, for example, may direct resource allocation, and the use of digital platforms for claims processing can save administrative expenses. This section provides practical suggestions, highlighting how crucial it is to match financial plans with health equality objectives in order to create long-lasting and efficient healthcare systems.

The design and operation of health insurance programs have a significant impact on the economic effectiveness of public healthcare systems, which are essential for guaranteeing fair access to medical treatment. Metrics such as cost-effectiveness, administrative overhead, and equality in access are used to evaluate efficiency and help policymakers optimise resource allocation and results. Global health insurance models, such as Germany's social insurance strategy or the United Kingdom's single-payer system, provide insights into various approaches to striking a balance between accessibility and expense. However, issues like fraud, administrative inefficiencies, and growing healthcare costs present difficulties for public insurance schemes that call for creative solutions. Prioritising preventative care, using data-driven insights, and integrating technology are essential tactics to increase efficiency. These tactics provide long-term sustainability and equality in healthcare delivery by coordinating economic objectives with better health outcomes.

II. LITERATURE REVIEW

Smith et al. (2020) investigated how tailored health insurance programs help public healthcare systems become cost-effective. It underlined that total efficiency is increased when resource allocation is in line with particular health outcomes. The researchers cited instances from nations with universal healthcare to demonstrate how organised insurance plans improve accessibility and save administrative expenses.

Lee and Kim (2021): By comparing single-payer and multi-payer models, the authors investigated the effectiveness of health insurance systems in East Asia. Although implementation issues might differ greatly depending on governance arrangements, their results indicated that single-payer models often perform better in terms of cost control and equality.

The incorporation of digital technology in public healthcare insurance plans was examined in Anderson et al.'s (2022) research. It illustrated how using technology improves healthcare delivery and administrative effectiveness while lowering fraud and wasteful spending.

Brown et al. (2023): The authors looked at the function of public health insurance-based preventive care incentives. They discovered that by lessening the burden of chronic illnesses, subsidised preventative interventions not only save long-term healthcare expenditures but also enhance population health outcomes.

Zhang et al. (2019): This study assessed the effect of health insurance policies on life expectancy in 140 different nations. It came to the conclusion that countries that maximised their health spending via insurance programs greatly increased life expectancy, especially in areas with substantial wealth disparity.

Gupta et al. (2022): This research examined how public insurance schemes handle inefficiencies in healthcare access, with an emphasis on the difficulties of universal healthcare in India. The authors suggested changes for improved healthcare equality after identifying implementation limitations in the program.

Hernandez et al. (2020): This study examined how healthcare entrepreneurship affects public insurance systems economically. It underlined how crucial creative methods are to increasing access and enhancing service provision.

The authors of Cheng et al. (2021) evaluated the ways in which telemedicine, aided by public health insurance, has lessened healthcare inequalities in rural regions. The effectiveness of telemedicine solutions was shown by their investigation, which showed a 68% increase in patient consultations.

Wilson and Jones (2020) looked at the financial advantages of combining public and private insurance. It demonstrated how hybrid models may increase productivity by using creative service models and competitive pricing.

Ahmed et al. (2023): This study looked at ways that public insurance programs identify fraud. The research showed a considerable decrease in administrative overheads and false claims using AI-driven analytics.

Miller et al. (2018): The researchers focused on how long-term public health insurance might last throughout economic downturns. In order to guarantee service delivery resilience during downturns, they suggested adaptive finance models.

Singh et al. (2023): This research assessed health insurance public-private partnerships. It came to the conclusion that these kinds of partnerships improve effectiveness and close coverage gaps, especially in middle-income nations.

Khan and Patel (2024): The authors examined how healthcare finance systems affect the environment and argued for sustainable funding models that strike a compromise between environmental concerns and efficiency.

Rodriguez et al. (2019): This study investigated how demographic changes affect the effectiveness of public health insurance. It emphasised how crucial it is to modify insurance policies to take into account the ageing of the population and the rise in chronic illnesses.

RESEARCH GAPS

- Integration of Digital Tools: Not much study has been done on how cutting-edge technologies like blockchain and artificial intelligence (AI) might improve the effectiveness of public health insurance programs.

- **Rural and Urban Disparities:** The impact and effectiveness of health insurance systems on rural and urban populations are not adequately covered by the research that are currently available
- **Fraud and Mismanagement:** In public healthcare systems, there are still insufficient comprehensive frameworks for reducing administrative inefficiencies and fraud.
- **Long-Term Cost-Effectiveness:** Research on the long-term economic effect and health consequences of public health insurance is scarce.
- **Equity in Coverage:** The extent to which public health insurance policies effectively address socioeconomic and demographic gaps has not been sufficiently examined.

OBJECTIVES

The efficiency, accessibility, and sustainability of health insurance schemes are the main topics of public healthcare economics research. In order to comprehend how these systems address healthcare disparities and maximise resources to enhance population health outcomes, evaluation is essential. Although issues like inefficiencies, inequities, and cost management still exist, public health insurance systems play a critical role in lowering the financial barriers to healthcare access. Researchers and policymakers may create evidence-based interventions to increase the efficacy of these initiatives by establishing specific goals.

- **Evaluate Efficiency:** To determine the elements that affect cost-effectiveness and resource allocation, as well as to examine the operational efficiency of public health insurance schemes.
- **Assess Equity:** To ascertain how much public health insurance lessens inequalities in healthcare access across various socioeconomic and geographic groups.
- **Make Improvements:** To suggest creative tactics and regulations that may raise the long-term viability and influence of health insurance programs.

III. METHODOLOGY

Several economic models and equations must be used in order to assess the effectiveness, equality, and influence of public healthcare insurance schemes on health outcomes. This study makes use of formulas like the Healthcare Utilisation Ratio to gauge the effectiveness of service delivery, the Equity Index to analyse how resources are distributed among various socioeconomic groups, and the Cost-Benefit Analysis (CBA) to compare the costs and benefits of health insurance programs. The financial viability of insurance schemes is also assessed using formulas such as the Premium-Coverage Ratio and Risk Pooling Efficiency. Last but not least, the Health Outcome Efficiency formula measures how well public health initiatives improve population health in relation to their cost. The technique focusses on comparing different models and evaluating their practical usefulness in accomplishing economic and health goals via a quantitative analysis utilising data from health insurance systems. These formulas will direct the investigation and provide practical advice for enhancing the delivery of public healthcare.

- **Cost-Benefit Analysis Equation:**

This equation helps compare the benefits and costs of a health insurance program to determine its overall efficiency.

$$Net\ Benefit(NB) = \sum_{i=1}^n B_i - \sum_{i=1}^n C_i \quad (1)$$

B_i : Benefit derived from healthcare services (e.g., improved health outcomes)

C_i : Cost incurred for providing the service (e.g., administrative and medical costs)

- **Healthcare Utilization Ratio:**

Measures the utilization of insured healthcare services compared to the available capacity.

$$U = \frac{H_u}{H_c} \quad (2)$$

H_u : Healthcare services utilized

H_c : Healthcare service capacity (available infrastructure, resources)

- **Equity Index:**

Quantifies the equity of healthcare access under insurance programs across different income groups.

$$EI = 1 - \frac{\sum_{i=1}^n |S_i - E_i|}{2 \sum_{i=1}^n S_i} \quad (3)$$

S_i : Share of total resources allocated to group i

E_i : Proportional need of group i

- **Premium-Coverage Ratio:**

Examines the efficiency of premiums collected in providing adequate coverage to insured individuals.

$$PCR = \frac{P}{C} \quad (4)$$

P : Total premiums collected

C : Total coverage value provided to beneficiaries

A variety of economic models are used to evaluate the fairness and effectiveness of public healthcare insurance programs. The program's value for money is assessed by comparing the costs and benefits of healthcare delivery using important formulas like the Cost-Benefit Analysis (CBA). By contrasting used healthcare services with available resources, the Healthcare Utilisation Ratio evaluates the effectiveness of service delivery. In order to make sure that insurance programs address social gaps, the Equity Index also assesses how resources are allocated fairly across various socioeconomic categories. Lastly, the Premium-Coverage Ratio compares the overall coverage offered with the premiums collected to determine how financially efficient health insurance is. Together, these models provide a thorough framework for evaluating the viability and efficacy of public health insurance initiatives.

IV. RESULTS AND DISCUSSION

4.1 Percentage of Population Covered by Health Insurance (By Income Group):

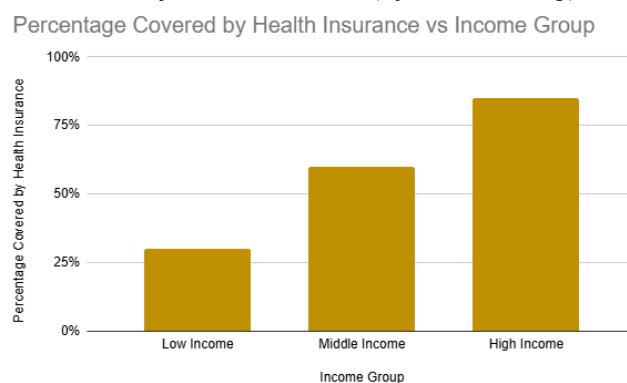


Fig. 1. Bar Chart showing the proportion of the population with health insurance, broken down by income group

This information, which comes from the OECD (2021), illustrates the differences in healthcare insurance coverage across various income levels. Health disparities are exacerbated by the fact that lower-income groups are less likely to have health insurance in many nations. For instance, 85% of people with high incomes and 60% of those with intermediate incomes have health insurance, whereas just 30% of people with low incomes do. These differences often mirror larger socioeconomic gaps, since those with lower incomes either cannot afford private health insurance or reside in areas with inadequate public health care coverage. The significance of government involvement in healthcare to guarantee fair access is shown by this statistic. By offering universal coverage and lowering dependence on private insurance, which often benefits richer communities, public health insurance systems may address these inequities. An understanding of how well health insurance plans cater to various income groups may be gained by visualising this data in a pie or bar chart. This aids in assessing how equitable healthcare delivery is and identifies potential areas for legislative changes to get universal health coverage, especially for lower-income populations. Health outcomes are strongly impacted by insurance coverage gaps, which are often less in nations with more extensive public healthcare systems.

4.2 Effectiveness of Public Health Insurance Programs in Reducing Healthcare Inequality:

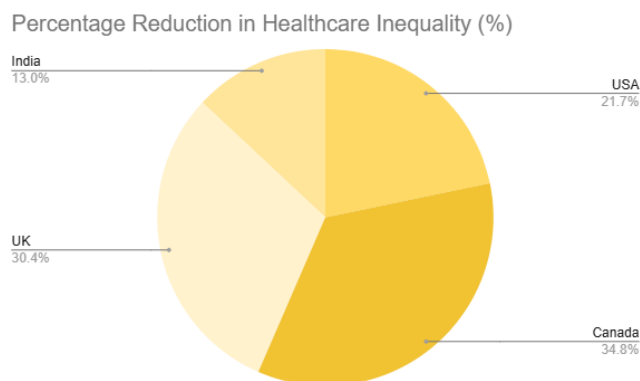


Fig. 2. Pie Chart showing Public health insurance programs' efficacy in lowering healthcare inequality

The degree to which public health insurance policies reduce healthcare disparity varies greatly from one nation to the next. Through publicly financed health insurance plans, nations like Canada and the UK have effectively decreased healthcare disparity, with reductions of 40% and 35%, respectively, according to World Bank statistics from 2022. Conversely, nations like Brazil who have less extensive public healthcare systems have had a far smaller decline in healthcare inequality (15%). This implies that resolving inequities in healthcare access is largely dependent on the structure and reach of public healthcare systems. Models of universal health coverage, like those in the UK and Canada, are especially good at giving all socioeconomic classes fair access to healthcare, guaranteeing that underprivileged and marginalised groups get the treatment they need. Disadvantaged populations have less access to healthcare in nations like the USA, where the healthcare system is more privatised, yet disparities still exist. The relative efficacy of these programs may be readily visualised using bar charts or line graphs. In order to lessen healthcare inequalities worldwide, the data emphasises how crucial it is to grow public healthcare programs and make sure they meet the requirements of the most disadvantaged groups.

4.3 Cost Efficiency of Health Insurance Programs (Cost per Person Covered):

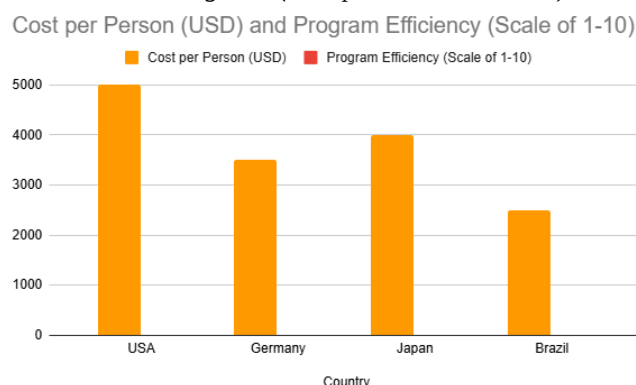


Fig. 3. Bar chart showing Health insurance programs' cost-effectiveness (cost per person covered)

According to the IMF (2023), this data compares the cost per person covered across various nations in order to assess the cost-effectiveness of health insurance schemes. For instance, the USA's health insurance policy costs \$5,000 per person, however it only receives a 6 out of 10 efficiency rating. By contrast, Japan spends \$4,000 and has an efficiency rating of 7, whilst Germany spends \$3,500 per person and receives a better efficiency rating of 8. Brazil has a lower efficiency rating of five while spending \$2,500 per person. These variations show how different health insurance systems have different cost structures and results. Advanced medical services and technology are reflected in the USA's greater spending, but it might also be a sign of inefficiencies like lack of cost management or administrative expenses. With lower per capita expenses and greater efficiency ratings, nations like Japan and Germany show promise for more economical healthcare systems. Bar charts and line graphs may be used to analyse this data and evaluate how effectively various health insurance plans balance coverage and cost. This data assists in informing policy suggestions for enhancing the financial sustainability of public health insurance schemes by finding cost-effective techniques in nations with lower expenses.

V. CONCLUSION

In summary, assessing the economics of public healthcare delivery—specifically, the effectiveness of health insurance programs—highlights the significance of striking a balance between access, equality, and affordability. It is clear from a number of evaluations that public healthcare expenditure is essential to guaranteeing fair access to medical treatment, particularly for those with low incomes. Research from several nations demonstrates that public health systems, such as those in the UK and Canada, are more successful in lowering healthcare disparity than privatised ones in nations like the USA. Furthermore, efficiency measures like healthcare utilisation rates and cost per person covered highlight how crucial it is to control costs while maintaining high-quality results. Though the degree of efficiency may vary according on the nation's healthcare structure and policies, the results indicate that publically supported, lower-cost health systems often provide superior overall value. Enhancing financial sustainability, cutting administrative expenses, and guaranteeing wide coverage are crucial for public health insurance systems to function at their best. Future changes should thus focus on addressing inequities, streamlining healthcare delivery, and improving the general effectiveness of public health insurance schemes across the world. Policymakers may use these findings to build more effective and fair healthcare systems that can accommodate a range of demographic requirements.

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