

MESTRADO INTEGRADO EM MEDICINA

Pathway to Equitable Healthcare Reform: A Comparative Epidemiological Analysis of Nigeria and Portugal.

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Original Project

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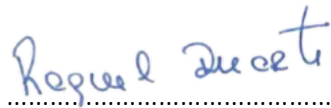
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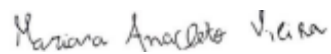
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Summary

Introduction This study conducts a comparative analysis of the healthcare systems of Portugal and Nigeria, which represent contrasting institutional and epidemiological models. Portugal operates a universal, tax-funded public system offering comprehensive services to all residents, while Nigeria maintains a mixed system involving public, private, fragmented in local, state and federal levels, and traditional providers, with high out-of-pocket payments and insurance coverage for specific groups. It also further examines how each system addresses health outcomes, disease burden, service delivery, and equity, identifying strengths and lessons for mutual learning.

Methodology Using the WHO's health system building blocks—service delivery, workforce, access to medicines, and financing—this study draws on quantitative data from international (WHO, World Bank) and national sources (INE Portugal, Nigeria's NBS) from 2014–2024. A quantitative method approach combined with thematic interpretation to assess system inputs, outputs, and outcomes.

Results Between 2014 and 2023, life expectancy rose from 81.0 to 82.3 years in Portugal and from 53.0 to 64.4 years in Nigeria. Portugal sustained immunization coverage above 95 percent for core vaccines (DTP3, BCG, Hepatitis B, MMR), while Nigeria improved immunization rates to approximately 75 percent. Non-Communicable Diseases account for 87 percent of deaths in Portugal, led by ischemic heart disease, stroke, diabetes, and cancer and 13 percent infectious diseases and various injuries. In Nigeria, communicable disease is the leading cause of mortality from 68.5 to 63.5 percent in the last decade, chronic diseases and injuries remain relatively low at 20 percent, high rising rates of cancers in Portugal -colorectal, breast, and prostate cases, while Nigeria shows overall lower incidence. Suicide mortality stands at 12.5 per 100,000 in Portugal versus 3.4–3.9 in Nigeria.

Discussion Portugal's universal health system ensures high access to care and life expectancy but faces rising challenges from non-communicable and chronic diseases, aging, and regional disparities despite high spending. Nigeria's low funded but adaptive system has improved immunization, life expectancy, and reduced maternal and infant mortality through decentralized outreach. Portugal's high suicide, smoking, alcohol consumption, obesity, and cancer rates contrast with Nigeria's lower lifestyle-related burdens, though underreporting is possible. Demographic divergence—Portugal's aging vs. Nigeria's youth bulge—shapes distinct health priorities. Cross-country learning is viable: Nigeria could adopt Portugal's universal coverage strategies, while Portugal may learn from Nigeria's community-driven models to improve equity and preventive care.

Conclusion Portugal benefits from a universal, tax-based system with advanced digital integration and strong coverage metrics. However, it must prepare for shifting health needs, chronic disease prevalence, and workforce instability. Nigeria's

decentralized model while underfunded, provides agility and community-level responsiveness that has led to targeted improvements.

Each system possesses complementary strengths: Portugal's institutional stability and centralized coordination, and Nigeria's grassroots innovation and flexibility. Shared challenges include workforce retention, equitable access, and rural-urban disparities.

Keywords: WHO's building block, Delivery of Health Care, Health System Performance, Health Disparities, Socioeconomic Factors, Comparative Health Policy

Resumo

Introdução Este estudo realiza uma análise comparativa dos sistemas de saúde de Portugal e da Nigéria, que representam modelos institucionais e epidemiológicos contrastantes. Portugal opera um sistema público universal, financiado por impostos, que oferece serviços abrangentes a todos os residentes. Em contrapartida, a Nigéria possui um sistema misto, envolvendo prestadores públicos, privados, tradicionais e estruturas fragmentadas entre os níveis local, estadual e federal, com elevada despesa direta do utilizador e cobertura de seguros limitada a grupos específicos. O estudo examina como cada sistema aborda os resultados em saúde, a carga de doença, a prestação de serviços e a equidade, identificando forças e lições para aprendizagem mútua.

Metodologia Com base nos blocos fundamentais da OMS para sistemas de saúde—prestação de serviços, força de trabalho, acesso a medicamentos e financiamento—esta investigação recorre a dados quantitativos de fontes internacionais (OMS, Banco Mundial) e nacionais (INE Portugal, NBS Nigéria) entre 2014 e 2024. A abordagem quantitativa combina estatísticas descritivas com interpretação temática, avaliando entradas, saídas e resultados dos sistemas.

Resultados Entre 2014 e 2023, a esperança média de vida aumentou de 81,0 para 82,3 anos em Portugal, e de 53,0 para 64,4 anos na Nigéria. Portugal manteve cobertura vacinal acima de 95% para vacinas essenciais (DTP3, BCG, Hepatite B, MMR), enquanto a Nigéria melhorou as taxas para cerca de 75%. As doenças não transmissíveis representam 87% das mortes em Portugal, com destaque para doença isquémica do coração, AVC, diabetes e cancro; as doenças infecciosas e lesões representam os restantes 13%. Na Nigéria, a mortalidade por doenças infecciosas permanece dominante, embora em declínio (de 68,5% para 63,5%), e as doenças crónicas e lesões mantêm-se relativamente baixas (cerca de 20%). Portugal regista taxas elevadas de cancro (cólon, mama e próstata), enquanto a Nigéria apresenta incidência global mais baixa. A mortalidade por suicídio é de 12,5 por 100.000 em Portugal, comparada com 3,4–3,9 na Nigéria.

Discussão O sistema universal de saúde português garante elevado acesso e esperança de vida, mas enfrenta desafios crescentes associados às doenças crónicas, envelhecimento populacional e desigualdades regionais, apesar dos elevados gastos. O sistema Nigeriana embora subfinanciado, demonstra capacidade adaptativa e progresso nos indicadores através de intervenções descentralizadas. As elevadas taxas portuguesas de suicídio, tabagismo, consumo de álcool, obesidade e cancro contrastam com os níveis mais baixos de fatores de risco na Nigéria, embora o sub-registo possa influenciar estes resultados. As trajetórias demográficas divergentes—envelhecimento em Portugal e juventude na Nigéria—definem prioridades distintas em saúde. A aprendizagem cruzada é possível: a Nigéria pode beneficiar do modelo de cobertura universal português, enquanto Portugal pode integrar estratégias comunitárias da Nigéria para melhorar a equidade e a prevenção.

Conclusão Portugal beneficia de um sistema público universal, financiado por impostos, com integração digital avançada e bons indicadores de cobertura. Contudo, enfrenta desafios no ajustamento às necessidades de saúde em mudança, à prevalência de doenças crónicas e à instabilidade da força de trabalho. O modelo descentralizado da Nigéria, ainda que subfinanciado, mostra agilidade e capacidade de resposta ao nível comunitário, promovendo melhorias direcionadas. Ambos os sistemas possuem forças complementares: a estabilidade institucional e a coordenação centralizada de Portugal, e a inovação de base e flexibilidade da Nigéria. Os desafios comuns incluem retenção de profissionais, equidade no acesso e disparidades urbano-rurais.

Palavras-chave Blocos da OMS, Prestação de Cuidados de Saúde, Desempenho dos Sistemas de Saúde, Desigualdades em Saúde, Fatores Socioeconómicos, Política de Saúde Comparada.

List of Abbreviations

ART Antiretroviral Therapy

ASIR Age-Standardized Incidence Rates

BGC Bacillus Camette-Guerin (Tuberculosis Vaccine)

CV Combination Vaccine

CD Communicable diseases

DALY Disability-Adjusted Life Year

DEA Data Envelopment Analysis

DTP3 Diphtheria, Tetanus, and Pertussis (third)

ECDC European Centre for Disease Prevention and Control

EU European Union

GDP Gross Domestic Product

HIV/AIDS – Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome

ICBAS Instituto de Ciências Biomédicas Abel Salazar

IHME Institute for Health Metrics and Evaluation

MMR Measles, Mumps and Rubella (vaccine)

NPHCDA National Primary Health Care Development Agency (Nigeria)

NG Nigeria

NGOs Nongovernmental organizations

NHS National Health Service (United Kingdom)

NHIS National Health Insurance Scheme (Nigeria)

NCD Non-communicable diseases

OECD Organization for Economic Co-operation and Development

PT Portugal

SNS Serviço Nacional de Saúde (Portugal)

TB Tuberculosis

UNAIDS United Nations Programme on HIV/AIDS

UNICEF United Nations International Children's Emergency Fund

USD United State Dollar

WHO World Health Organization

Table of Contents

SUMMARY	VI
RESUMO.....	VIII
LIST OF ABBREVIATIONS	X
LIST OF TABLES	XIII
LIST OF FIGURES	XIV
INTRODUCTION	1
STUDY OBJECTIVES.....	3
METHODOLOGY	4
RESULTS	6
POPULATION GROWTH AND DEMOGRAPHICS.....	6
HEALTHCARE SYSTEM FINANCING AND STAFFING	6
LIFESTYLE AND BEHAVIORAL HEALTH INDICATORS	6
COMPARATIVE BURDEN OF COMMUNICABLE AND NON-COMMUNICABLE DISEASES	6
CHRONIC DISEASE PATTERNS	7
EPIDEMIOLOGICAL TRENDS OF CANCER	7
KEY HEALTH OUTCOMES	7
IMMUNIZATION AND DISEASE PREVENTION:.....	7
DISCUSSION.....	8
CONCLUSION	10
STRENGTHS AND LIMITATIONS	10
BIBLIOGRAPHY	12
ANNEX- TABLES AND FIGURES ILLUSTRATING THE DATA.....	18

List of Tables

Table I-Demonstrates Population Growth Demographics including population number, birthrate, deathrate, and fertility rate from 2014 to 2022, between Nigeria and Portugal.

Table II- Demonstrates Healthcare Spending and Staffing which includes health funding, medical institutes, number of healthcare centers, ratio of hospital bed, doctor, nurse-patient ration from 2014 to 2022, between Nigeria and Portugal.

Table III- Demonstrates Lifestyle and Behavioral Health Indicators, including smoking rate, obesity, drug-related mortality, alcohol consumption from 2014 to 2022, between Nigeria and Portugal.

Table IV- Demonstrates Health Indicators and key mortality causes and incidence rate of suicide, Communicable and non-communicable diseases from 2014 to 2022, between Nigeria and Portugal.

Table V- Demonstrates Mortality and incidence rates of key neoplastic(cancer) diseases, including breast, Respiratory, Stomach, Prostate and Colorectal cancers from 2014 to 2022, between Nigeria and Portugal.

Table VI- Demonstrates Mortality and incidence rates of key neoplastic(cancer) diseases, including breast, Respiratory, Stomach, Prostate and Colorectal cancers from 2014 to 2022, between Nigeria and Portugal.

Table VII- Demonstrates Key Health Outcomes including life expectancy, neonatal mortality rate, maternal mortality rate, HIV prevalence from 2014 to 2024, between Nigeria and Portugal.

Table VIII- Demonstrates Immunization compliance rate by percentage of people from 2014 to 2022, between Nigeria and Portugal.

List of Figures

Figure 1 - illustrates graphic representation of Population Growth and Demographics which includes population growth, birth rate, fertility rate and death rate, between Nigeria and Portugal from 2014 to 2024.

Figure 2 - illustrates graphic representation of government spending on health, % of GDP between Nigeria and Portugal from 2014 to 2024.

Figure 3 - illustrates graphic representation of lifestyle and behavioral health indicators over a which includes obesity rate, alcohol use rate, smoking rate and suicide rate between Nigeria and Portugal from 2014 to 2024.

Figure 4 - illustrates graphic representation of Health Burden by large groups of communicable, non-communicable diseases and injuries between Nigeria and Portugal from 2014 to 2024.

Figure 5 – illustrates graphic representation illustrates of Health Burden of various diseases which includes mortality rate of ischemic heart diseases, cerebrovascular diseases, TB incidence rate and mortality rate by respiratory infections between Nigeria and Portugal from 2014 to 2024.

Figure 6 - illustrates graphic representation of Health Burden: prevalence of Alzheimer's disease and other dementias/100k, and prevalence of Diabetes mellitus between Nigeria and Portugal from 2014 to 2024.

Figure 7 - illustrates graphic representation of Health Burden of neoplasms(cancers) includes prevalence of trachea, bronchus, and lung cancer, mortality rate of breast cancer, stomach cancer, and prostate cancer between Nigeria and Portugal from 2014 to 2024.

Figure 8 - illustrates graphic representation of Key Health Outcomes which includes Neonatal mortality, Maternal mortality rates and Life expectancy from birth between Nigeria and Portugal from 2014 to 2024.

Introduction

The World Health Organization (WHO) identifies six essential building blocks—service delivery, workforce, health information, access to medicines, financing, and governance—as fundamental to the functioning of health systems [1]. Healthcare systems are profoundly shaped by geography, demographics, socioeconomic status, and political and cultural contexts—all of which influence disease patterns, access equity and healthcare efficiency [2,3]. While all systems aim to deliver accessible, quality care, their effectiveness depends on how well their components function together [4-6]. Gaps in any of these components often result in inequitable care and poor outcomes, particularly in under-resourced regions [7-11].

While Nigeria and Portugal differ markedly in economic development and institutional capacity, both countries face challenges in achieving equitable healthcare outcomes. Disparities in financing, governance, and workforce distribution are central to these challenges [9-11].

Nigeria is a populous West African country with over 220 million people. It operates a mixed healthcare system that integrates public, private, and traditional sectors. Public healthcare is organized into three tiers of primary, secondary, and tertiary delivered through a decentralized framework governed by federal, state, and local authorities [10-13]. However, the private sector delivers approximately 60% of health services, particularly in urban areas making it a critical actor in Nigeria's health landscape [14]. Key issues in Nigeria's health system have persisted over the years. The right to health is influenced not only by policies but also by the broader social, political, and economic environments in which individuals access care, [15], one of the most important problems is funding, less than 5 percent of the national budget is allocated to health, while out-of-pocket payments account for over 70% of total health expenditure, [9,16]. Rural and low-income communities often lack access to essential services, exacerbating health inequities [17], another issue is workforce shortages, with the Nigerian healthcare system counting with less than 5 physicians per 10,000 people, [18] with disproportionate shortages in rural and northern regions [17]. Despite reforms like the National Health Insurance Scheme [13], coverage remains limited mainly to formal sector workers, leading to persistent high epidemiological levels of communicable diseases [6,19]. Recent health financing reforms and strategies target universal coverage through expanded insurance and was enshrined by the passage of the National Health Act of 2014 in response to the continued underinvestment and poor performance of its health care system, investment in primary care, and improved human resources for health, as health financing reforms are central to achieving universal health coverage [14,20,21].

Portugal by contrast, has a universal, predominantly tax-funded healthcare system provided through the Serviço Nacional de Saúde (SNS), established in 1979. With a population of around 10 million, the SNS offers comprehensive care to all legal residents, covering all levels of service [22]. While public service delivery remains dominant, private expenditure accounts for around 30 percent of total health spending and has grown steadily [23-25].

Challenges in Portugal's healthcare system include demographic pressure, an aging

population has increased demand for chronic disease management and long-term care, straining healthcare capacity [25]. Also workforce burnout and emigration exacerbate this issue, low wages and suboptimal working conditions have led to high rates of healthcare worker emigration and regional imbalances in staff availability [26], dual-track system, a growing private sector has enabled faster access for wealthier patients, raising concerns about equity and fragmentation [14,23]. Nonetheless, the SNS continues to evolve, with reforms emphasizing decentralization, digital health, and integrated care models to enhance equity and responsiveness [23].

Although Although direct comparisons between Nigeria and Portugal are rare and almost nonexistent, broader comparative analyses with similar contexts offer useful insight. For instance, Nigeria's health system has been compared to those in the UK and China, revealing governance challenges and gaps in service delivery [27,28]. Portugal has been analyzed alongside Brazil's SUS, showcasing how universal systems can improve equity and outcomes [29]. Portugal and Nigeria illustrate two ends of the epidemiological transition—Portugal faces rising non-communicable disease (NCD) burdens such as diabetes and cancer [30,31], while Nigeria still grapples with infectious diseases (e.g., malaria, HIV) alongside rising NCDs [19]. In 2022, Nigeria reported an estimated 219 cases of tuberculosis per 100,000 population, reflecting the continued burden of communicable diseases in high-risk settings [32]. Despite differences in GDP and institutional development, both countries contend with workforce emigration, regional disparities, and funding challenges [12]. According to WHO data, Nigeria's overall health service coverage index remains substantially below global targets, with key gaps in maternal and infectious disease services [33]. In contrast, Portugal has achieved near-universal service access, yet still faces rising NCD burdens and challenges in timely cancer screening and geriatric care [34]. Political fragmentation and lack of continuity in health sector governance have been identified as major barriers to Nigeria's primary healthcare reform, stalling progress toward universal coverage [35].

Gaps in the Literature Though extensive research exists on each country's healthcare system, few studies offer equity-driven, cross-national comparisons between systems with such contrasting institutional contexts [19], specifically, there is limited analysis of how governance and financing intersect with social determinants and rights like income, gender, and geography to influence health outcomes [15,17]. What remains especially underexplored is how political dynamics such as weak accountability structures, fragmented authority across government levels, and policy discontinuity, political instability, undermine sustained health system reform, particularly in Lower support context-sensitive reforms while promoting cross-national learning in global health equity. This study intends to fill a gap by directly comparing these two health systems from an equity and epidemiological standpoint.

Study Objectives

This study aims to conduct a comparative analysis of healthcare systems in Portugal and Nigeria. Specifically, it intends to compare health indicators and outcomes, disease burden by examining communicable and non-communicable diseases (NCD), drawing on recent epidemiological data. Additionally, it aims to investigate disparities in healthcare infrastructure and service delivery, particularly in how access to quality care differs across both nations. Furthermore, the study intends to understand comparatively the lifestyle and behavioral health determinants, including obesity, smoking, and alcohol consumption, on national disease trends. It will further on a national level the key health indicators such as maternal and infant mortality, vaccination coverage, life expectancy, and progress toward universal health coverage, and finally will explore and identify systemic areas in need of reform, proposing lessons for cross-national learning by examining communicable and non-communicable diseases (NCD), drawing on recent epidemiological data to identify how health system weaknesses contribute to disease burden in each country, and to propose targeted, evidence-based reforms—such as improving primary care access in Nigeria, optimizing resource allocation in Portugal, that could enhance health system performance, resilience, and equity in both contexts and offering evidence-based policy recommendations for sustainable health system improvement.

Methodology

This dissertation employs a quantitative approach to provide a comprehensive analysis of the healthcare systems in Nigeria and Portugal, aiming to identify systemic inefficiencies and propose actionable recommendations for reform. By integrating quantitative data, this approach captures both measurable system performance and contextual realities affecting healthcare delivery.

Data Sources were obtained from international and national sources, including the WHO Global Health Observatory [13], IHME, World Bank [19,20], OECD Health Statistics [24], and Portugal's Ministry of Health and Health System Review [25,36]. These were supplemented by academic literature from peer-reviewed journals to ensure contextual depth and analytical robustness, for the purpose of aligning statistical trends with historical, economic, and governance contexts [18,24]. The analysis covers the decade 2014–2024. All data were harmonized for comparability by adjusting currency values to constant 2020 USD using World Bank deflators, while population-based indicators were standardized per 1,000 or 100,000 inhabitants.

The sources were cross-verified through peer-reviewed epidemiological reports or grey literature (e.g., government bulletins) to ensure reliability. This quantitative analysis identified recurrent patterns and outlier cases, enabling the extraction of actionable insights for improving efficiency and equity in health delivery [37].

To evaluate cross-national healthcare efficiency, this study employs Data Envelopment Analysis (DEA), a well-established non-parametric technique in health economics. DEA facilitates comparative assessment by measuring how effectively countries convert available inputs into health outcomes. Following established literature [3], inputs such as per capita health expenditure and healthcare workforce density were selected to reflect system capacity, while outputs like life expectancy and mortality rates capture population-level outcomes. This input-output configuration aligns with validated DEA models used in prior cross-country efficiency assessments and allows for a contextualized benchmarking of health system performance under resource constraints. DEA works by comparing each country's input-output ratio to the "best practice" frontier, thereby identifying which systems are most efficient and where improvements may be needed.

DEA models used here follow the WHO's guidelines on health system efficiency analysis [3]. Data Quality Assurance To ensure robustness, all indicators underwent validity checks. Triangulation was performed using multiple sources where discrepancies arose and was conducted by excluding years with incomplete or anomalous entries. The final DEA scores were interpreted alongside descriptive statistics and thematic policy literature to identify patterns of underperformance or best practice.

Outcome Use These findings guided the development of context-sensitive, evidence-based policy recommendations for improving health service equity, reducing inefficiencies, and enhancing long-term system sustainability in both settings [25]. Comparative results from this methodology will be used to highlight structural gaps and performance asymmetries. These findings inform policy recommendations aimed at enhancing healthcare delivery, reducing inequities, and increasing system

resilience with emphasis on equitable access, workforce distribution, and service integration—key levers identified as essential to resilient and high-performing health systems [25,26].

RESULTS

Result: Comparative analysis of healthcare parameters for one decade (2014-2024).

The following health outcomes reflects the researched results:

Population Growth and Demographics

Between 2014 and 2024, Nigeria's population increased from 179 million to 229 million, reflecting a 28.0% rise over the decade [2]. The total fertility rate declined from 5.68 births per woman in 2014 to 5.01 in 2024, a decrease of 11.8% [38]. The crude death rate decreased from 13.2 to 10.8 per 1,000 population, a reduction of 18.2% [39]. The crude birth rate declined from 40.0 to 35.7 per 1,000, a change of -10.8% [38], though it remained among the highest globally. Portugal's population remained relatively stable, increasing from 10.42 million in 2014 to 10. million in 2024, an increase of 0.2% [2]. The crude birth rate declined from 8.36 to 7.67 per 1,000 population, a decrease of 8.3% [39]. The crude death rate rose from 10.25 to 11.25 per 1,000, reflecting a 9.8% increase [39]. The fertility rate remained low throughout the decade, averaging 1.44 births per woman [20,38]. (table I and figures 1).

Healthcare System Financing and Staffing

From 2014 to 2024, Portugal's health expenditure increased from 9.34 to 11.14 percent of GDP (+19.3 %) [21,40]. Hospital bed density remained stable at 3.47 beds per 1,000 population), increasing doctors (from 45.6 to 58.0/10,000), and nurses (from 63.7 to 77.9/10,000) [36]. With 11 medical schools and 225 hospitals [18]. In the same period, Nigeria's health expenditure ranged from 2.99 to 4.08 percent of GDP (+36.5 percent increase) [10,12], with hospital bed density rising from 0.5 to 1.0 per 1,000, the number of health workers increased modestly, physicians from 14.0 to 16.8 per 10,000 (+20.0 percent) [18,20]. Hospital bed density of 0,5 to 1.0/1,000 [18]. (illustrated in table ii and figure 2).

Lifestyle and Behavioral Health Indicators

Between 2014 and 2022, Portugal's adult smoking rate remained at percent [24], while obesity prevalence increased from 19.2 to 21.8 percent (+13.5%) [34]. Alcohol consumption ranged between 11.4 and 14.2 liters per capita annually [24]. Drug-related mortality rose markedly from 13.5 to 81.0 per 100,000 (+500 percent) [36], and suicide rates ranged from 11.4 to 14.2 per 100,000 [34]. In Nigeria, adult smoking declined from 4.7 to 2.3 percent (-51.1 percent) [34], and alcohol use remained between 3.4 and 4.5 liters per capita [12]. Obesity prevalence increased from 9.2% to 12.4 percent (+34.8 percent) [17], drug-related deaths remained stable (4.4 to 5.9 per 100,000), and suicide rates ranged from 3.4 to 3.9 per 100,000 [33]. [(illustrated in table iii and figure 3).

Comparative Burden of Communicable and Non-Communicable Diseases By 2024, noncommunicable diseases (NCDs) account for 87 percent of total deaths in Portugal [19,24,41]. In Nigeria, NCD-related mortality rose to 29.5 percent in 2024, while communicable diseases declined from 68.5 to 63.5 percent of total deaths (7.37 percentage points) [19,42,43]. Injury-related mortality remained at 7 percent in

Nigeria [33] and 5 percent in Portugal [34]. Suicide mortality in Portugal decreased from 14.2 to 12.5 per 100,000 between 2014 and 2020 [24], while in Nigeria it ranged from 3.4 to 3.9 per 100,000 across the same period [33]. Malaria incidence in Nigeria increased slightly from 298 to 315 cases per 1,000 population at risk (2014–2024); Portugal recorded no malaria cases [34]. HIV/AIDS-related mortality in Nigeria declined from 31.9 to 23.6 per 100,000, while Portugal’s rate remained at 2.2 per 100,000 (2019 to 2022, [19,33,43]. (illustrated in tables IV, and figures 4 in annex).

Chronic Disease Patterns

In 2022, ischemic heart disease mortality in Portugal was 128 per 100,000, while cerebrovascular diseases accounted for 108 per 100,000 [36]. In comparison, Nigeria reported 98 per 100,000 for ischemic heart disease and 26 per 100,000 for cerebrovascular diseases [12,19]. Dementia mortality in Portugal reached 60 per 100,000. The diabetes prevalence remained at 13 percent [30]. In Nigeria, diabetes prevalence increased from 2.2 percent (2014) to 6.0 percent (2022) [30]. Tuberculosis incidence in Nigeria was 219 per 100,000 in 2022, [32,33], while Portugal reported a decline to 13 per 100,000 [36]. Lower respiratory infection mortality was 96 per 100,000 in Nigeria and 59 per 100,000 in Portugal [33,34]. (illustrated in tables V and figures 5 in annex).

Epidemiological Trends Of Cancer Between 2014 and 2023, in Portugal, the age-standardized incidence rate (ASIR) for trachea, bronchus, and lung cancers was 18.5 per 100,000 [44]. In Nigeria, the ASIR for the same group of cancers was 1.31 per 100,000 [31,33]. Colorectal cancer incidence in Portugal exceeded 50 per 100,000 in all years reviewed [34,44], while Nigeria reported incidence rates consistently below 9.0 per 100,000 [33]. Prostate cancer mortality was 39.7 per 100,000 in Portugal [36,] and 25.3 per 100,000 in Nigeria [33]. Stomach cancer mortality was reported at 8.0–10.0 per 100,000 in Portugal and approximately 1.4 per 100,000 in Nigeria [31]. Breast cancer mortality in Nigeria ranged from 17.5 to 26.8 per 100,000, while in Portugal it ranged from 12.0 to 13.0 per 100,000 [31,44] (illustrated in tables VI and figures 7 in annex).

Key Health Outcomes Between 2014 and 2024, life expectancy in Portugal increased from 80.85 to 82.80 years, a net gain of 1.95 years [24]. Neonatal mortality declined from 2.1 to 1.62 per 1,000 live births (–22.4 percent), and maternal mortality ranged between 7 and 12 per 100,000 live births, [24]. In contrast, Nigeria’s life expectancy from 52.4 to 64.0 years, a 22.1 percent increase, [33], neonatal mortality decreased from 37.3 to 33.0 per 1,000 live births (–11.5 percent), maternal mortality increased from 814 to 1,047 per 100,000 live births (+28.6%) between 2014 and 2021, [33,34]. (illustrated in Table VII and Figure 8 in annex).

Immunization and Disease Prevention:

Between 2014 and 2022, Portugal maintained immunization coverage among 1-year olds, consistently exceeding 93 percent for BCG, DTP3-CV, Polio 3,[42], Hepatitis B, and MMR [23,24]. Nigeria reported BCG coverage increasing from 60 (2015) to 75 (2022) percent, coverage for DTP3, Polio 3, Hepatitis B, and MMR fluctuated between 45 and 70 percent, [45] (illustrated in table VIII in annex)

Discussion

Portugal and Nigeria offer instructive contrasts in healthcare system organization, shaped by divergent financing mechanisms, institutional capacities, and governance structures. Portugal's universal, tax-funded system prioritizes integration and equity in access, whereas Nigeria's decentralized, mixed-model approach highlights flexibility and the substantial role of private providers in bridging service gaps [1,2,14,18].

This contrast invites closer examination of how different models shape access, responsiveness, and equity. In Nigeria, low public health spending constrains infrastructure development, yet community-based delivery, non-state actors, and targeted immunization initiatives have contributed to incremental progress. However, these gains are uneven and equity remains a persistent concern. In Portugal, despite sustained investment and comprehensive coverage, inefficiencies in primary care coordination and gaps in preventive services remain, a phenomenon often described as the "Portuguese paradox" [24,29].

Exploring health workforce dynamics further reveals systemic stress points: Portugal has more health professionals per capita but faces internal imbalances and outmigration, particularly from underserved areas [46]. Nigeria's workforce shortages are more severe, compounded by poor remuneration, infrastructure deficits, and high emigration rates among trained personnel all leading to household catastrophic expenditure [14,18]. These observations underscore the importance of not just funding levels, but how resources are deployed, retained, and integrated across service delivery tiers.

Notably, several unexpected and under-discussed findings emerged from this study, for example, Portugal continues to face significant challenges linked to lifestyle, including high rates of smoking, obesity, alcohol use, and rising suicide and drug-related deaths. These patterns persist despite robust infrastructure and national interventions, highlighting a gap between investment and behavioral outcomes [24]. Nigeria, by contrast, exhibits relatively lower levels of these lifestyle risks, Cultural and religious norms, along with community-based health promotion, contribute to healthier behavioral patterns in some regions also there is possibility of underreporting, [33]. Alzheimer's mortality is rising in Portugal, reflecting both population aging and improved diagnosis. Nigeria's lower figures are consistent with its younger population, though rates may rise as longevity improves [2,20,38].

From epidemiological standpoint, Nigeria and Portugal lie at opposite ends of the epidemiological and demographic transition. Nigeria continues to grapple with infectious diseases such as malaria and HIV, [43], though non-communicable diseases (NCDs) are rising without adequate chronic care readiness [19,24]. Portugal, meanwhile, faces a mature NCD burden—cancer, cardiovascular, and metabolic diseases (Diabetes Mellitus)—intensified by aging and lifestyle risks [24,30]. Differences in cancer incidence underscore divergent risk exposures, population structures, and diagnostic capacities. These epidemiological contrasts align with demographic realities: Portugal's aging population strains long-term care and workforce capacity, [46], while 9 Nigeria's youthful demographic demands scaled maternal, child, and preventive services [2,38].

Social and structural inequalities underpin much of the health divergence. In Nigeria, poor outcomes cluster in northern rural regions where poverty, low female gender literacy and disparity, and weak infrastructure limit access, particularly for Hausa and Fulani populations of Nigeria [15,17,47], persistent disparities in maternal and child health reflect broader structural inequalities in not only Nigeria but in West Africa, with inadequate health systems and limited access to emergency gynecology and obstetric care continue to drive preventable mortality among the poorest and most remote communities [48], While southern zones perform better, rural gaps persist , In Portugal, interior regions like Alentejo face similar challenges, Persistent regional and gender disparities in obesity trends further underscore the need for targeted interventions that address social determinants of health across Portugal's diverse populations,[49], accessibility to urgent and emergency care services is poor, maternal health care utilization among poor, mental health issues, and limited screening, Roma populations also suffer elevated infant mortality and low vaccine uptake due to exclusion and poor living conditions, while immigrants face barriers in navigating the system, language, and treatment adherence [17], less educated and lower income women experience tend to be more prone to lower health outcome [47].

These patterns emphasize that even universal systems are not immune to health inequities. Portugal's digital health and NCD programs show how structured, data-driven models can support chronic care, while Nigeria's community-based outreach expands access under constraints, with objective of reaching the underserved populations, building healthcare bridges to cut the cost of healthcare coverage of the population [50]. Nigeria could adapt Portugal's universal coverage features—public funding, national insurance, and patient records—to improve equity while Portugal could apply Nigeria's grassroots strategies— community health workers, mobile teams, and local outreach—to strengthen rural care, obesity prevention, and geriatric services.

Conclusion

This study highlights structural contrasts between Nigeria and Portugal's health systems. In a broader analysis, this study proposes to understand how differences in financing, workforce, governance, and service delivery between Nigeria and Portugal impact access to care, disease burden, system efficiency, and health outcomes, from 2014 to 2024, identifying critical disparities and exploring policy-relevant lessons for improving resilience and health system responsiveness in both contexts. Portugal's tax-funded model ensures broad coverage of health outcomes in life expectancy, maternal and infant mortality, and immunization but faces rising strain from aging, chronic illness, and lifestyle-driven conditions (e.g., obesity, alcohol use), and persistent regional disparities. Nigeria, despite mixed public-private system, has made gains in immunization, life expectancy, and community-level service delivery. To improve outcomes, Nigeria should expand national health insurance to reduce catastrophic out-of-pocket payments and extend coverage beyond the formal workforce. Investment in digital infrastructure is critical not only for managing patient records but also for real-time disease surveillance, outbreak tracking, and strategic resource allocation, especially in rural and conflict-prone areas. Integration of NCD and maternal care into primary care would enhance continuity, early detection, and equity, particularly for underserved women and children.

Portugal would benefit from decentralizing elements of care delivery to address regional imbalances, especially in interior and rural areas like Alentejo. Scaling up home-based and geriatric care is vital to reduce hospital overuse and improve aging population outcomes, also adopting Nigeria's community outreach models such as mobile health teams and local screening campaigns could help address Portugal's gaps in preventive care, obesity control, and rural service delivery. In addressing behavioral and lifestyle-related disease risks, Portugal must pair infrastructure with more intensive and organized health promotion campaigns and behavior-change interventions, while Nigeria should formalize and scale existing informal prevention already embedded in community and faith-based outreach. Lastly, both countries would benefit from bilateral collaboration in digital health, maternal health training, and epidemic forecasting systems to enhance preparedness and workforce capacity. These concrete recommendations support the study's broader goal of promoting adaptive, equitable, and evidence-informed health reforms across diverse systems.

Strengths and Limitations This comparative analysis is subject to certain limitations. Relying on national-level data may obscure significant within-country disparities—such as the health divide between northern and southern Nigeria or between rural and urban regions in Portugal. The absence of disaggregated data by socioeconomic status, gender, or ethnicity limits deeper equity-focused evaluation. Additionally, differences in data quality, self-reporting standards, and methodological inconsistencies between countries may affect the accuracy and comparability of findings.

Despite these limitations, the study offers an important contribution to global health systems literature by presenting one of the first structured comparisons between a Western African Nation and a Southern European Nation. Applying a consistent

analytical framework across two epidemiologically distinct settings enables meaningful insights into how health financing, workforce dynamics, and service delivery models influence health outcomes. The integration of both structural and outcome indicators—such as maternal mortality, life expectancy, and infrastructure coverage—alongside demographic and contextual variables, strengthens the study’s relevance. By drawing from multiple nationally representative data sources, the analysis offers a broad yet nuanced perspective that can inform system-level reforms. These findings provide a foundation for policy learning and cross-contextual strategies aimed at enhancing equity, efficiency, and resilience in both countries’ healthcare systems [1–9].

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Annex- Tables And Figures illustrating the data

*Table I-*demonstrates Population Growth Demographics including population number, birthrate, deathrate, and fertility rate from 2014 to 2022, between Nigeria and Portugal.

Year	Population (Million)	BirthRate (/ 1,000 people)	Death Rate(/ 1,000 people)	Fertility rate(Birth / 1000 women)
	Nigeria/ Portugal	NG/PT	NG/PT	NG/PT
2014	179,379,016 / 10,408,372	40.036/ 8.363	13.201 / 10.253	5.675 / 1.284
2015	183,995,785 / 10,365,435	39.551/ 8.231	12.892 / 10.338	5.611 / 1.285
2016	188,666,931 / 10,332,753	39.067/ 8.10	12.583 / 10.422	5.546 / 1.286
2017	193,495,907 / 10,307,530	38.582 / 7.968	12.274 / 10.507	5.482 / 1.287
2018	198,387,623 / 10,289,835	38.098 / 7.836	11.965 / 10.591	5.417 / 1.288
2019	203,304,492 / 10,289,923	37.684/ 7.802	11.771 / 10.702	5.349 / 1.300
2020	208,327,405 / 10,298,192	36.855 / 7.768	11.577 / 10.813	5.281 / 1.313
2021	213,401,323 / 10,290,103	36.440 / 7.733	11.382 / 10.924	5.144 / 1.325
2022	218,541,212/ 10,270,865	36.440 / 7.699	11.188 / 11.035	5.076 / 1.338
2023	229,521,409 / 10,430,738	36.026 / 7.665	10.994 / 11.146	5.076 / 1.350
2024	229,152,217 / 10,408,373	35.683 / 7.672	10.833 / 11.249	50.09 / 13.60

Table I-Population Growth Demographics including health funding, medical institutes, number of healthcare centers, ratio of hospital bed, doctor,nurse-patient ration from 2014 to 2022, between Nigeria and Portugal.

Year	Gov't spending on health spending. % of GDP	No. of medical schools	Total No. of Healthcare/Hospitals, and primary health center	Density of hospital beds per 100,000 inhabitants.	Ratio of hospital beds / 1,000 inhabitants.	No. of medical doctors / 10 000 people	No. of nurses and midwifery personnel per 10,000
	NG/PT	NG/PT	NG/PT	NG/PT	NG/PT	NG/PT	NG/PT
2014	3.35 / 9.34	50 / 11	40 000 / 225	15 / 232.7	0.5 / 3.32	4.0 / 45.60	14.00 / 63.70
2015	3.58 / 9.32	53 / 11	4 200 / 225	16 / 231.96	0.5 / 3.37	4.40 / 47.60	17.00 / 65.30
2016	3.65 / 9.39	53 / 11	40 222 / 225	17 / 232.98	05 / 3.4	4.8 / 49.40	17.40 / 67.20
2017	3.75 / 9.31	53 / 11	40621 / 225	17 / 233.49	0.6 / 3.5	4.90 / 51.1	15.10 / 69.30
2018	3.09 / 9.41	53 / 11	40621 / 225	17 / 234.46	0.7 / 3.53	4.70 / 52.90	13.10 / 71.60
2019	2.99 / 9.51	53 / 11	40621 / 225	17 / 238.19	0.8 / 3.49	4.50 / 54.50	14.80 / 73.40
2020	3.38 / 10.55	53 / 11	40621 / 225		1.0 / 3.47	3.90 / 56.20	15.00 / 75.50
2021	4.08 / 11.14	53 / 11	40621 / 225		0.9 / 3.47	3.90 / 57.70	15.60 / 77.90
2022	/10.62		621 / 225			3.90 / 58.00	16.80 / 77.00
2023			40621 / 225				

Table III. Lifestyle and Behavioral Health Indicators, including smoking rate, obesity, drug-related mortality, alcohol consumption from 2014 to 2022, between Nigeria and Portugal.

Year	Smoking rate (from age 15) %	Obesity among adults(18+years) %	Drug related mortality/ 100,000 people	Alcohol taken per year (from age 15), in litres
	NG/PT	NG/PT	NG/PT	NG/PT
2014	4.70 / 25.30	9.22 / 19.20		4.40 / 13.50
2015	3.90 / 30.00	9.53 / 19.50		4.40 / 12.20
2016	3.60 / 30.00	9.87 / 19.80		4.54 / 10.30
2017	3.80 / 30.00	10.20 / 20.10		4.54 / 10.50
2018	3.90 / 30.20	10.80 / 20.40		4.54 / 10.50
2019	3.90 / 30.25	11.00 / 20.70	5.81 / 72.00	4.54 / 12.30
2020	3.70 / 30.28	11.40 / 21.10	5.60 / 63.00	4.10 / 12.10
2021	3.00 / 30.30	11.90 / 21.40	5.90 / 81.00	3.60 / 12.20
2022	3.00 / 30.20	12.40 / 21.80		3.50 / 12.30
2023	2.70 / 30.35			3.40 / 12.30
2024	2.30 / 30.30			

Table IV- Demonstrates Health Indicators and key mortality causes and incidence rate of suicide, Communicable and non-communicable diseases from 2014 to 2022, between Nigeria and Portugal.

Year	Suicide mortality rate (per 100,000 people) -	Mortality(%) by Communicable diseases	Mortality(%) Noncommunicable diseases	Mortality by Injuries (%)	Malaria incidence (per 1000 population at risk)	HIV/AIDS Mortality Rate/ 100,000 people
	NG/PT	NG/PT	NG/PT	NG/PT	NG/PT	NG/PT
2014	3.90 / 14.20	68.50 / 9.00	24.50 / 86.30	7.00 / 5.00	298 / N	31.90/ No data
2015	3.70 / 13.20	68.40 / 8.40	29.6 / 80.30	7.00 / 5.00	243.20 / N	30.87 / No data
2016	3.70 / 11.40	63.70 / 15.4	27.7 / 80.30	7.00 / 5.00	295.00 / N	32.63 / No data
2017	3.70 / 12.10	67.50 / 8.60	27.30 / 80.30	7.00 / 5.00	299.00 / N	
2018	3.50 / 11.70	66.00 / 8.20	27.70 / 80.30	7.00 / 5.00	300.00 / N	
2019	3.50 / 11.50	65.21 / 8.52	27.13 / 86.69	7.00 / 5.00	301.00 / N	31.2 / 3.40
2020	3.40 / 12.50	65.21 / 8.52	27.50 / 87.20	7.00 / 5.00	312.00 / N	30.8 / 2.20
2021		66.00 / 8.00	28.00 / 87.40	7.00 / 5.00	306.00 / N	28.48 / 2.20
2022		65.50 / 7.80	28.50 / 87.6	7.00 / 5.00	312.00 / N	23.57 / 2.20
2023		64.50 / 7.40	29.00 / 87.8	7.00 / 5.00	312.80 / N	
2024		63.5 / 7.00	29.5 / 88.00		315.00 / N	

Table VI- Demonstrates Mortality and incidence rates of key neoplastic(cancer) diseases, including breast, Respiratory, Stomach, Prostate and Colorectal cancers from 2014 to 2022, between Nigeria and Portugal.

Year	Total number of all cancers Year	Breast Cancer Mortality Rate (per 100,000) NG/PT	ASIR of trachea, bronchus, and lung cancers/100,0 00. NG/PT	Stomach cancer (Mortality Rate/100,00 0)) NG/PT	Prostate cancer Prostate cancer(Mortalit y Rate/100,000) NG/PT	Colon and rectum cancers (Incidence Rate/100,000) NG/PT
2014		17.48 / 12.20	1.31 / 18.5	1.4 / 10.2	25.3 / 39.7	1.70 / 50.54
2015		17.96 / 12.40	1.31 / 18.5	1.4 / 9.9	25.3 / 39.7	2.80 / 53.74
2016		18.45 / 13.00	1.31 / 18.5	1.4 / 9.9	25.3 / 39.7	3.20 / 52.78
2017		18.93 / 12.80	1.31 / 18.5	1.4 / 9.3	25.3 / 39.7	3.50 / 53.74
2018	No data / 1,250,000	22.42 / 12.90	1.31 / 18.5	1.4 / 9.0	25.3 / 39.7	6.00 / 52.74
2019	No data / 1,300,000	24.1 / 12.90	1.31 / 18.5	1.4 / 8.7	25.3 / 39.7	8.00 / 53.35
2020	119,991/ 1,350,000	23.10 / 12.80	1.31 / 18.5	1.4 / 8.4	25.3 / 39.7	8.00 / 54.8
2021	120,665 / 1,400,000	24.59 / 12.60	1.31 / 18.5	1.4 / 8.1	25.3 / 39.7	8.00 / 52.54
2022	124,735 / 1,450,000	24.6 / 12.40		1.4 / 7.8	25.3 / 39.7	
2023		26.8 / 12.00		1.4 / 7.5	25.3 / 39.7	

Table VII- Demonstrates Key Health Outcomes including life expectancy, neonatal mortality rate, maternal mortality rate, HIV prevalence from 2014 to 2024, between Nigeria and Portugal.

Year	Life expectancy from birth	Neonatal Mortality Rate	Maternal mortality rate (Per 100k Live births)	Adult HIV Prevalence (% of population aged 15–49)
	NG/PT	NG/PT	NG/PT	NG/PT
2014	52.40 / 80.85	37.30 / 2.10	814.00 / 9.00	2.8 / 0.5
2015	52.80 / 81.07	37.00 / 2.10	814.00 / 10.00	2.8 / 0.5
2016	53.29 / 81.30	36.00 / 2.10	814.00 / 11.00	2.8 / 0.5
2017	53.80 / 81.52	36.00 / 2.10	814.00 / 10	2.8 / 0.5
2018	54.20 / 81.75	35.00 / 2.00	814.00 / 12.00	1.4 / 0.5
2019	54.49 / 81.93	35.90 / 2.00	814.00 / 11.00	1.4 / 0.5
2020	55.30 / 82.11	35.50 / 1.80	814.00 / 10	1.3 / 0.5
2021	64.50 / 82.29	35.30 / 1.70	1,047.00 / 7.00	1.3 / 0.5
2022	64.80 / 82.47	34.00 / 1.62	1,047.00 / 7.00	1.3 / 0.5
2023	63.80 / 82.65	33.80 / 1.62		1.3 / 0.5
2024	64.00 / 82.80	33.00 / 1.62		1.3 / 0.5

Table VIII- Illustrates Immunization compliance rate by percentage of people from 2014 to 2022, between Nigeria and Portugal.

Year	TB vaccination BCG (1-year-olds %)	Polio 3 vaccine (1-year-olds %)	DTP3-CV (1-year-olds %)	Hepatitis B(1-year-olds %)	Hib3 vaccine (1-year-olds %)	MMR vaccine (1-year-olds %)	Measles-vaccine (1st-dose 1-year-olds %)	Pneumococcal Conjugate vaccines (PCV3) among 1-year-olds (%)
	NG/PT	NG/PT	NG/PT	NG/PT	NG/PT	NG/PT	NG/PT	NG/PT
2014	60 / 98	40 / 97	40 / 97	64 / 93	48 / 97	55 / 97	55 / 97	64 / 93
2015	61 / 32	42 / 96	42 / 96	61 / 96	46 / 96	48 / 96	48 / 96	61 / 96
2016	64 / -	53 / 95	53 / 95	64 / 93	53 / 95	53 / 95	53 / 95	64 / 93
2017	67 / -	55 / 97	55 / 97	61 / 96	53 / 96	55 / 97	55 / 97	61 / 96
2018	70 / -	61 / 98	61 / 98	64 / 93	60 / 98	61 / 98	61 / 98	64 / 93
2019	74 / -	66 / 97	66 / 97	61 / 96	66 / 92	66 / 97	66 / 97	61 / 96
2020	75 / -	66 / 98	66 / 98	64 / 93	66 / 98	66 / 98	66 / 98	64 / 93
2021	75 / -	64 / 97	64 / 97	64 / 93	64 / 93	64 / 93	64 / 93	64 / 97
2022		65 / 98	65 / 98	61 / 96	68 / 94	61 / 96	61 / 96	65 / 98

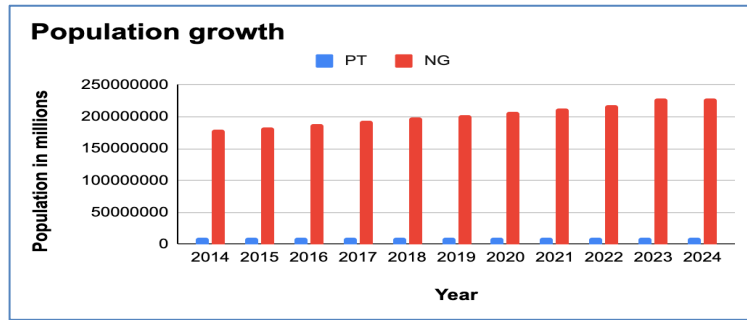


figure 1.1 population growth between NG and PT over a decade.

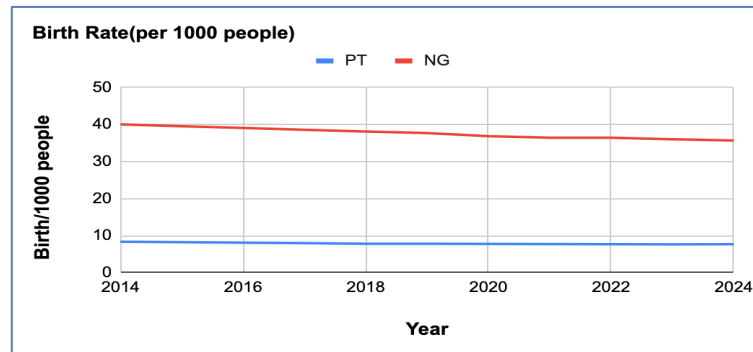


figure 1.2 birth rate between NG and PT over a decade.

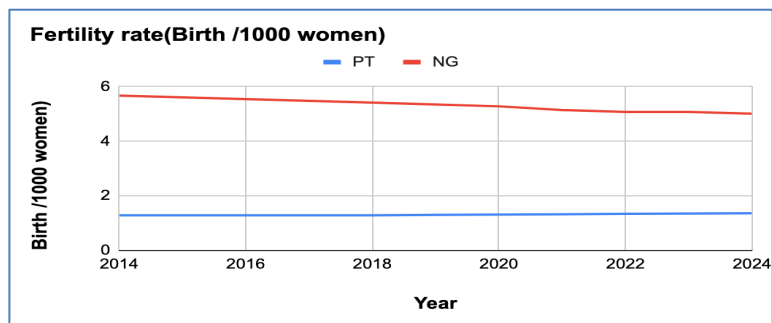


figure 1.3 fertility rate between NG and PT over a decade.

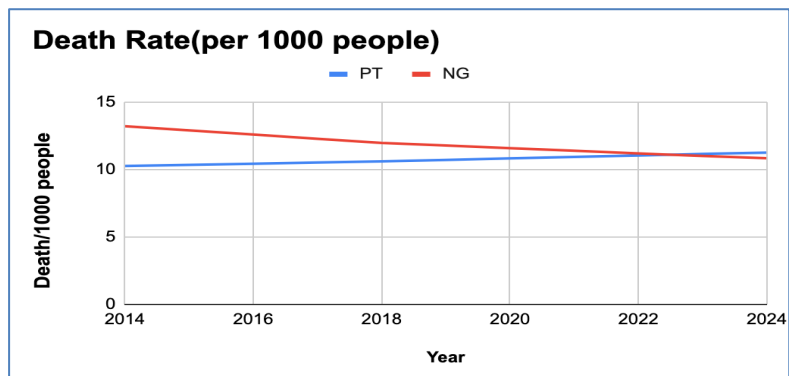


figure 1.4 death rate.

Figures 1: illustrates Population Growth and Demographics between NG and PT over a decade which includes population growth, birth rate, fertility rate and death rate

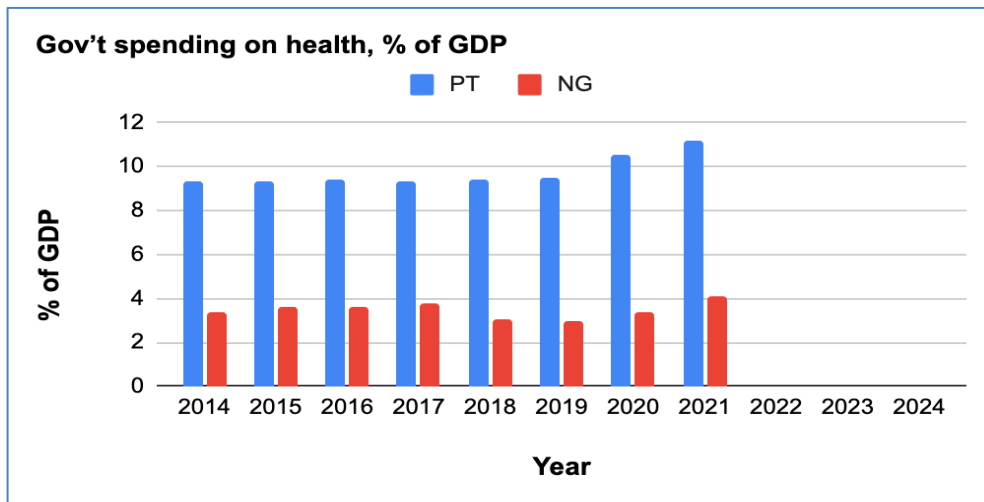


Figure 2: illustrates Gov't spending on health spending. % of GDP between NG and PT over a decade.

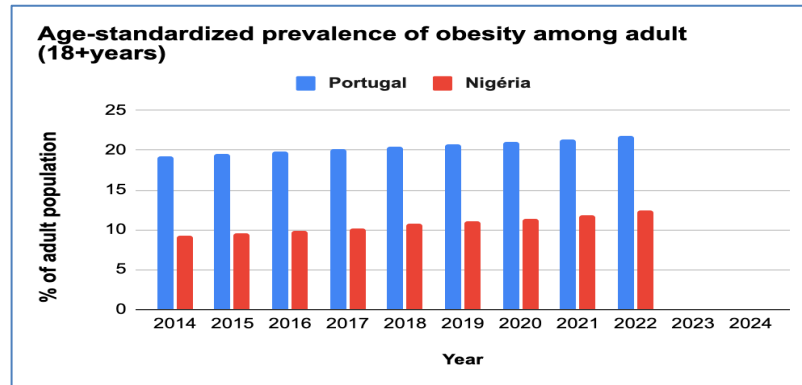


Figure 3.1, Age-standardized Prevalence of obesity among adults (18+years) between NG and PT over a decade

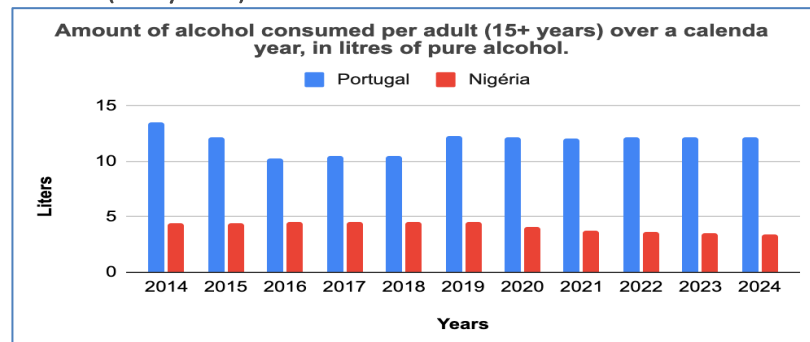


Figure 3.2, alcohol use between NG and PT over a decade.

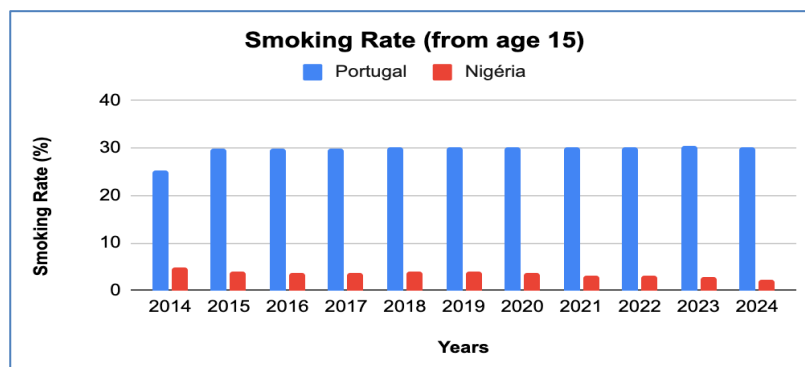


Figure 3.3, rate of smoking from age 15 between NG and PT over a decade.

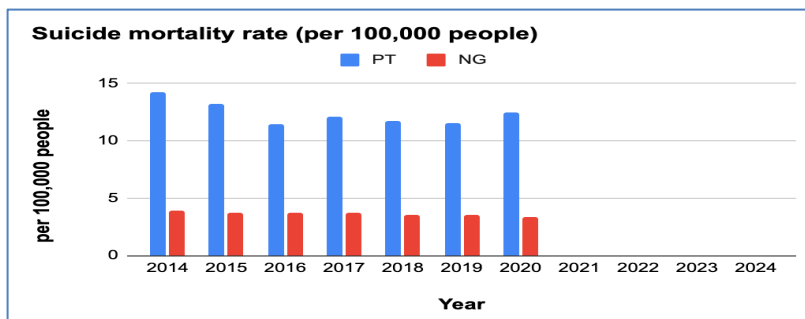


Figure 3.4, suicide rates between NG and PT over a decade.

Figures 3: Demonstrates lifestyle and behavioral health indicators over a decade which includes obesity rate, alcohol use rate, smoking rate and suicide rate.

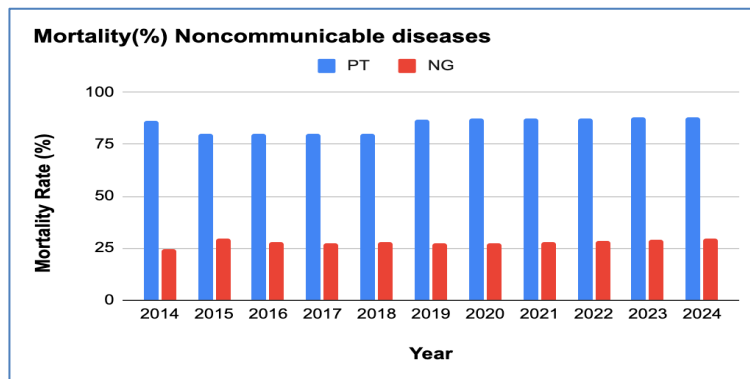


Figure 4.1 mortality rate by communicable diseases %

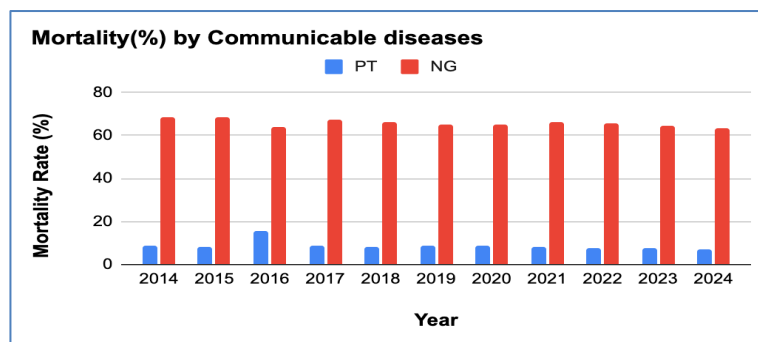


Figure 4.2 mortality rate by noncommunicable diseases %,

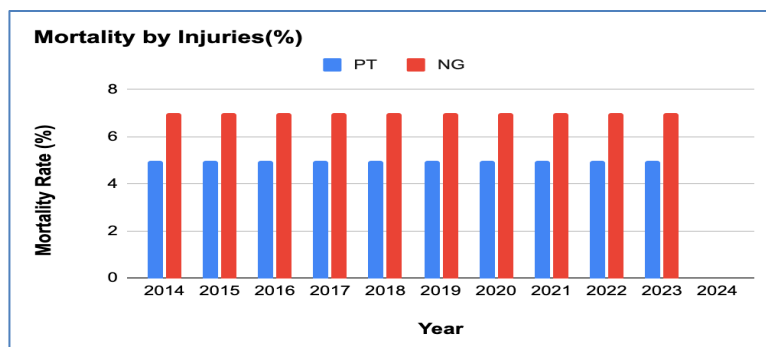


Figure 4.3 mortality rate by injuries %

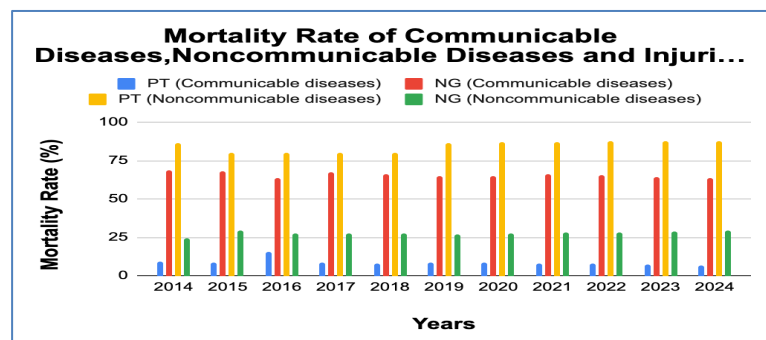


Figure 4.4 Summation of mortality rates of the three groups.

Figures 4: Demonstrates Health Burden by large group of communicable, non-communicable diseases and injuries over a decade.

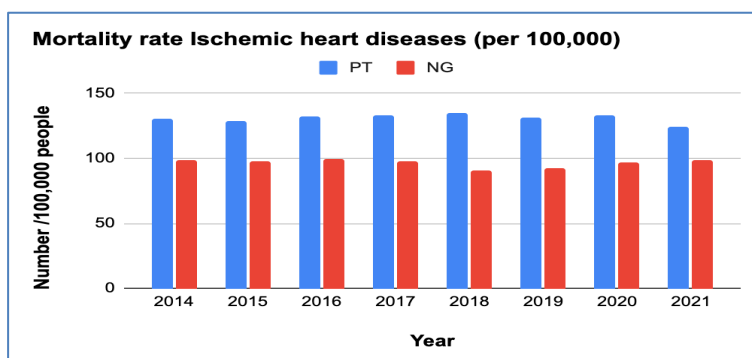


Figure 5.3 mortality rate of ischemic heart diseases/100k.

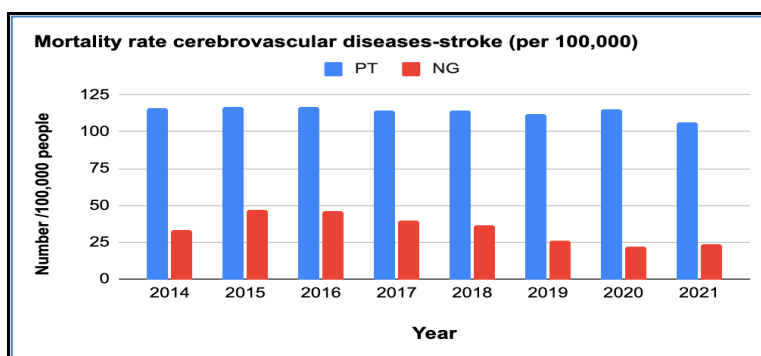


Figure 5.2 mortality rate of cerebrovascular diseases/100k.

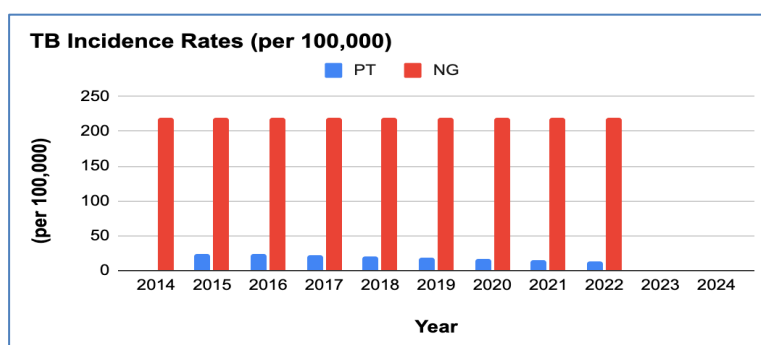


Figure 5.4 TB incidence rate/100k.

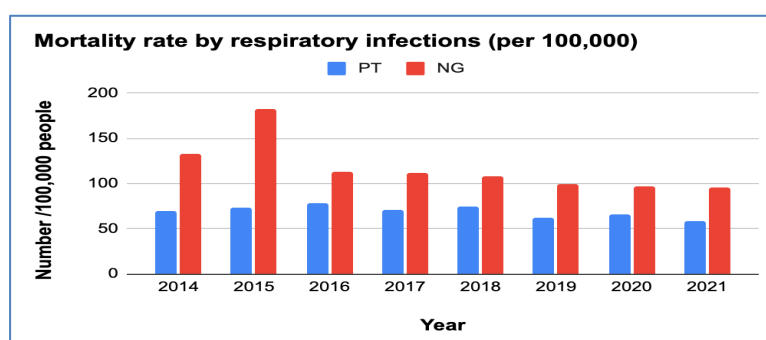


Figure 5.4 mortality rate by respiratory infections/100,000.

Figures 5: Demonstrates Health Burden by various diseases which includes mortality rate of ischemic heart diseases, cerebrovascular diseases, TB incidence rate and mortality rate by respiratory infections.

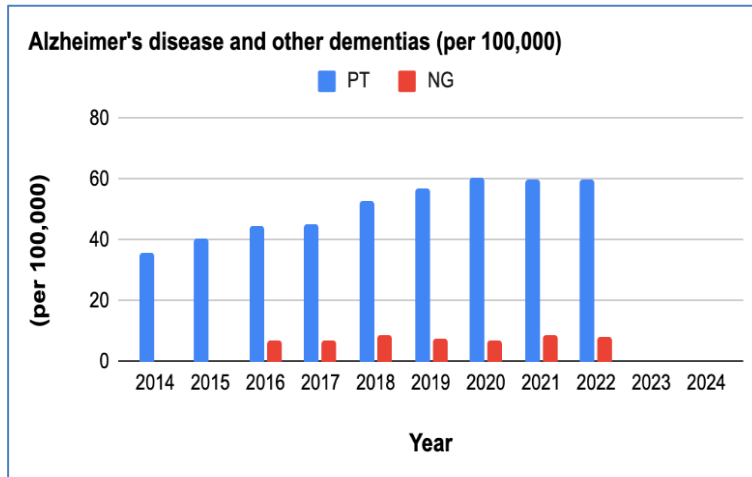


Figure 6.1 prevalence of Alzheimer's diseases and other dementias/100k.

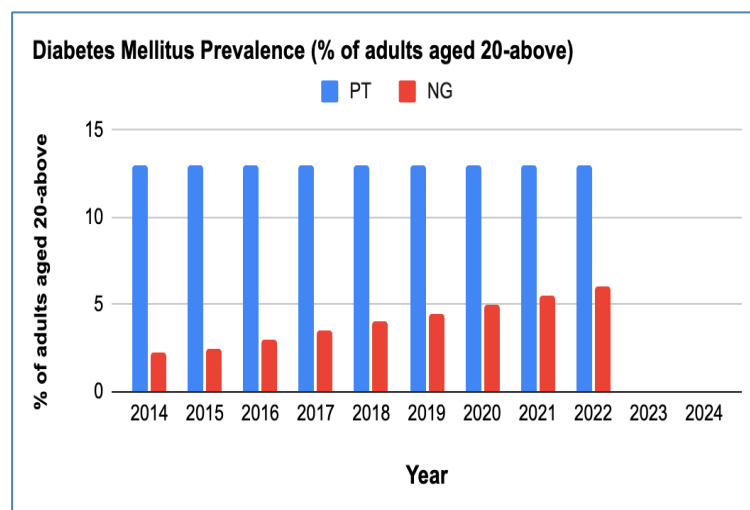


Figure 6.2 prevalence of Diabetes mellitus - % of adults aged 20-above

Figures 6: Demonstrates Health Burden which includes prevalences of Alzheimer's diseases and other dementias and Diabetes mellitus

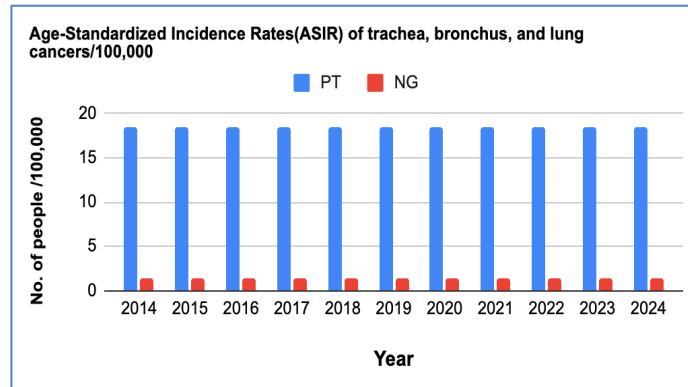


Figure 7.1 incidence rate of trachea, bronchus, and lung cancers/100k.

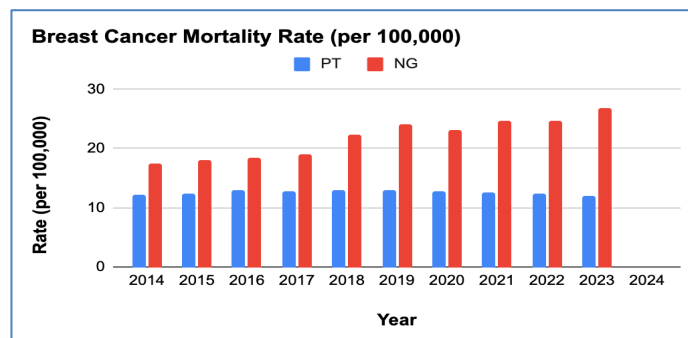


Figure 7.2 mortality rate of breast cancer/100k.

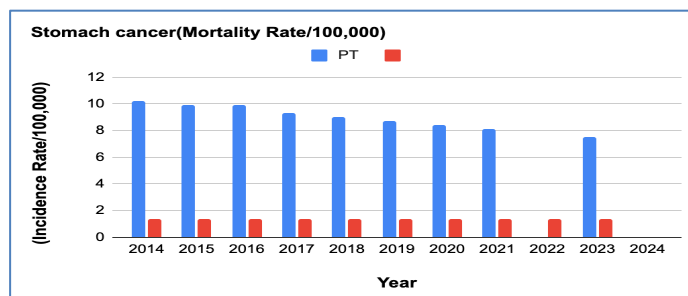


Figure 7.3 mortality rate of stomach cancer/100k.

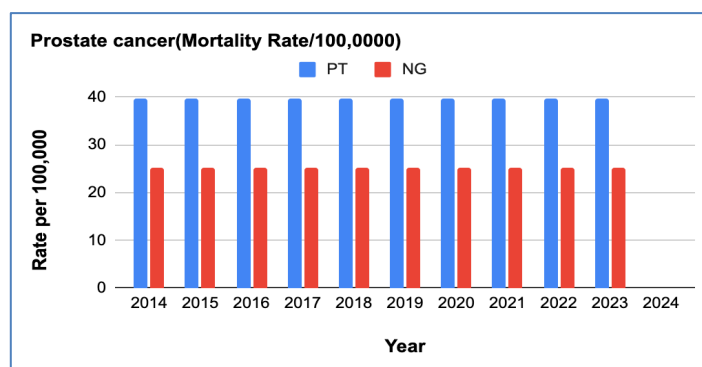


Figure 7.4 mortality rate of prostate cancer/100k

Figures 7: Demonstrates Health Burden which includes prevalence of trachea, bronchus, and lung , mortality rate of breast cancer, stomach cancer, prostate cancer.

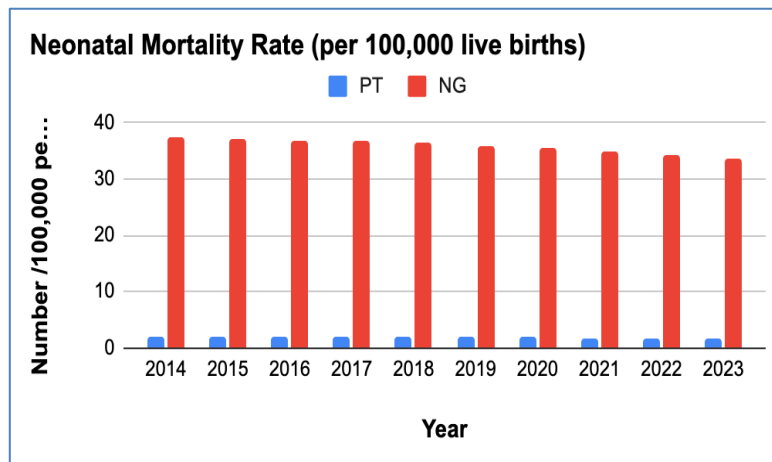


Figure 8.1 Neonatal mortality rate/100k.

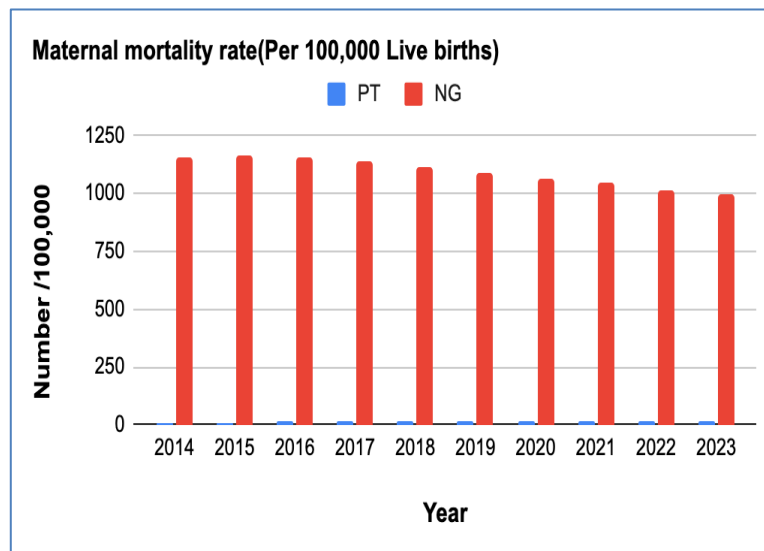


Figure 8.2 Maternal mortality rate/100k.

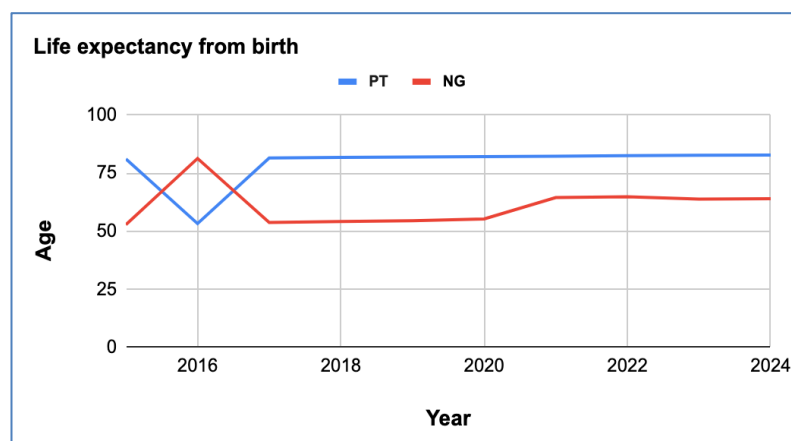


Figure 8.3 Life expectancy from birth.

Figures 8 : Demonstrates Key Health Outcomes which includes Neonatal mortality, Maternal mortality rates and Life expectancy from birth.

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