Heart disease mortality in the Philippines from 1960 to 2019: a big data analysis

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ABSTRACT

Heart diseases remain one of the major health concerns worldwide, inflicting a tremendous financial burden, especially in low to middle-income countries like the Philippines. An exhaustive time-trend analysis, including recent data, is essential to measure the nation's progress in cardiac health, capturing the effect of national-scale changes over time. Thus, using stored data from the Philippine health statistics, this study analyzed trends and profiles of heart disease mortality in the Philippines from 1960 to 2019 and discussed relevant national policies for greater recognition and awareness. Ischaemic heart disease constituted the most significant proportion of mortality among all types. Steadily increasing trends by cause, gender, age group were observed, and with males and the elderly population having higher rates. Regional differences also existed, having the highest rates in Luzon, the Visayas, and Mindanao respectively. Like global patterns, heart disease remained one of the country's leading causes of mortality over decades. Differences between genderes, age groups, and regions are attributed to complex and interrelated factors making males, the elderly, and highly urbanized areas most vulnerable among the population.

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1. INTRODUCTION

Despite the overwhelming shift of interest and health priorities in infectious diseases due to the advent of COVID-19, chronic non-communicable diseases (NCDs) remain exigent as they continue to affect the global populace and considerably bring a heavy economic burden. It has long been found to contribute mainly to worldwide deaths, accounting for 40 million people annually, equivalent to 70% of the global mortality [1], [2]. Heart disease causes a significant part of deaths from NCDs. It is considered a single leading cause of death and is one of the most severe health problems; equally valid among genderes and across countries [3]–[5]. Global health statistics rely on national registers for data on important health events. These are used as a premise in standardizing national progress and assessing the burden of diseases. In the Philippines, these data are provided by the Philippine health statistics (PHS), an annual publication of the Department of Health (DOH). PHS' data shows that, similar to global data, heart diseases have consistently been one of the top ten causes of mortality for many years, along with other non-communicable conditions, such as diabetes, chronic obstructive pulmonary disease, and cancer [6]. Growing attention given to heart diseases in the country has started since World War II due to increased public awareness, expanded knowledge about the disease, and improved methods of diagnosis [7].

The current study assesses the local menace of heart diseases and contemplates efforts needed for its health outcomes; it is vital to study the mortality it causes among the people. Downward or upward trends are important indicators of the nation's progress in its efforts toward cardiovascular disease care. On the other hand, the profile of its different types helps determine which heart condition is the most threatening, eventually leading to the assessment of pervasive causative risks among the population that leads to this prevalence. Mortality profiles and trends are often presented to healthcare personnel as the basis for critical decisions regarding the public's welfare, now and in the future [8]. Since mortality is considered one constant demographic process, preventing its occurrence has been a motivation for the rapid cardiac health advancements available today [9]. Unfortunately, access to these developments is unequal among different population sectors, causing disparities in cardiac health outcomes.

Moreover, complex and interrelated factors including, but not limited to, gender, age, and region are also associated with varying tendencies of heart diseases [10], [11]. Considering this, it is apparent that existing health inequalities should also be considered an impetus in amending strategies for better cardiac health beyond the cause-specific outcomes. Without thorough contemplation of these efforts, heart disease is assumed to continue as a leading cause of death in the country.

Given the unwavering scope of heart diseases, it is clear that it inflicts a significant strain on the nation's economic burden considering both direct and indirect costs related to its monitoring and management. With this, numerous studies concerning the profile and trends of heart diseases in the country have been carried out to serve as retrospective information to underscore the strategies needed to turn these statistics around. However, considering the changes in epidemiological and demographic conditions, exhaustive analysis inclusive of recent data is ideal for assessing and facilitating current decisions for cardiac health outcomes in the country. Thus, this study aimed to provide complete profiles and trends of heart disease mortality in the country for six decades (1960-2019), accounting for salient demographic factors, i.e., age, gender, and region that influence this outcome. This report can serve as a commonition to enhance screening programs, and cost-effective therapies for heart diseases since very little has been done in the Philippines' public health system.

2. RESEARCH METHOD

2.1. Data sources

DOH annually publishes the PHS, an annual report of important health events, including mortality data per cause, gender, age group, and region. This information is regularly reported in compliance with the Republic Act 3,753 of civil registration laws which mandates the registration of a person's civil status [12]. Deaths should be certified by a physician or by a health officer in cases of deaths outside the hospital. These data are initially registered in the local civil registrar's office (LCRO), which then supplies death certificate copies to the office of the Philippine statistics authority's (PSA) Civil Registrar General for processing and documentation. Subsequently, PSA summarizes these demographics and provides them to DOH for the production and publication of PHS. Mortality data available before the year 1974 were not yet centered on PSA. However, the present study is still scoped within six decades, including the 1960s, to exhaustively examine the outcomes and tendencies of heart diseases since it already gained increasing attention around the end of World War II in 1945 [7].

2.1.1. Data mining

Data on mortality from heart diseases occurring between 1960 to 2019 were sourced from the PHS. These datasets were accessed online through the Department of Health's website (doh.gov.ph). The mortality data and estimated population (used for subsequent computations) were obtained by gender, age group, and region and were organized using the microsoft excel spreadsheet software.

2.1.2. Data cleaning

PHS adopted the international classification of diseases (ICD) format in reporting the causes of death. This format has undergone several revisions over the years, hence the inconsistencies within the data; some causes were merged or classified separately over time, depending on the latest revision for a particular year of interest as shown in Table 1. Since this study covered six decades, several modifications were also comprised. In this study, the merging and splitting of classifications were handled by considering the latest revision (ICD 10) and structuring earlier revisions to this format. Using the formula feature of microsoft excel, prior revision formats were conformed to the ICD 10 categorization: merged classifications (sum function), split classifications (subtraction function), and cause of death classifications not previously accounted which may be due to new disease discoveries (hyphen, meaning an absence of information). With this, the data reported in all of the years considered in the present study was uniform, assuring a sound basis for analysis.

A considerable number of missing values was observed in regional data. Although, since 2002, region IV has been separated into region IV-A, CALABARZON, and region IV-B MIMAROPA, the present study has merged more recent data from region IV for homogeneity. Also, the CARAGA region was only founded last 1995, so the supplementation of missing data (1990-1994) was based on the first value. Due to the incompleteness of data from the PHS, only three decades were accounted for in the regional analysis. Values of heart disease mortality per region were missing in the 1960s and 1970s because heart disease was not considered one of the notifiable diseases back then. Although some data were available in the 1980s, it was only up until 1983, hence the consideration of only three decades in analyzing regional differences. Some missing data were supplemented with the average values from the preceding and succeeding years, based on the standard protocol in data mining.

Table 1. Codes used for the classification of heart diseases as per ICD

Cause	ICD 7 (1960-1973)	ICD 8 (1974-1986)	ICD 9 (1987-1996)	ICD 10 (1997-2019)
Rheumatic heart diseases	400-402, 410-416	390-398	390-398	I00-09
Hypertensive diseases	440-443	402	401-405	I10-13
Ischaemic heart diseases	420	410-413	410-414	I20-25
Other heart diseases	421-422, 430-433	420-425, 427-429	420-429	I26-51

2.1.3. Data exploration

Proportionate mortality of the heart disease classifications considered was calculated using the formula feature of microsoft excel. Meanwhile, specific death rates (SDR) were used for the rest of the analysis. Both-gender, all-age, and all-region mortality are not particularly helpful in public health surveillance since the distribution of deaths by gender, age group, region is affected by the population's gender, age, and geographical structure. SDRs, i.e., Cause-specific, Gender-specific, Age-specific, and Region-specific, were then computed to show trends in specific deaths due to these factors. The formulas used for solving SDRs were based on the equations provided by PHS [6]. The age-specific rates were used to get the age-adjusted rates by direct standardization using the standard world population (2000-2025) established by the World Health Organization (WHO) [13].

The profile of heart diseases was graphically examined, consisting of the proportionate mortalities of the types of heart diseases considered. The tableau software analyzed the overall trend of heart disease mortality (cause-specific death rates). Trendline and forecast functions were utilized in the analysis to identify the general (cause-specific) and gender-specific trend of mortality over time (whether linear, polynomial, logarithmic, or exponential) and predict the rate values up to the year 2029, respectively. Redaniel *et al.* [14] was used as a reference for analyzing the age-specific and region-specific death rates. The 3-point moving average data analysis was employed to get a general impression regarding the trend of the annual rates. The input was in the three-year interval, centering the moving averages on the last year of each three years; hence the graphs began in 1962. Trends were then examined based on the graphical outputs.

3. RESULTS AND DISCUSSION

3.1. Heart disease classifications

Data from the national statistics office (now PSA), which is provided for PHS publication, conforms to the ICD codes. ICD is a format conventionally adapted for international comparability of mortality data. However, several revisions were made between 1960-2019, as shown in Table 1.

Diagnosis and recognition of heart diseases have changed over the decades, especially how it was monitored and managed has also changed. The statistics were thus consequently subjected to varying nomenclature, and these changes adapted for large-scale development and acceptance. This evolution can be reflected in these revisions. The latest revision of ICD (ICD-10) classifies heart diseases under the category of cardiovascular diseases and consists of acute rheumatic fever and chronic rheumatic heart diseases (I00-I09), hypertensive diseases (I10-I13), ischemic heart diseases (I20-I25), and others (I26-I51). The present study has extracted and analyzed data based on this more recent classification, summating data from earlier sets that had different codes.

3.2. Mortality profile
3.2.1. Proportionate mortality of heart disease types

The percentage of mortality from specific types of heart diseases in the Philippines referred to as the actual number of registered deaths from each cause across six decades (1960-2019), is shown in Figure 1. Ischaemic heart disease (IHD), also known as coronary heart disease (CHD), has cumulatively caused the most significant mortality (37%) in the Philippines from 1960 to 2019. Other than the unspecified types (36%), hypertensive diseases (HPN) succeeded IHD, and a minor proportion was caused by rheumatic heart diseases (RHD). International IHD epidemiology records support this profile. This type of heart disease is globally identified as the most prevalent, causing alone 360,900 US deaths in 2019 [15] which is thereby approximated to cause coronary problems every 25 seconds, with one dying from a coronary event per minute [16]. In China, although HPN mortality is higher than IHD, the IHD burden has still been increasing within its population [17]. Even earlier studies in the Philippines recognized IHDs as significant contributors to cardiac problems, accounting for 6% of all heart patients in Manila hospitals [7], and significantly increased mortality among both genderes within 1963-1976 [18]. However, in Western countries, IHD mortality has decreased over the last decade. But despite this decline, it remained to constitute one-third of their deaths among aged 35 years and up [16], [19]–[21]. Previous reports from 1963 to 1976 in the Philippines showed that HPNs had succeeded IHDs in causing heart disease mortality among males and females. RHD deaths also remained unchanged over the years, constituting a relatively smaller national-scale percentage [18]. The profile of earlier reports in the country thus followed the pattern revealed in the present study.

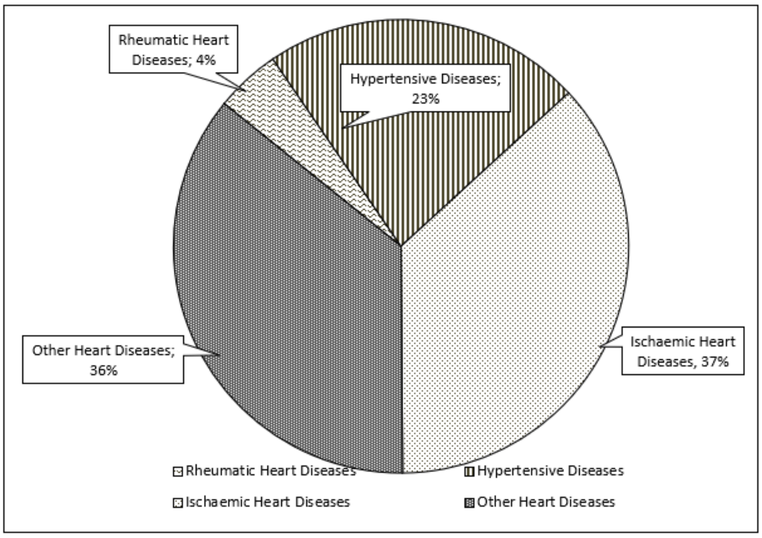


Figure 1. Profile of heart diseases in the Philippines, by type, 1960 to 2019

Several pieces of the literature showed an association between urbanization and high serum total cholesterol (TC) levels to atherosclerotic, and thereby IHD, risk [22], [23] and increasing mortality [24] TC constitutes high-density lipoprotein (HDL or "good cholesterol") and Low-density lipoprotein (LDL or "bad cholesterol"). The rise of LDL and decline of HDL levels in the body is correlated to a high intake of trans fatty acid (trans fat) [25], [26]. Rooted in this fact, a recent study in England laid a potential trans-fat policy to decrease IHD mortality. Here, it was shown that excluding trans fatty acids can approximately prevent several 7,200 deaths from IHD [27]. Fortunately, the Philippines is in its initial phase of banning trans-fat from food supplies, as of the 2021 report of Ablao *et al.* [28].

3.3. Mortality trends
3.3.1. General mortality

Heart disease mortality in the Philippines from 1960 to 2019 is plotted in cause-specific death rates by 100,000 population. The trendline and forecast (highlighted part of the trend) up to 2029 are also reflected, as shown in Figure 2.

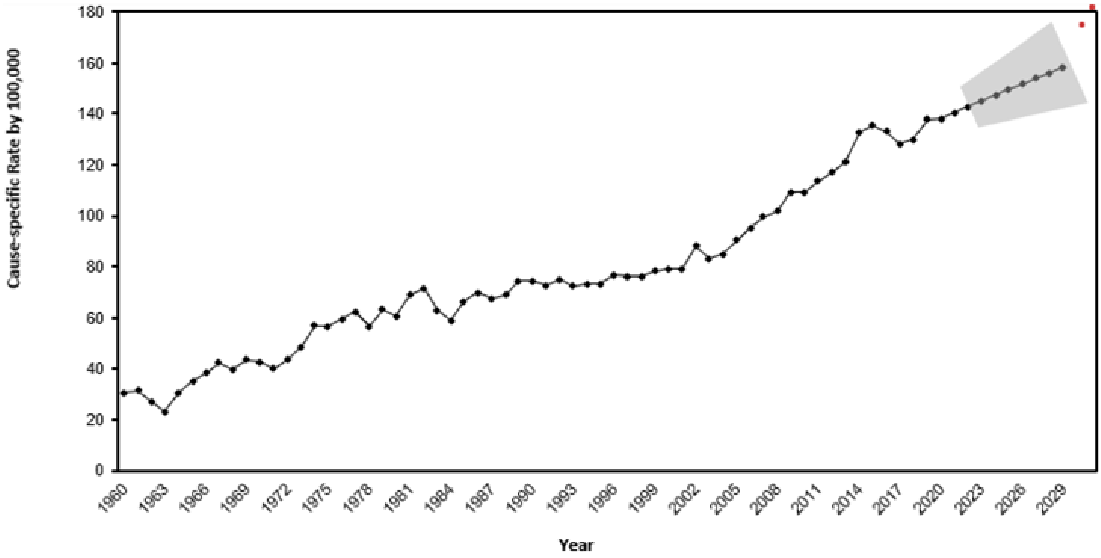


Figure 2. Profile of heart diseases in the Philippines, by type, 1960 to 2019

The overall mortality from heart diseases occurring between 1960-2019 in the Philippines has steadily increased. Rates per 100,000 increased from 30.69 in 1960 to 42.59, 60.76, 74.57, 79.13, and 109.49, 137.88 in 1970, 1980, 1990, 2000, 2010, and 2019, respectively and is forecasted to increase further up to 140.3 by 2023, 145.5 by 2026, and 150.6 by 2029. This increasing trend can be explained, in part, by the prevalence of smoking and alcohol consumption among Filipinos, which has been long considered to be an alarming problem in the country. Environment (family, peers, and gathering), social pressure (perceived these habits as looking "cool and stylish"), personal issues (depression and stress), and the media are but some of the factors that drive Filipinos into these habits [29]. Also, the purchase of cigarettes can be one at a time, giving easy access to the public and thus furthers the concern about smoking. Moreover, Filipinos were found to have an unhealthy taste in food, as evident in the traditional dishes with high fat and salt contents [30]–[32]. Sodium in salt increases blood levels in the arteries, raising blood pressure and increasing the risk of stroke and heart diseases [33]. The common use of *patis* (fish sauce), soy sauce, *bagoong* (shrimp paste), and anchovies by Filipinos in making foods contributes to this risk [29].

Earlier international reports also revealed a generally increasing trend in developed countries until the 1960s [34], [35]. However, due to improvements in heart disease prevention programs, diagnosis, and treatment in these countries, the risk profile in their population has decreased, giving downward trends soon afterward the 1960s [36]. In the united kingdom, more than 50% of all mortality in 1961 was caused by cardiac and vascular diseases. However, this dropped to 32% in 2009 [37]. It is important to note that the Philippines is still a developing country. Its economic capacity could be one of the possible explanations for the lag in ameliorating disease control and prevention, hence the cumulative upward trend. Although readily accessible cardiac interventions were available in the country, such as the Philippine heart association mobile application, allowing people to easily access to heart-related information, lack of dissemination and thus awareness also became the problem. Despite the trend difference between countries, heart diseases remain the leading cause of death worldwide.

3.3.2. Mortality by confounding factors

Gender is a well-established factor in health outcome disparities. The actual and forecasted values of gender-specific SDRs (by 100,000 population) were plotted to unravel the trend of heart disease mortality by gender in the Philippines from 1960 to 2019, shown in Figure 3. A steadily increasing trend was also observed among genderes, with males having higher rates than females. Given that males have a higher estimated population within the country but still have higher mortality rates, it suggests a significant difference in health-related outcomes between the genderes. Over many decades of research regarding cardiac and vascular diseases, it was only in recent studies that gender has been recognized as an independent factor for its pathophysiology, clinical manifestations, and outcomes [38]. The notion that cardiac problems more prominently affect males has been passed, proved, and discussed in many pieces of literature [39]–[42]. It was long thought that females are more likely to have cases of breast cancer rather than heart diseases [43]. Cardiac and vascular diseases have been traditionally seen as a "man's disease" since age-standardized rates worldwide are significantly higher in males than females. However, the rates become decreasingly different in older ages [44]. Global data further verify this account by about a tenfold difference between genderes in early studies, with males having higher rates, equally valid between high and low-rate countries. For instance, in the United States, half the rate among males (121 per 100,000) was recorded for females (67 per 100,000). Meanwhile, the European union also reveals higher mortality rates from coronary heart disease (CHD) in males, accounting for 100 per 100,000 compared to 45 in 100,00 among females [45]. For one, it can be explained in terms of the earlier onset of heart problems in males, increasing the linear increase in cardiovascular risk and progressing the atherosclerotic process among them. Other hypotheses for this difference have been proposed, including more active female immune functioning, compensatory action of the second X chromosomes, and protection provided by estrogen [41]. This innate protection by the hormone estrogen in females was found to act via genomic and non-genomic mechanisms that positively affect the cardiovascular system [43]. Estrogen acts on the liver to reduce low density lipoprotein (LDL) cholesterol ("bad cholesterol"), which can build up in the arteries and eventually lead to atherosclerotic infarction and stroke. At the same time, it increases high density lipoprotein (HDL) cholesterol ("good cholesterol") which helps remove macrophage foam cells involved in atherosclerotic plaque formation. This hormone, therefore, indirectly limits macrophagic metabolic activity, which is a sign of early atherosclerotic lesions. Testosterone, on the other hand, promotes it. This partly explains why males have higher mortality than females due to cardiac diseases [46]. However, it should be noted that hormone levels and biological predisposition do not solely determine gender differences in heart disease mortality. Health outcomes of heart diseases are attributed to complex and interrelated determinants. Several pieces of literature have suggested psychological and psychosocial risk factors in the etiology of heart diseases, such as stress, anxiety, and depression [47]–[49] Research shows that distress and depression are higher in females than males. But despite this prevalence among females, males most likely develop less efficient coping mechanisms such as smoking, unhealthy eating habits, and alcohol abuse, compared to females, who most likely have better help-seeking behavior, thus the higher risk.

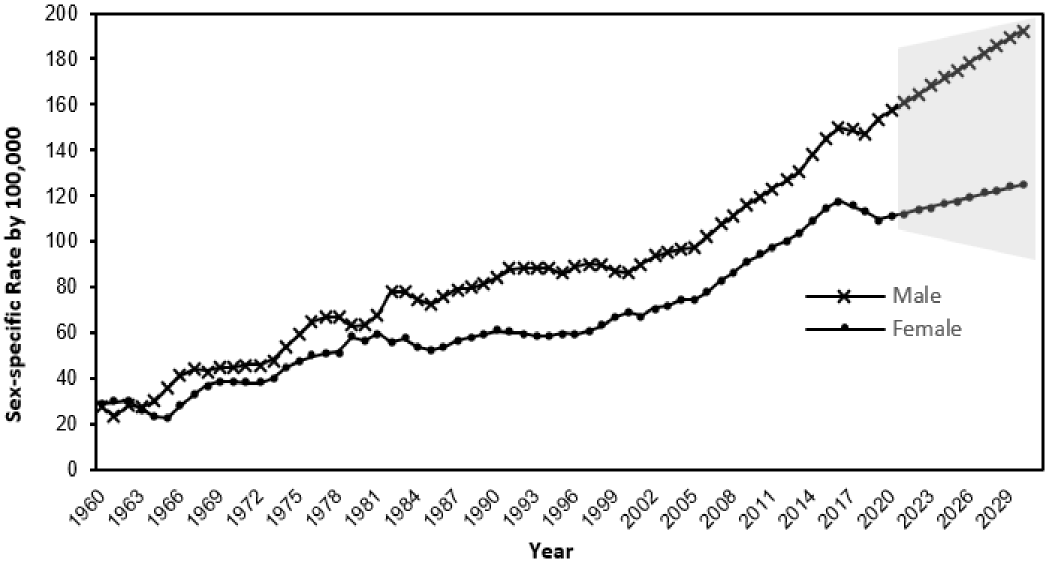
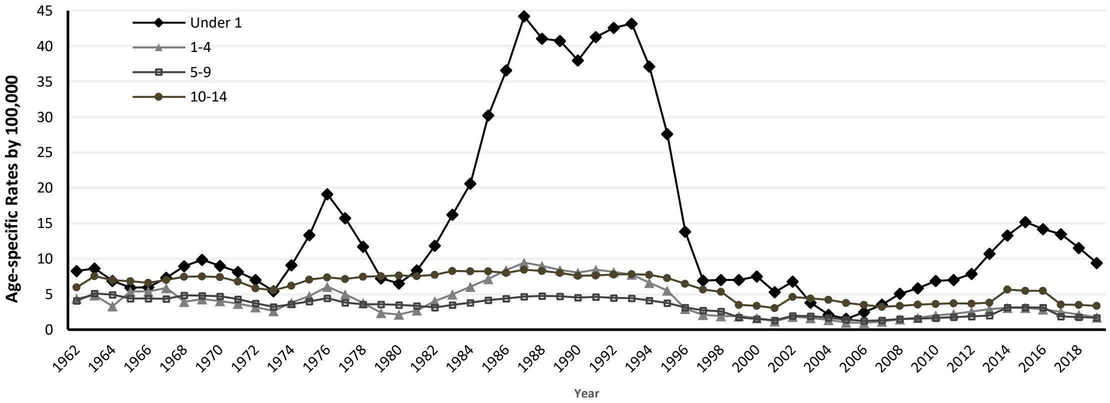
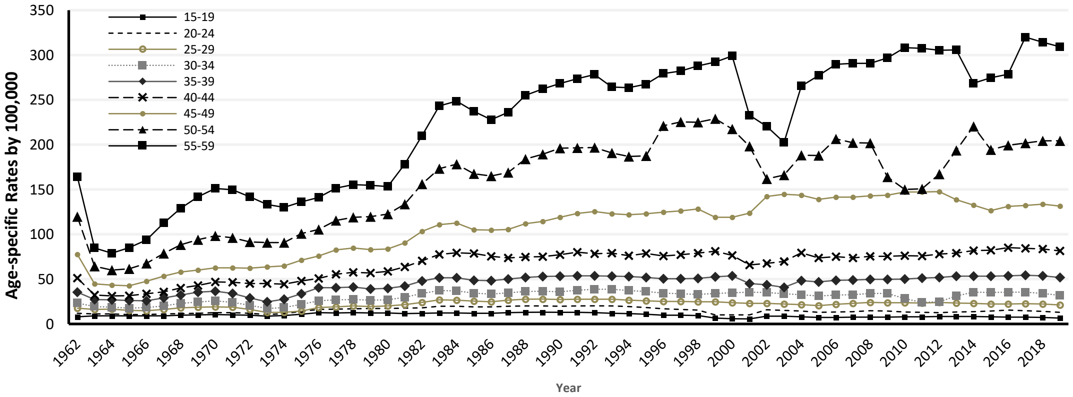


Figure 3. Heart disease gender-specific mortality trend and forecast in the Philippines from 1960-2019

As gender and age are the most common factors for heart diseases, moving averages of age-specific death rates were also investigated. Rates were plotted separately by three broad age groups: Children and young adolescents (under 15 years), the working-age population (15-64 years), and the elderly population (65 years and up), as respectively shown in Figures 4(a), 4(b), and 4(c). Among children and young adolescents, infants (under 1 year) show the highest trend, with a remarkable rise from 6.50 in 1980 to 44.19 in 1987 (peak rate value within the group). It was followed by ages 10-14, which forecasted a relatively stable trend. Ages 5-9 and 1-4 also show a similar trend with nearly identical values. The latter notably rose from 2.14 in 1980 and peaked at 9.45 in 1987, which stabilized afterward with comparable values to the 5-9 age group. It can be observed in the working-age and elderly population that mortality rates also increase as age increases. Within the former group, rates ranged from 7.97 to 319.99, whereas among the latter, rates ranged from 156.76 to 2203.63, thus revealing a significant increase across age groups. Heart disease mortality is an increasing function of age, except for infants. Trends within all age groups have relatively increased from 1960 to 2019, most prominent in the elderly population.



(a)



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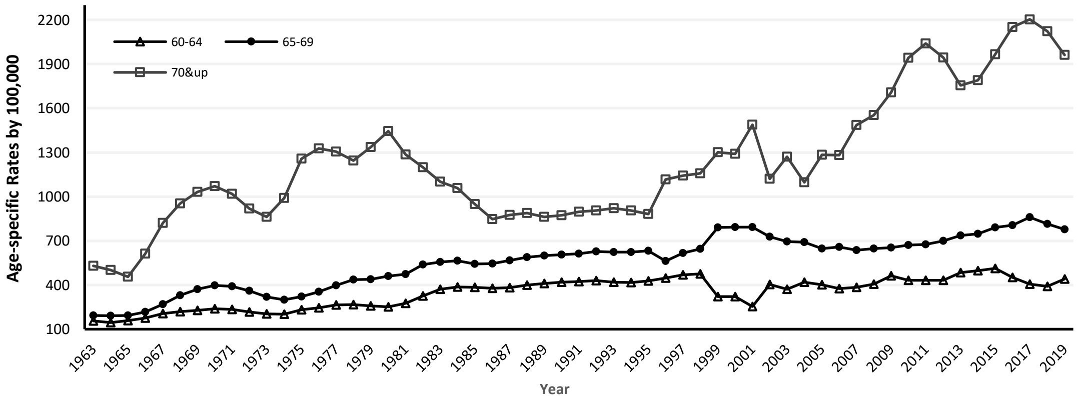

(c)

Figure 4. Trends in age-specific death rates in standard age groups: a) children and young adolescents, b) working-age population, and c) elderly population for heart diseases in the Philippines from 1960-2019 (3-point moving averages, centered in the last year of three years)

The pattern seemed to follow global trends in cardiovascular mortality. A dramatic rise in mortality from cardiovascular diseases occurred in Asia-Pacific regions due to epidemiologic changes [50] and rapidly growing and aging populations [46]. Population aging contributes around 52.5% of this global mortality increase. The proportion of the elderly in the Philippines increases over time [47] and is the fastest-growing population sector [48]. Yet, the Philippine population is still considered young but is nevertheless on the boundary of the demographic transition of aging. Still, this demographic transition impacted adult mortality, increasing at progressively older ages worldwide. However, this pattern differs from country to country. The rise of heart diseases has exponentially increased medical costs. This is problematic among developing countries, including the Philippines, as it imposes a tremendous economic burden given the age structural transition (due to demographic shift), medical services, technological advancements, and treatment costs [50]. This is one of the great reasons why Filipinos generally live longer but with poorer socioeconomic and health conditions. Although under the 1987 constitution (article XIII, section II), the Philippine government is obliged to ensure the quality of life among its elderly population, the challenge of facing the growing prevalence of heart diseases inflicts difficulties in making ends meet given the country's economy. Moreover, while the annual growth rate of the Philippine population has been declining significantly since 1960 (from 3.3% to 1.3% in the present), the yearly addition of about two million people to the population still substantially impacts the ability of our government to meet the needs for medical costs [51]. Aside from the economic burden that puts "active aging" on the brink, the elderly population is also more vulnerable to stress [52]. Exposure to high levels of stress induces a neuroendocrine response (*e.g.*, cortisol) due to the overactivation of sympathetic-adrenal-medullary (SAM) and hypothalamic-pituitary-adrenal (HPA) axes, which later influence secondary (*e.g.*, blood pressure) and tertiary (*e.g.*, cellular aging) consequences [53].

Moreover, mortality from heart diseases among the first group (children and young adolescents) have shown the highest values in infants. This trend is consistent with national studies in the United States, wherein deaths from heart disease were highest among infants and lowest among 5-17 years old children. Several hypotheses suggest that this can be attributed to smoking, drug misuse, or alcohol during pregnancy, genetic or chromosome problems, viral infection, or diabetes in the mother [54]. Fortunately for the US, this mortality has declined over the years due to advanced diagnostic and ascertainment methods available [55] Again, it is important to note that the US is a developed country. The precarious healthcare access in developing countries, including the Philippines, has partially led to the globally consistent higher infant mortality rate from heart diseases [56], [57].

Regional-specific rates by 100,000 are shown in Figure 5, further categorized as per three main Philippine Islands: Luzon (NCR, CAR, and regions I to V), Visayas (regions VI-VIII), and Mindanao (regions IX-XIII and Autonomous Region of Muslim Mindanao or ARMM).Since data from the overall mortality showed an increasing trend, it was expected that regional values would show a similar forecast. Regardless, regional disparities can be observed, with regions from Luzon having higher values primarily prominent in the 2010s. Within this decade, peak values per island were 154.67 (NCR), 135.38 (region VII), and 109.48 (region X) in Luzon, Visayas, and Mindanao respectively. The rampancy of cardiovascular risk factors, like hypertension, has long been higher in urban than rural areas in the Philippines. From earlier years to 2015, urbanization (proportion of the urban population to total population) has increased in all regions, thus attributing to the increase in heart disease mortality. NCR is urbanized (100.0), followed by region IV-A (66.4), region XI (63.5), region III (61.6), region XII (51.6), region VII (49.4), region X (48.5), region VI (38.1), region IX (37.8), caraga (33.5), region IV-B (30.6), CAR (30.5), region V and ARMM (23.2), region I (20.5), region II (19.2), and region VIII (11.9), respectively. A similar influence of urbanization is true in other parts of the world [58]-[60], A sedentary lifestyle is typical in urban areas due to technological advancement, hence the dependence on machines for physical activities [61]. Highly urbanized areas are also typically inhabited by many people from different places due to better job opportunities, thereby having a more heterogeneous population, which may affect health outcomes and regional influence gaps in health. Most jobs in these areas require sitting for a long time and/or being physically inactive. This may cause a buildup of fatty material in the arteries, leading to a heart attack when these vessels get clogged and damaged [62]. The pressure of "city-life" also evokes people into unhealthy habits such as cigarette smoking and alcohol drinking [63].

However, it should be noted that urbanization does not significantly influence the increase of heart disease mortality in a region. Different regions also have differing access to healthcare attributed to the variation of health resources, living conditions, practice in medicine, healthcare provider salary, and incentives, among others [64]. This difference is evident in the Philippine heart center's report, wherein 45% of the admissions are from regions outside Metro Manila (capital of NCR). People from other areas tend to go to Manila due to a lack of specialized physicians and equipment, lack of other cardiovascular care specialists, and reduced government subsidies to support cardiovascular surgeries in their regions [63]. Meanwhile, one sign of good healthcare facilities in hospitals is the number of beds, and as per the recommendation of WHO, 20 hospital beds shall be available per 100,000 population [65]. ARMM has the lowest ratio of beds to population (0.17) among all the regions, while the rest have insufficient beds except for NCR, CAR, region X, and region XI. Therefore, the scarcity of hospital beds in ARMM tells something about the low registered deaths since certificates from deaths occurring in places other than hospitals are not guaranteed. This under registrations can also be attributed to cultural reasons, wherein Muslims must always be buried as soon as possible after death. In fact, it was revealed through the analysis of causes of national death for action (ANACONDA) that many deaths within ARMM were not registered since they did not pass the threshold in the comparator data given by the Institute of Health Metrics and Evaluation (IHME). Moreover, the regions mentioned above, having sufficient facilities, *i.e.*, CAR, region X, and region XI, have relatively low mortality except for NCR. This thus displays the complexity of factors contributing to regional differences. However, being a developing country with increasing heart disease mortality (among others) thereby adheres to this relation.

Concerned government bodies have extensively worked on improvements in cardiac health control. However, regional differences in access to these services, such as the unevenly distributed percutaneous coronary interventions (PCI)-capable hospitals, are a continuing concern. A limited number of PCI centers in the country are only concentrated in 13, 7, and 5 hospitals in highly-urbanized cities of Luzon, Visayas, and Mindanao respectively [66]. Cardiology training programs are also only accessible in major urbanized areas, having only 20 accredited training institutions in 17 major cities in Luzon, 3 in the Visayas, and none in Mindanao [67]. Aside from this boundary in seeking cardiac care, financial constraint is also a major factor in the health-seeking behavior of Filipinos. Although PhilHealth, the national health insurance company in the country, provides financial aid for cardiovascular care like PCI, the expenses in seeking services are still way higher than the assistance coverage. On the brighter side, the Heart Failure Clinic program of the Philippine heart center (PHC) has been shown to reduce the cost of heart failure treatments. It decreases morbidity, mortality, and re-hospitalization [68]. Since these programs are centered in major urbanized areas, a great disadvantage is put on Filipinos residing in far-flung parts of the country, especially those poverty-stricken areas, given the financial difficulties for one.

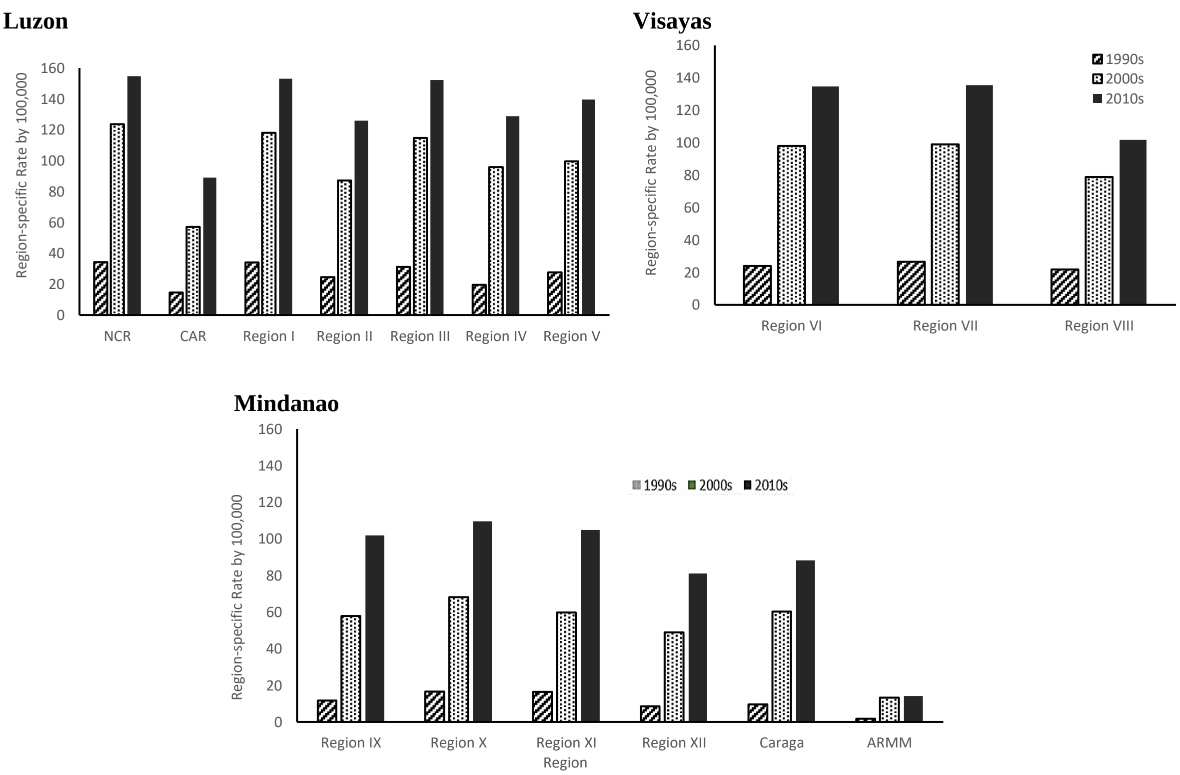

Figure 5. Profile of region-specific rates (average regional rates) for heart diseases in the Philippines from 1990-2019

4. CONCLUSION AND RECOMMENDATION

Heart diseases have remained a significant public health concern since the 1960s. Despite the local interventions for cardiac health, mortality from heart diseases persistently increased due to composite and interconnected factors including, but not limited to, national status. The Philippines' economy directly impacts this trend since several developed countries have already shown decreasing trends in cardiac health outcomes. However, the profile of heart diseases in the Philippines conforms to a global pattern, with ischaemic heart diseases being the leading cause of death among all types. Health inequalities in terms of gender, age group, the region also exist in the country, with males, the elderly, and the highly urbanized areas most vulnerable.

It is enticing to assume that this gap in health outcomes is inevitable and has yet to be effectively addressed due to factors beyond public management and control because heart diseases are lifestyle-related. The complexity and interrelation of determinants and the demographic differences of risk profiles suggest that preventive initiatives will only be effective if they are adapted to the specific needs in which they will be implemented. This must also be multisectoral-implementing policies that influence the food system, commercial and industrial sectors, and finance, among others, just like the initiative above of the trans-fat ban in the country. The Philippine government should also maximize the accessibility and affordability of current cardiac services by recognizing the need for capacity building in hospitals, expanding training programs in all regions, and increasing the financial assistance coverage for cardiac health-related insurance. Current strategies can be retained, but amendments must be thoroughly discussed with different and interrelated health sectors, which should always include scientists. Scientific research which is not output-based is usually undervalued in the Philippines, including studies like public health surveillance. Local government agencies favor marketable research such as new patents, new technology, or new drugs. Although financial aids are available and research is regarded as a priority by the legislation, institutional support for the scientific community is still lacking. Hence, policies that secure the allocation of sufficient funding and fair attention to both output and non-output-based research must be emphasized. This dramatically helps inform decisions for policymaking and response to the current national crisis, including public health like heart diseases.

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