

Research Article

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The Hypertension–Diabetes Nexus in Jamaica: Sociodemographic, Functional Health and Multimorbidity Patterns in the 2023 Jamaica Survey of Living Conditions

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ABSTRACT

Background: Globally, hypertension and diabetes mellitus are major contributors to cardiovascular morbidity, disability and premature mortality, with particularly substantial burdens across the Caribbean and Latin America. Although Jamaican studies have examined these conditions separately and within multimorbidity frameworks, limited contemporary evidence integrates hypertension-diabetes coexistence with socioeconomic characteristics, functional health and additional chronic diseases. This study addresses that gap using the 2023 Jamaica Survey of Living Conditions (JSLC).

Methods: A cross-sectional secondary analysis was conducted using JSLC 2023 data archived through the SALISES Documentation and Data Centre, The University of the West Indies, Mona Campus, Jamaica. The JSLC is a national cross-sectional probability survey of 4,442 Jamaicans across the 14 parishes. For this study, the analytical dataset comprised 858 cases selected using a hypertension-diabetes filter. Data were analysed using descriptive statistics, cross-tabulations, and Pearson's chi-square tests.

Results: Women constituted 65.0% of participants, while 62.5% were aged 60 years or older. Hypertension was reported by 88.9% and diabetes by 37.5% of the analytical population, while 26.5% were classified with combined hypertension and diabetes. Functional impairment was substantial, with 46.3% reporting some degree of difficulty and 25.7% reporting severe difficulty or complete inability. Arthritis, heart disease, asthma, kidney disease and other chronic conditions further indicated considerable multimorbidity. Combined hypertension and diabetes did not differ significantly by sex ($P=0.174$), although sex was significantly associated with age and socioeconomic group.

Conclusion: The Jamaican hypertension-diabetes nexus is an ageing, socially differentiated, functionally consequential and multimorbid phenomenon. The findings extend Caribbean and international literature by demonstrating that cardiometabolic disease management should integrate socioeconomic vulnerability, functional health and multimorbidity within person-centred NCD care.

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Introduction

Non-communicable diseases have transformed the epidemiological landscape of contemporary societies and are responsible for a substantial proportion of premature mortality, disability, health expenditure and reduced quality of life. Hypertension and diabetes mellitus occupy particularly important positions within this transition because both conditions contribute to cardiovascular disease, cerebrovascular disease, chronic kidney disease and premature mortality, while their coexistence can intensify clinical complexity [1-5]. Hypertension is frequently asymptomatic and may remain undetected until complications occur, whereas diabetes can progressively damage the cardiovascular, renal, neurological and visual systems. The coexistence of these diseases consequently creates a clinical and public-health problem greater than consideration of either disease in isolation. International

observational evidence has consistently indicated that hypertension is extremely common among people with type 2 diabetes, with many studies reporting prevalence exceeding 50% and some exceeding 75% [5].

The burden is especially pertinent to Latin America and the Caribbean (LAC), where demographic ageing, urbanisation, dietary transitions, physical inactivity, obesity and social inequality have combined to produce a substantial NCD burden [1-4,6]. A systematic review and Meta-analysis of multimorbidity in LAC estimated a pooled prevalence of 43%, while nationally representative studies produced a pooled estimate of 37% [6]. Importantly, hypertension and diabetes were the only two conditions included in every multimorbidity definition considered in that review [6]. This consistency illustrates their centrality to the regional multimorbidity problem. The considerable heterogeneity between countries nevertheless indicates that the burden cannot be understood solely through regional averages.

The Caribbean represents an especially important epidemiological setting. Hypertension rates in the English-speaking Caribbean have been reported among the highest in the Americas, and PAHO has estimated that approximately one-quarter of adults in this subregion experience hypertension [1]. Earlier comparative evidence from low- and middle-income countries similarly identified Latin America and the Caribbean as having among the highest regional hypertension prevalence estimates [7]. In Barbados, for example, a nationally representative cross-sectional investigation reported hypertension prevalence of 40.6% and diabetes prevalence of 18.7% among adults aged 25 years and older [8]. Longitudinal research in Trinidad has also documented the development of hypertension and non-insulin-dependent diabetes within a rapidly changing Caribbean society [9]. The Caribbean burden must therefore be understood within the broader epidemiological transition occurring throughout small island developing states.

Jamaica represents an important case within this regional context of NCDs. PAHO data indicate a substantial national burden of both hypertension and diabetes, accompanied by high levels of overweight and obesity and insufficient physical activity [2–4]. Previous Jamaican research has shown that hypertension, obesity, hypercholesterolaemia and diabetes are important components of national multimorbidity patterns [10,11]. Using Jamaica Health and Lifestyle Survey data, researchers estimated that 24.1% of participants had at least two NCDs, with multimorbidity substantially higher among women than men [10]. The metabolic disease cluster was particularly important and incorporated hypertension and diabetes alongside obesity and hypercholesterolaemia [10]. These findings established that Jamaican NCDs frequently occur as interconnected conditions rather than isolated diseases.

Earlier research among older Jamaicans similarly indicated the importance of hypertension-diabetes coexistence. Almost half of older persons in one Jamaican study experienced more than one NCD (47.5%), and 21.9% reported both hypertension and diabetes [11]. The combined burden differed substantially by sex, with coexistence reported by 28.2% of women compared with 15.1% of men [11]. A study by Bourne et al examined chronic non-communicable diseases among 619 Jamaicans with diagnosed chronic conditions, highlighting important demographic, socioeconomic, and health-care differences in the distribution of diabetes, hypertension, arthritis, and other NCDs [12]. Women accounted for 74.8% of persons with diabetes and 71.8% of those with hypertension, demonstrating a substantial sex disparity in the cardiometabolic disease burden. At least half of respondents within each major disease category lived in rural areas, including 52.0% of those with diabetes, 57.3% with hypertension, 53.6% with arthritis, and 55.6% with other chronic conditions. The study also revealed considerable disease coexistence, with 71.0% of persons with diabetes having hypertension, while 90.2% of those reporting hypertension also had diabetes; additionally, 87.1% of persons with arthritis had hypertension and 68.2% of those with other NCDs had hypertension. Health insurance coverage was comparatively limited, with 56.1% of persons with diabetes, 71.8% with hypertension, 74.5% with arthritis, and 81.2% with other chronic conditions lacking health insurance. Collectively, these findings demonstrate that chronic disease in Jamaica was characterised not simply by individual diagnoses but by substantial multimorbidity, sex differences, rural concentration, and gaps in financial protection, providing an important empirical foundation for examining the continuing burden of NCDs among contemporary Jamaicans.

Another study by Bourne examined the prevalence and determinants of hypertension, diabetes, and obesity among 1,185 rural Jamaican adults aged 15 years and older, using secondary data from the Jamaica Health and Lifestyle Survey III (2016–2017) [13]. Hypertension affected 34.5% of the sample, while 12.8% had diabetes and 28.9% were obese, demonstrating a substantial cardiometabolic disease burden within rural Jamaica. Age emerged as an important determinant, as adults aged 60 years and older had 4.8 times greater odds of hypertension (OR, 4.8; 95% CI, 3.7–6.2) and 3.5 times greater odds of diabetes (OR, 3.5; 95% CI, 2.5–4.9). Obesity and physical inactivity were also independently associated with increased disease risk, whereas secondary or higher education was protective against diabetes. An earlier study by Wilks et al, using data from the Jamaica Health and Lifestyle Survey 2007–2008 (JHLS II), provided nationally representative evidence of the substantial burden of chronic non-communicable diseases and their associated risk factors among Jamaicans aged 15 to 74 years [14]. The survey included approximately 2,848 participants and reported an overall hypertension prevalence of approximately 25%, with the burden increasing markedly with age and demonstrating important sex and sociodemographic differences. Diabetes affected approximately 8% of the population, further illustrating the importance of cardiometabolic disease within Jamaica's changing epidemiological profile. Importantly, the study examined not only disease prevalence but also levels of awareness, treatment, and control, thereby demonstrating that the public-health challenge extended beyond the presence of hypertension and diabetes to their effective detection and management. Lifestyle-related risk factors, including obesity, inadequate physical activity, dietary practices, and other behavioural characteristics, were also examined as contributors to the country's growing NCD burden. Collectively, Wilks et al established an important national benchmark for understanding hypertension and diabetes in Jamaica and provided a valuable historical comparator for assessing whether the prevalence and social patterning of these conditions have changed in more recent Jamaican datasets such as the 2023 Jamaica Survey of Living Conditions. Such findings suggested that cardiometabolic multimorbidity in Jamaica may be strongly associated with demographic characteristics, particularly sex and ageing. However, the age structure of that investigation means that its findings cannot automatically be generalised to all contemporary Jamaican adults.

Research Gap

Despite the established literature, an important empirical gap remains. Jamaican research has documented individual NCD prevalence, multimorbidity and hypertension-diabetes coexistence, but there is comparatively little contemporary evidence using the 2023 JSLC to locate hypertension-diabetes coexistence simultaneously within socioeconomic position, educational attainment, age, sex, household characteristics, geography, functional health and additional chronic morbidity. Much of the international literature focuses on clinical populations, disease prevalence or biomedical risk factors, while comparatively less attention is given to how the hypertension-diabetes nexus is embedded within living conditions and functional capability. This distinction is important because the consequences of cardiometabolic disease extend beyond diagnosis to disability, social participation, household dependency and health-care requirements.

A second gap concerns temporal relevance. Jamaica is experiencing continuing population ageing and epidemiological change, meaning evidence from surveys conducted more than a decade ago cannot fully describe the contemporary distribution

of chronic disease. The JSLC 2023 provides an opportunity to revisit the problem using recent nationally collected household data. It additionally allows disease indicators to be interpreted alongside variables traditionally associated with social policy rather than solely clinical medicine. The present study therefore moves beyond asking how common hypertension or diabetes is and examines the characteristics of persons located within the hypertension-diabetes analytical population.

Aim of the Study

The study aimed to examine the demographic, socioeconomic, morbidity and functional-health characteristics of Jamaicans in a hypertension-diabetes analytical population using data from the 2023 Jamaica Survey of Living Conditions.

Specifically, the study sought to:

- Describe the sex, age, socioeconomic, educational, household, union-status and geographical characteristics of the analytical population
- Determine the proportion identified with combined hypertension and diabetes within the selected analytical population
- Examine the burden of additional chronic conditions
- Assess functional-health limitations
- Determine whether selected demographic, socioeconomic and health characteristics differ significantly by sex; and compare the Jamaican findings with research from the Caribbean, Latin America and the wider international literature.

Materials and Methods

Study Design

This study employed a quantitative, cross-sectional secondary-data research design using data from the 2023 Jamaica Survey of Living Conditions (JSLC) [15]. The design was appropriate because the investigation focused on describing the characteristics of a defined hypertension-diabetes analytical population and examining statistical relationships among established demographic, socioeconomic and health variables. A cross-sectional approach permits the examination of health conditions and associated characteristics at a particular period without requiring prospective follow-up of participants. Secondary analysis was selected because the variables required to address the research objectives had already been collected as part of the nationally administered JSLC 2023. Consequently, no new clinical measurements, laboratory investigations, interviews or physical examinations were undertaken specifically for the present study. The design therefore facilitated the systematic examination of contemporary Jamaican health and social data while making efficient use of an established national dataset.

The quantitative approach was particularly suitable because the study sought to measure distributions, frequencies, percentages and statistical associations among categorical variables. Numerical information from the JSLC 2023 allowed the demographic and socioeconomic characteristics of the analytical population to be examined alongside chronic diseases and functional-health indicators. The study was descriptive in determining the composition and morbidity profile of the selected population and analytical in testing whether selected characteristics differed significantly by sex. No attempt was made to manipulate exposures, assign participants to treatment groups or introduce an intervention, thereby maintaining the observational nature of the investigation. Because the data represent observations collected during a defined survey period, the findings describe associations rather than temporal or

causal relationships. Accordingly, interpretations throughout the study distinguish statistical association from causation and avoid attributing observed differences to mechanisms that cannot be established from cross-sectional data.

Data Source

The data analysed in this study were obtained from the 2023 Jamaica Survey of Living Conditions, a long-established national household survey conducted in Jamaica. The JSLC was developed to provide systematic empirical information on the social, economic and living conditions of the Jamaican population for research, planning and public-policy purposes. Its scope extends across major dimensions of welfare, including health, education, household consumption, housing, demographic characteristics and other indicators of social conditions. The survey therefore provides an important framework for examining relationships between health status and the wider socioeconomic circumstances in which individuals and households are situated. Information is collected at both the individual and household levels, permitting researchers to examine population characteristics from complementary social and health perspectives. This broad coverage makes the JSLC particularly useful for investigating non-communicable diseases within their demographic and socioeconomic contexts rather than treating disease as an exclusively biomedical phenomenon.

The JSLC employs a structured national household-survey methodology designed to generate information from persons residing within sampled Jamaican households. A stratified sampling framework is used to improve representation across relevant population and geographical groupings within Jamaica. Standardised survey instruments are administered to collect comparable information on individuals, households and their living circumstances. The survey therefore provides variables that can be systematically coded, categorised and subjected to descriptive and inferential statistical analysis. Within the health component, information is available on reported illnesses, chronic conditions, injuries and aspects of functional health, while demographic and socioeconomic sections provide variables necessary for examining social patterning. These features made the JSLC 2023 particularly appropriate for assessing hypertension-diabetes-related morbidity alongside age, sex, socioeconomic status, education, household characteristics and geographical location.

The dataset used for the present study was made available through the SALISES Documentation and Data Centre, The University of the West Indies, Mona Campus, Kingston, Jamaica [16]. The Documentation and Data Centre provides access to datasets and supporting documentation for academic research, teaching, secondary analysis and evidence-informed policy development. The 2023 JSLC forms part of the broader collection of Jamaican social and economic datasets accessible through this institutional data infrastructure. The national JSLC series involves institutional contributions from the Planning Institute of Jamaica and the Statistical Institute of Jamaica in the production and collection of nationally relevant living-conditions information. SALISES, through its documentation and data-management functions at The University of the West Indies, facilitates the preservation and scholarly utilisation of these datasets. The present research therefore constitutes a secondary analysis of an established national dataset rather than an independently administered primary survey.

The use of data obtained through SALISES was important to the methodological integrity and reproducibility of the investigation. Access to documented survey data permits variables to be

interpreted within the context in which they were originally collected and coded. The researcher relied on the available JSLC 2023 dataset and its established variable structure rather than constructing retrospective responses or deriving information from undocumented sources. The statistical analyses consequently reflect the observations contained within the dataset made available for secondary research purposes. Appropriate acknowledgement of SALISES Documentation and Data Centre, The University of the West Indies, Mona Campus, Kingston, Jamaica, is therefore necessary in reporting the provenance of the data. Recognition of the data source also differentiates the responsibilities of the original data-producing institutions from the secondary analyses, interpretations and conclusions presented in this study.

Study Population and Analytical Sample

The analytical population for this study was derived from the JSLC 2023 dataset after application of the specified Hypertension Diabetes=1 filter. Application of this filter produced a working analytical file containing 858 cases, which formed the basis of the statistical analyses reported in the study. The selected cases represented individuals meeting the operational criterion embedded in the hypertension-diabetes filter used in the supplied statistical analysis. No additional participants were recruited, contacted or assessed by the researcher because all observations originated from the existing JSLC 2023 dataset. The analytical sample should therefore be understood as a defined secondary-data population extracted according to the specified variable criterion rather than as a newly sampled population. This distinction is essential for interpreting the findings and determining the limits within which generalisations may reasonably be made.

No statistical weighting was applied to the supplied analyses used in the present study. Consequently, reported frequencies and percentages represent the observed distribution within the filtered analytical file rather than survey-weighted population estimates for Jamaica. User-defined missing values were treated as missing in accordance with the statistical procedures applied to the dataset. Analyses for individual variables were based on cases with valid observations, meaning that the denominator could vary slightly where information was unavailable. This approach explains why some analyses contained fewer than the full 858 cases despite the working analytical file containing 858 observations. Valid percentages were therefore used where necessary to prevent missing observations from distorting the interpretation of categorical distributions.

An important methodological qualification concerns the interpretation of the 858 cases and the percentages generated from this selected population. The observations should not automatically be regarded as an unrestricted random subsample of the entire Jamaican population because they were obtained after application of a specific hypertension-diabetes analytical filter. Similarly, percentages calculated after filtering should not automatically be interpreted as national prevalence estimates of hypertension, diabetes or hypertension-diabetes coexistence in Jamaica. Instead, they describe the distribution of demographic, socioeconomic, functional and morbidity characteristics among persons contained within the defined analytical population. This distinction is particularly important when interpreting the combined hypertension-and-diabetes variable because its percentage reflects its occurrence within the selected sample rather than its prevalence among all Jamaicans. Accordingly, the study consistently uses terms such as analytical population, selected population and within-sample proportion where necessary to

avoid overstating population-level inference.

Variables

The demographic variables examined in the study included sex and age cohort, both of which were treated as categorical variables. Sex was classified according to the categories recorded in the JSLC 2023 dataset and was used as a principal grouping variable for the bivariate analyses. Age was organised into six cohorts to capture different stages of the life course and facilitate comparison of disease-related patterns across age categories. These categories comprised children aged 0-14 years, youth aged 15-24 years, young adults aged 25-44 years, middle-aged adults aged 45-59 years, elderly adults aged 60-74 years and seniors aged 75 years and older. Categorising age in this manner permitted the analysis to identify the extent to which the hypertension-diabetes analytical population was concentrated in later adulthood and older age. The age-cohort variable also enabled formal statistical testing of whether the age distribution differed between males and females within the analytical population.

Socioeconomic status was operationalised using three categories derived from the population quintile structure available in the dataset. Participants in quintiles 1 and 2 were classified as poor, those in quintile 3 were classified as middle socioeconomic status, and those in quintiles 4 and 5 were classified as wealthy. This categorisation was intended to provide a parsimonious measure of socioeconomic stratification while preserving meaningful distinctions between lower, middle and higher economic positions. Educational attainment was separately classified as primary education and below, secondary education and post-secondary education. Additional social variables included household headship, union status and parish of residence, thereby permitting assessment of household, relational and geographical characteristics. Together, these variables provided a social framework through which hypertension-diabetes-related health patterns could be interpreted beyond the conventional biomedical focus on disease diagnosis alone.

The health variables included a range of self-reported chronic illnesses contained within the JSLC 2023 dataset. These conditions included hypertension, diabetes mellitus, asthma, arthritis, chronic obstructive pulmonary disease, heart disease, sickle-cell disease, depression, dementia, other mental disorders, cancer, epilepsy and kidney disease. Where the dataset distinguished between illness reported within the preceding 12 months and illness extending beyond the preceding 12 months, these categories were retained in the descriptive analysis. Information on injury incidents requiring medical attention was also examined to provide additional insight into the broader health experience of the analytical population. Reported illness other than that resulting from injury was included to distinguish chronic illness, other illness, combinations of illness and the absence of reported illness. Collectively, these health indicators enabled the study to situate hypertension and diabetes within a wider multimorbidity environment rather than analysing the two cardiometabolic conditions in isolation.

A derived indicator representing combined hypertension and diabetes was also examined as part of the health analysis. This variable was used to identify the proportion of the filtered analytical population classified as experiencing the combined condition according to its coding within the supplied dataset. Its interpretation was kept separate from the original filter used to define the analytical population because the two variables served different statistical functions in the supplied analysis. The

combined-condition measure was subsequently cross-tabulated by sex to determine whether its distribution differed significantly between males and females. Because the analysis was based on the filtered file, the resulting percentage was interpreted as a within-sample proportion rather than a population prevalence estimate. This operational distinction was maintained throughout the results and discussion to preserve methodological accuracy and prevent overgeneralisation.

Functional health was examined as an additional indicator of the lived burden associated with chronic disease and multimorbidity. The variable was classified into four ordered categories comprising no difficulty, some difficulty, a lot of difficulty and inability to perform the specified activity at all. This measure allowed the investigation to move beyond the simple presence or absence of diagnosed or reported conditions and examine the degree to which participants experienced limitations in everyday functioning. Functional health is particularly relevant to hypertension-diabetes research because chronic cardiometabolic disease frequently coexists with ageing, arthritis, cardiovascular complications and other conditions capable of reducing physical independence. The variable was examined descriptively for the entire analytical population and comparatively by sex using cross-tabulation and inferential statistics. Its inclusion therefore strengthened the study by incorporating a dimension of health burden that may not be adequately represented by disease counts alone.

Statistical Analysis

Statistical analysis initially involved the generation of descriptive statistics to summarise the principal characteristics of the analytical population. Frequencies and percentages were calculated for categorical demographic, socioeconomic, geographical, morbidity and functional-health variables. Valid percentages were reported where missing observations occurred so that distributions reflected only cases containing analysable information for the relevant variable. Descriptive analysis was used to identify dominant population characteristics, including sex composition, age structure, socioeconomic distribution, educational attainment and patterns of chronic disease. These statistics also provided the basis for constructing summary tables and comparing the magnitude of different morbidity and functional-health categories. The descriptive phase therefore established the empirical profile required before inferential relationships between selected variables were examined.

Cross-tabulation procedures were subsequently used to examine selected variables according to sex. Variables examined in these comparisons included age cohort, educational level, socioeconomic group, functional health, injury requiring medical attention, reported illness and the combined hypertension-and-diabetes indicator. Both cell counts and column percentages were considered so that absolute distributions could be interpreted alongside proportional differences between males and females. Cross-tabulations were particularly useful because the variables under investigation were predominantly categorical rather than continuous. The procedure facilitated direct comparison of male and female distributions within each substantive category while preserving the original structure of the variables. These tables also provided the observed frequencies used in the subsequent chi-square analyses.

Pearson's chi-square test of independence was used to determine whether statistically significant associations existed between sex and the selected categorical variables. The null hypothesis

for each test assumed that the two variables being examined were statistically independent within the analytical population. Statistical significance was evaluated at the conventional alpha level of $P < .05$, with values below this threshold interpreted as evidence against the null hypothesis. Where assumptions relating to small expected cell frequencies were relevant, the expected-count information accompanying the chi-square output was considered in interpreting the findings. Fisher's exact test was available within relevant two-by-two analyses where sparse expected frequencies could affect the reliability of the asymptotic chi-square approximation. Inferential conclusions were therefore based not simply on the calculated chi-square statistic but also on the structure and adequacy of the contingency tables from which it was derived.

Measures of association were examined alongside significance tests to assess the magnitude of relationships between categorical variables. Phi was considered for appropriate contingency tables, while Cramer's V provided an effect-size measure suitable for tables involving more than two categories. The contingency coefficient was also generated as an additional measure of the strength of nominal association in the statistical output. These measures were important because statistical significance alone does not indicate whether an observed relationship is weak, moderate or substantively important. A small P value can arise even when the underlying association is limited, particularly when sample size is sufficient to detect comparatively small departures from independence. Accordingly, effect-size measures were used to complement probability values and produce a more balanced interpretation of statistically significant findings.

Interpretation of the statistical results deliberately distinguished statistical significance from epidemiological, clinical and social importance. A statistically significant relationship was understood to indicate evidence that the observed variables were not independent within the analysed data, but it was not automatically interpreted as a large or practically important association. Conversely, a non-significant finding was not treated as proof that no meaningful difference could exist, particularly where proportional differences might warrant further investigation in larger or differently specified analyses. Cramer's V and related measures were therefore considered when evaluating the substantive strength of associations identified by Pearson's chi-square test. The cross-sectional nature of the data further meant that statistically significant associations could not establish causal direction, temporal ordering or underlying biological mechanisms. This interpretive framework ensured that conclusions remained consistent with the strengths and limitations of the JSLC 2023 secondary-data design.

Results

Sociodemographic Characteristics

Table 1 indicates that the analytical sample was predominantly female, with women accounting for 65.0% of participants compared with 35.0% for men. The age distribution was strongly concentrated in the older age groups, as 40.2% of participants were aged 60–74 years and a further 22.3% were aged 75 years or older. Taken together, 62.5% of the sample was aged 60 years or older, demonstrating that the hypertension-diabetes analytical population was primarily composed of older adults. Socioeconomically, the largest proportion of participants belonged to the wealthiest two quintiles, representing 46.4% of the sample, while 32.5% were classified as poor and 21.1% as middle socioeconomic status. Educational attainment was relatively high among participants with valid data, with 56.9% having post-secondary education,

compared with 34.4% having secondary education and 8.7% having primary education or below. These findings suggest that the analytical population was characterised by advanced age, female predominance and considerable socioeconomic and educational diversity.

The social and geographical characteristics further demonstrate that the analytical population was heterogeneous rather than concentrated within a single social grouping. Among participants with valid union-status information, 51.9% were single, while 30.2% were married, 9.1% were in visiting relationships and 8.8% were in common-law unions. Geographically, the largest proportions of participants resided in St Catherine (18.1%) and St Andrew (17.6%), followed by Clarendon (9.6%) and Manchester (8.3%). Smaller proportions were observed in parishes such as St Thomas, Kingston and Trelawny, although all parishes were represented in the analytical sample. The distribution across socioeconomic groups, educational levels, union statuses and parishes indicates that hypertension-diabetes-related morbidity was represented across a broad cross-section of the selected population rather than being restricted to one demographic or social category. These percentages should, however, be interpreted as characteristics of the filtered 858-case analytical sample and not as weighted national prevalence estimates for Jamaica.

Table 1: Demographic and Socioeconomic Characteristics of the Analytical Sample, JSLC 2023 (N = 858)

Sex	n	%
Male	300	35.0
Female	558	65.0
Age cohort, years		
0-14	4	0.5
15-24	4	0.5
25-44	75	8.7
45-59	239	27.9
60-74	345	40.2
75 and older	191	22.3
Socioeconomic group		
Poor: quintiles 1 and 2	279	32.5
Middle: quintile 3	181	21.1
Wealthy: quintiles 4 and 5	398	46.4
Educational attainment*		
Primary education and below	74	8.7
Secondary education	293	34.4
Post-secondary education	484	56.9
Union status†		
Married	258	30.2
Common-law union	75	8.8
Visiting relationship	78	9.1
Single	443	51.9
Parish of residence		
Kingston	31	3.6
St Andrew	151	17.6
St Thomas	19	2.2
Portland	42	4.9
St Mary	49	5.7
St Ann	38	4.4

Trelawny	31	3.6
St James	43	5.0
Hanover	53	6.2
Westmoreland	34	4.0
St Elizabeth	59	6.9
Manchester	71	8.3
Clarendon	82	9.6
St Catherine	155	18.1

Hypertension and Diabetes

Table 2 indicates that hypertension was overwhelmingly the most frequently reported chronic condition within the analytical population, with a combined reported history of 88.9%, comprising 14.7% reported within the preceding 12 months and 74.2% extending beyond 12 months. Diabetes was the second most prominent cardiometabolic condition, with a combined reported history of 37.5%, including 6.5% within the preceding 12 months and 31.0% extending beyond 12 months. Arthritis was also substantial, affecting 21.0% of the analytical population, thereby indicating that musculoskeletal morbidity constituted an important component of the wider chronic-disease profile. Asthma and heart disease recorded combined histories of 6.3% and 5.9%, respectively, while all remaining conditions occurred in fewer than 3% of participants. Cancer was reported by 2.1%, while kidney disease and depression each accounted for 1.9%, and sickle-cell disease was reported by 1.6% of the analytical population. Collectively, Table 2 reveals a disease profile dominated by hypertension and diabetes but accompanied by several additional chronic conditions, supporting the interpretation that the health burden within this population extends beyond a two-disease cardiometabolic framework.

A particularly important pattern in Table 2 is that, for almost every chronic condition, the proportion reported for more than 12 months exceeded that reported within the preceding 12 months, indicating the predominantly long-term nature of morbidity within the analytical population. This pattern was especially pronounced for hypertension, for which 74.2% reported a history extending beyond 12 months compared with 14.7% within the preceding year, and diabetes, for which the corresponding proportions were 31.0% and 6.5%. The persistence of arthritis, asthma and heart disease further suggests that many participants may be managing cardiometabolic conditions alongside longstanding musculoskeletal, respiratory or cardiovascular morbidity. Although COPD, dementia, epilepsy and other mental disorders were comparatively uncommon, their coexistence with hypertension or diabetes may nevertheless increase clinical complexity, medication burden and demands for continuing care. The distribution therefore provides evidence of a broader multimorbidity environment, in which hypertension and diabetes are situated alongside chronic conditions capable of affecting functional capacity, quality of life and disease self-management. Consequently, Table 2 strengthens the study's central argument that the hypertension-diabetes nexus in Jamaica should be approached through integrated, person-centred and multimorbidity-oriented care rather than through separate disease-specific interventions.

Table 2: Major Chronic Conditions in the Analytical Population

Condition	Within preceding 12 months, %	>12 months, %	Combined reported history, %
Hypertension	14.7	74.2	88.9
Diabetes	6.5	31.0	37.5
Arthritis	4.5	16.4	21.0
Asthma	0.7	5.6	6.3
Heart disease	1.2	4.8	5.9
Kidney disease	0.5	1.4	1.9
Depression	0.6	1.3	1.9
Cancer	0.2	1.9	2.1
Sickle-cell disease	0.1	1.5	1.6
Other mental disorder	0.3	0.8	1.2
Dementia	0.1	0.7	0.8
COPD	0.1	0.6	0.7
Epilepsy	0.2	0.3	0.6

Functional Health

Table 3 presents the functional health status of 857 participants with valid responses and indicates that slightly more than one-half (53.7%; n=460) reported experiencing no functional difficulty. Conversely, 20.7% (n=177) reported some difficulty, indicating that approximately one in five participants experienced a mild or moderate degree of functional limitation. A further 11.9% (n=102) reported a lot of difficulty, while 13.8% (n=118) indicated that they could not perform the relevant function at all. When the three categories representing any level of difficulty are combined, 46.3% of the analytical population experienced some degree of functional limitation. More importantly, 25.7% reported either a lot of difficulty or complete inability, demonstrating that approximately one-quarter of participants experienced substantial functional impairment. Thus, Table 3 reveals a considerable functional-health burden within the hypertension-diabetes analytical population despite 53.7% reporting no difficulty.

The functional-health findings are particularly important when interpreted alongside the chronic-disease profile presented in Table 2, because hypertension, diabetes, arthritis, heart disease and other conditions may coexist with limitations in everyday functioning. The high proportion reporting functional difficulty suggests that assessing the burden of chronic disease exclusively through diagnostic status may understate its broader consequences for independence, mobility, self-care and quality of life. This issue is especially relevant given the older age structure identified in Table 1, where 62.5% of the analytical population was aged 60 years or older, an age group in which multimorbidity and functional decline may become increasingly important. Nevertheless, the cross-sectional data do not establish that hypertension, diabetes or any particular chronic condition caused the functional limitations observed, and such causal attribution should therefore be avoided. From a health-policy perspective, the findings support incorporating functional-health assessment alongside conventional cardiometabolic screening and disease management, particularly for individuals living with multiple chronic conditions. Consequently, Table 3 reinforces the study's central argument that the Jamaican hypertension-diabetes nexus should be understood not merely in terms of disease coexistence but as a broader cardiometabolic, multimorbidity and functional-health phenomenon.

Table 3: Functional Health Status

Condition	Within preceding 12 months, %	>12 months, %
Functional health status	n	Valid %
No difficulty	460	53.7
Some difficulty	177	20.7
A lot of difficulty	102	11.9
Cannot do at all	118	13.8
Total	857	100.0
Depression	0.6	1.3
Cancer	0.2	1.9

Sex Differences

Table 4 indicates several sex differences in the demographic, socioeconomic and health characteristics of the analytical population, although most of the observed differences were not statistically significant. Post-secondary education was more common among women than men, at 59.4% compared with 52.2%, but the overall association between sex and educational attainment was not statistically significant ($\chi^2=4.094$, $P=.129$). The most pronounced sex difference occurred in socioeconomic position, with 36.2% of women classified in the poor socioeconomic group compared with 25.7% of men, whereas 57.3% of men were classified as wealthy compared with 40.5% of women. The overall association between sex and socioeconomic group was statistically significant ($\chi^2=22.242$, $P<.001$), indicating meaningful socioeconomic differentiation between males and females within the analytical population. Functional health showed comparatively smaller sex differences, as 56.9% of men and 52.0% of women reported no functional difficulty, while 11.4% of men and 15.1% of women reported being unable to perform the relevant function at all. However, the overall relationship between sex and functional-health status was not statistically significant ($\chi^2=2.906$, $P=.406$), suggesting that the observed proportional differences could not be distinguished from sampling variation within this analytical population.

The health-related indicators in Table 4 similarly reveal modest female excesses that did not attain statistical significance. Injury requiring medical attention was reported by 1.8% of women compared with 1.0% of men, but the association between sex and injury was not statistically significant ($\chi^2=0.820$, $P=.365$). Combined hypertension and diabetes were identified among 28.0% of women compared with 23.7% of men, representing a 4.3-percentage-point female excess within the selected analytical population. Nevertheless, this difference was also statistically non-significant ($\chi^2=1.846$, $P=.174$), indicating insufficient evidence that combined hypertension-diabetes status differed systematically by sex in these data. Taken together, the findings suggest that socioeconomic position, rather than education, functional health, injury or combined hypertension-diabetes status, represented the clearest dimension of sex differentiation among the characteristics reported in Table 4. Consequently, the results support a nuanced interpretation of sex and cardiometabolic morbidity in which women and men may experience different socioeconomic circumstances even though their functional-health and combined hypertension-diabetes distributions were not statistically distinguishable.

Table 4: Selected Characteristics by Sex

Characteristic	Male %	Female %	χ^2	P value
Post-secondary education	52.2	59.4	4.094	0.129
Poor socioeconomic group	25.7	36.2	22.242	<0.001
Wealthy socioeconomic group	57.3	40.5	22.242	<0.001
No functional difficulty	56.9	52.0	2.906	0.406
Cannot do at all	11.4	15.1	2.906	0.406
Injury requiring medical attention	1.0	1.8	0.820	0.365
Combined hypertension and diabetes	23.7	28.0	1.846	0.174

Combined Hypertension and Diabetes by Union Status and Sex
Table 5 indicates that combined hypertension and diabetes varied significantly across union-status categories in the overall analytical population ($\chi^2=12.292$, $df=3$, $P=.006$), although the magnitude of association was relatively weak (Cramer's $V=.120$). The highest proportion was observed among single participants at 30.2%, followed by married participants at 26.4%, those in common-law unions at 20.0%, and those in visiting relationships at 12.8%. Sex-stratified analysis revealed an important difference, as union status was significantly associated with combined hypertension and diabetes among women ($\chi^2=12.808$, $P=.005$; Cramer's $V=.152$) but not among men ($\chi^2=1.817$, $P=.611$; Cramer's $V=.078$). Among women, the combined condition was most frequently observed among those who were single (32.0%) and married (29.2%), compared with 16.0% among those in common-law unions and 10.9% among those in visiting relationships. Among men, common-law participants recorded the highest proportion at 28.0%, although differences across union-status categories were comparatively small and statistically non-significant. These findings suggest that union status may have greater relevance to the distribution of hypertension-diabetes coexistence among women than men, although the cross-sectional design does not establish whether relationship status itself contributes to cardiometabolic morbidity.

The pattern among women warrants particular attention because union status may represent more than marital or relationship circumstances and may intersect with age, household composition, socioeconomic position and social support. The relatively high proportion of combined hypertension and diabetes among single women could partly reflect the older age composition of the analytical population, including widowed, separated or previously partnered individuals who may be coded within the available single category. Conversely, partnership may influence health through financial resources, dietary practices, caregiving, treatment adherence and support for accessing health services. However, these mechanisms were not tested in the present crosstabulation and should therefore be regarded as possible explanations rather than indicated causal pathways. The weak Cramer's V values also indicate that union status alone accounts for only limited variation in the combined condition despite the statistically significant overall and female-specific relationships. Multivariable analysis controlling for age, socioeconomic status, education and other relevant characteristics would therefore be necessary to determine

whether union status independently predicts hypertension-diabetes coexistence.

Table 5: Combined Hypertension and Diabetes by Union Status and Sex, JSLC 2023

Union status	Male, n/N (%)	Female, n/N (%)	Total, n/N (%)
Married	26/114 (22.8)	42/144 (29.2)	68/258 (26.4)
Common-law	7/25 (28.0)	8/50 (16.0)	15/75 (20.0)
Visiting	5/32 (15.6)	5/46 (10.9)	10/78 (12.8)
Single	33/127 (26.0)	101/316 (32.0)	134/443 (30.2)
Total	71/298 (23.8)	156/556 (28.1)	227/854 (26.6)
Pearson χ^2 (df)	1.817 (3)	12.808 (3)	12.292 (3)
P value	0.611	0.005	0.006
Cramer's V	0.078	0.152	0.120

Note: Percentages are calculated within each sex and union-status category. Four observations had missing union-status information. The overall chi-square assumptions were satisfied, with no expected cell count below 5.

Arthritis by Union Status and Sex

Table 6 indicates substantial variation in reported arthritis history across union-status groups, with the highest overall proportion occurring among single participants at 26.8%. Married participants recorded the second-highest proportion at 19.4%, whereas substantially lower proportions were observed among those in visiting relationships (7.7%) and common-law unions (5.4%). The sex-specific pattern was especially pronounced among women, among whom arthritis history ranged from 6.0% for common-law participants to 31.6% among single women. The association between arthritis status and union status was statistically significant among women ($\chi^2=23.439$, $P=.005$) but not among men ($\chi^2=5.476$, $P=.484$), although the corresponding Cramer's V values indicated relatively weak associations. For the total analytical population, the association was statistically significant ($\chi^2=30.700$, $P<.001$; Cramer's $V=.109$), indicating that the distribution of arthritis differed across union-status categories. Nevertheless, the presence of several small expected frequencies means that the inferential result should be interpreted cautiously and the descriptive pattern should receive considerable emphasis.

The higher burden of arthritis among women is particularly relevant to the wider hypertension-diabetes study because musculoskeletal morbidity may compound the functional consequences of cardiometabolic disease. Overall, approximately 25.7% of women reported an arthritis history compared with 12.1% of men, indicating a substantial sex difference within this analytical population. Arthritis may limit mobility and physical activity; thereby potentially complicating lifestyle recommendations commonly used in hypertension and diabetes management. The particularly high proportion among single women may also indicate a subgroup potentially experiencing simultaneous cardiometabolic, musculoskeletal and social-support challenges, although this possibility requires direct multivariable investigation. These findings strengthen the argument that hypertension-diabetes management should not be organised exclusively around blood

pressure and glycaemic control when substantial coexisting morbidity may affect patients' ability to implement recommended behaviours. Table 6 therefore provides further evidence supporting the study's multimorbidity and functional-health framework.

Table 6: Reported Arthritis History by Union Status and Sex, JSLC 2023

Union status	Male, %	Female, %	Total, %
Married	13.1	24.3	19.4
Common-law	4.0	6.0	5.4
Visiting	3.1	10.9	7.7
Single	14.9	31.6	26.8
Overall reported history	12.1	25.7	21.0
Pearson χ^2 (df)	5.476 (6)	23.439 (9)	30.700 (9)
P value	0.484	0.005	<0.001
Cramer's V	0.096	0.119	0.109

Note: Reported arthritis history combines reports within the preceding 12 months and more than 12 months previously. The Pearson chi-square results should be interpreted cautiously because 37.5% of cells in the overall table had expected frequencies below 5.

Union Status and Other Chronic Conditions

Table 7 provides a consolidated assessment of whether union status was associated with the selected chronic conditions within the hypertension-diabetes analytical population. Of the conditions examined, the clearest statistically significant relationships were observed for combined hypertension and diabetes and arthritis, and both associations were evident in the overall population and specifically among women. Combined hypertension and diabetes

were associated with union status overall ($P=.006$) and among women ($P=.005$), whereas no corresponding relationship was detected among men ($P=.611$). Arthritis displayed a similar pattern, with significant overall ($P<.001$) and female-specific ($P=.005$) associations but no significant male association ($P=.484$). By contrast, COPD, heart disease, sickle-cell disease, depression, dementia, other mental disorders, cancer, epilepsy and kidney disease showed no statistically significant overall association with union status. The results therefore suggest that the relationship between union status and morbidity was selective rather than uniformly distributed across all chronic conditions examined.

Importantly, statistical non-significance for the less common conditions should not be interpreted as definitive evidence that union status has no epidemiological or clinical relevance to these diseases. Many of the contingency tables contained substantial numbers of cells with expected frequencies below five, reflecting the low occurrence of conditions such as COPD, dementia, epilepsy and several mental-health disorders within the analytical population. Sparse cells reduce the reliability of conventional Pearson chi-square approximations and considerably limit statistical power to identify genuine group differences. Cancer provides a particularly clear example because, although the overall association was non-significant ($\chi^2=7.451$, $P=.281$), 58.3% of the expected cells were below five. The cancer-type analysis was even more sparse, with 91.7% of overall expected cells below five, making its nominal chi-square result unsuitable for strong inferential conclusions. Accordingly, the most defensible interpretation is that combined hypertension-diabetes and arthritis provide the strongest evidence of union-status patterning, particularly among women, whereas the rarer conditions require larger samples, collapsed clinically meaningful categories or exact statistical procedures before firm conclusions can be reached.

Table 7: Associations Between Union Status and Selected Chronic Conditions, Overall and by Sex

Health condition	Male χ^2 (P)	Female χ^2 (P)	Overall χ^2 (P)	Overall Cramer's V	Interpretation
Combined hypertension and diabetes	1.817 (.611)	12.808 (.005)	12.292 (.006)	.120	Significant overall and among women
Arthritis	5.476 (.484)	23.439 (.005)	30.700 (<.001)	.109	Significant overall and among women*
COPD	2.711 (.438)	1.399 (.966)	2.777 (.836)	.040	Not significant*
Heart disease	4.787 (.571)	10.035 (.348)	7.981 (.536)	.056	Not significant*
Sickle-cell disease	8.373 (.212)	4.749 (.576)	6.801 (.658)	.052	Not significant*
Depression	1.351 (.717)	4.129 (.659)	4.710 (.581)	.053	Not significant*
Dementia	3.083 (.379)	4.384 (.884)	5.844 (.755)	.048	Not significant*
Other mental disorder	4.317 (.634)	2.767 (.837)	4.603 (.867)	.042	Not significant*
Cancer	5.646 (.464)	1.632 (.652)	7.451 (.281)	.066	Not significant*
Epilepsy	Not estimable†	3.060 (.801)	3.729 (.713)	.047	Not significant*
Kidney disease	2.784 (.835)	2.812 (.971)	5.012 (.833)	.044	Not significant*

Note: * Results should be interpreted cautiously where substantial proportions of expected cell frequencies were below five. † No male-specific statistic was computed for epilepsy because epilepsy was constant among males in the analytical sample. The overall epilepsy association was non-significant ($\chi^2=3.729$, $P=.713$), and the kidney-disease association was similarly non-significant ($\chi^2=5.012$, $P=.833$).

Discussion

The Hypertension–Diabetes Nexus in Jamaica

The present study indicates that the contemporary hypertension–diabetes problem in Jamaica is embedded within a wider landscape of population ageing, socioeconomic differentiation, multimorbidity and functional limitation. One of the most striking demographic findings was the concentration of participants in older age groups, with 62.5% of the analytical population aged 60 years or older. This pattern is epidemiologically plausible because the prevalence of hypertension and type 2 diabetes generally increases with advancing age as cumulative exposure to metabolic, behavioural and physiological risk factors intensifies [1,5,7]. Ageing is additionally associated with vascular changes, declining insulin sensitivity, changes in body composition and increased exposure to obesity and physical inactivity, all of which may contribute to cardiometabolic disease. The Jamaican findings therefore suggest that the national NCD challenge increasingly intersects with the country's demographic transition and the expanding health-care requirements of older adults. Cardiometabolic disease management should consequently be incorporated into healthy-ageing strategies rather than remain confined to traditional disease-specific programmes that treat hypertension and diabetes as independent conditions.

The age distribution also has implications for future health-service demand because older persons living with hypertension and diabetes may require substantially more than pharmacological disease control. Older adults frequently experience multiple chronic conditions, functional decline, polypharmacy and increased dependence on formal and informal caregivers, thereby increasing the complexity and cost of disease management. Within the present analytical population, the concentration of participants aged 60 years and older occurred alongside considerable functional limitation and several additional chronic conditions. This combination suggests that the consequences of cardiometabolic disease extend beyond conventional indicators such as blood pressure, blood glucose and medication utilisation. A comprehensive Jamaican response must therefore consider mobility, functional independence, rehabilitation, medication management, social support and continuity of care alongside clinical disease control. Such an approach would situate hypertension and diabetes within the broader concept of healthy longevity rather than treating survival with chronic disease as the sole objective of health intervention.

The findings are consistent with previous Jamaican evidence demonstrating the central role of metabolic and vascular conditions within the country's multimorbidity profile. Earlier national research identified hypertension, obesity, hypercholesterolaemia and diabetes as major contributors to patterns of multiple chronic disease in Jamaica [10]. These conditions share important behavioural and metabolic risk factors and may interact in ways that progressively increase cardiovascular, cerebrovascular and renal risk. The current JSLC 2023 analysis extends that literature by demonstrating that the hypertension–diabetes nexus is also accompanied by substantial functional impairment and additional chronic morbidity in a contemporary Jamaican analytical population. Its contribution is therefore not limited to confirming that hypertension and diabetes coexist, because previous Jamaican research has already established that epidemiological relationship. Instead, the present study advances the literature by locating this coexistence within a broader demographic, socioeconomic, functional and multimorbidity environment that has received comparatively limited attention in recent Jamaican scholarship.

Comparison with Earlier Jamaican Research

Earlier research among older Jamaicans reported hypertension–diabetes coexistence in 21.9% of the investigated population, with the combined conditions being considerably more prevalent among women than men [11]. In comparison, the derived combined-condition variable in the present study identified 26.5% of the selected analytical population as having combined hypertension and diabetes. These percentages should not be interpreted as evidence of a temporal increase because the studies differed in population selection, age composition, survey design, disease measurement and construction of the analytical variables. The current 26.5% represents a within-sample proportion within the specifically filtered JSLC analytical population rather than an unrestricted national prevalence estimate for Jamaica. Nevertheless, both studies independently demonstrate that hypertension and diabetes frequently coexist and should not be conceptualised as unrelated components of Jamaica's NCD burden. The consistency of this broad pattern across different Jamaican studies strengthens the argument for integrated cardiometabolic surveillance and management.

The sex pattern observed in the present analysis provides an especially interesting comparison with earlier Jamaican research. Previous research identified a considerably greater female burden of hypertension–diabetes comorbidity among older Jamaicans, suggesting that women represented an important high-risk population [11]. In the current analysis, women again displayed a higher proportion of combined hypertension and diabetes than men, at 28.0% compared with 23.7%, but this 4.3-percentage-point difference was not statistically significant. The association was also weak according to Cramer's V, indicating that sex alone explained little of the observed distribution of the combined condition within the selected population. Differences between earlier and current findings could reflect changes in population composition, disease detection, survival, socioeconomic circumstances, sampling procedures or the operational definitions employed across studies. Consequently, contemporary national datasets remain essential because historical sex patterns cannot automatically be assumed to characterise the present distribution of cardiometabolic morbidity.

The findings further demonstrate why sex should be interpreted together with socioeconomic and demographic characteristics rather than as an isolated biological variable. Although sex was not significantly associated with the combined hypertension–diabetes indicator, it was significantly associated with both age cohort and socioeconomic group in the present analysis. Women were disproportionately represented among poorer participants, whereas men were substantially more represented within the wealthier socioeconomic category. Such social differences may shape opportunities for disease prevention, access to nutritious food, medication affordability, continuity of treatment and the capacity to manage multiple chronic conditions. Sex differences in cardiometabolic outcomes may therefore emerge partly through gendered social and economic pathways rather than exclusively through biological susceptibility. Future Jamaican studies should investigate these intersecting pathways using multivariable models capable of separating the independent and combined effects of sex, age, socioeconomic position, education and other relevant determinants.

Caribbean Comparison

The Jamaican findings must be interpreted within the wider Caribbean NCD environment because hypertension and diabetes represent major public-health challenges throughout the subregion. Barbados has reported adult hypertension prevalence

of approximately 40.6% and diabetes prevalence of 18.7%, illustrating the substantial cardiometabolic burden found elsewhere in the English-speaking Caribbean [8]. Longitudinal evidence from Trinidad has similarly established hypertension and diabetes as important chronic-disease outcomes occurring within processes of socioeconomic and epidemiological transition [9]. PAHO has additionally characterised the English-speaking Caribbean as a particularly high-hypertension subregion, highlighting the importance of cardiovascular risk reduction across Caribbean states [1]. Although prevalence estimates cannot be directly compared with the selected JSLC analytical proportions, the regional evidence indicates that Jamaica's cardiometabolic challenge occurs within a broader Caribbean epidemiological pattern. Hypertension-diabetes coexistence should therefore be regarded as both a Jamaican national health problem and an important component of the Caribbean NCD transition.

Several shared structural conditions may help explain similarities across Caribbean populations. Caribbean societies have experienced rapid nutritional transitions involving increased availability of energy-dense processed foods, changing dietary practices and reduced levels of routine physical activity. Population ageing, urbanisation, obesity and socioeconomic inequality have developed alongside these changes and may contribute to the persistence of hypertension and diabetes. Small island health systems must simultaneously address chronic disease, infectious diseases, injuries, ageing populations and other health priorities while operating within comparatively constrained fiscal and human-resource environments. Historical socioeconomic inequalities may further influence access to preventive services, nutritious food, safe environments for physical activity and consistent chronic-disease management. Consequently, the Caribbean cardiometabolic burden should be understood as the product of interacting biological, behavioural, demographic, economic and health-system forces rather than individual lifestyle choices alone.

Despite these commonalities, substantial variation across Caribbean countries cautions against conceptualising the region as epidemiologically homogeneous. Differences in demographic structures, health systems, socioeconomic development, dietary environments, screening practices and disease-surveillance systems can produce important differences in observed hypertension and diabetes patterns. Even within individual Caribbean countries, health outcomes may differ according to sex, age, socioeconomic position, geographical location and access to health services. Jamaica therefore requires interventions grounded in national evidence while simultaneously drawing on successful strategies and lessons from neighbouring Caribbean states. Regional collaboration could strengthen NCD surveillance, professional training, pharmaceutical procurement, health promotion and the development of culturally appropriate prevention programmes. Such cooperation would allow Caribbean countries to respond collectively to shared structural challenges without overlooking the distinct epidemiological circumstances of individual national populations.

Latin American and Caribbean Comparison

The broader Latin American and Caribbean literature reinforces the importance of interpreting hypertension and diabetes within the framework of multimorbidity rather than as isolated diseases. Huaquía-Díaz and colleagues estimated a pooled multimorbidity prevalence of approximately 43% across studies conducted in Latin America and the Caribbean, while nationally representative studies generated a pooled estimate of approximately 37% [6]. Particularly noteworthy is that hypertension and diabetes were included in

every multimorbidity definition examined in that systematic review [6]. Their consistent inclusion indicates the foundational role of these two conditions within attempts to measure multiple chronic disease throughout the region. The current Jamaican findings are therefore consistent with a wider regional transition in which cardiometabolic conditions increasingly coexist with other chronic diseases and functional limitations. This convergence strengthens the rationale for replacing fragmented single-disease approaches with integrated models capable of managing multiple conditions simultaneously.

The Jamaican evidence nevertheless contributes an important country-specific perspective to the broader LAC literature. Research contributing to regional multimorbidity estimates has been disproportionately generated from larger Latin American countries, particularly Brazil, while smaller Caribbean states have been comparatively less represented [6]. Consequently, regional pooled estimates may obscure epidemiological experiences occurring within small island developing states with distinct histories, demographic profiles, health systems and socioeconomic environments. The JSLC provides an important mechanism through which Jamaica can contribute nationally grounded evidence to the international literature on chronic disease and multimorbidity. Using national household surveys also allows biomedical outcomes to be examined alongside education, socioeconomic circumstances, household characteristics and functional health, dimensions that may be less comprehensively captured in clinical datasets. The present analysis therefore indicates how established Caribbean social-survey infrastructure can strengthen the representation of smaller countries within international NCD scholarship.

Comparison with Latin America additionally highlights the importance of socioeconomic transition in shaping cardiometabolic disease. Hypertension and diabetes were historically portrayed as conditions associated predominantly with affluence, but the epidemiological transition has increasingly shifted substantial burdens towards socially and economically disadvantaged populations. This transition can produce complex patterns in middle-income societies where disease simultaneously affects wealthier groups with long-standing exposure to obesogenic environments and poorer groups facing limited preventive resources. The present finding that 46.4% of the selected Jamaican analytical population belonged to the wealthiest two quintiles must therefore be interpreted within this evolving social gradient. Because the sample was filtered, this percentage cannot establish that wealthy Jamaicans have greater population prevalence than poorer Jamaicans. It does, however, reinforce the need for socioeconomic-specific prevalence studies capable of determining whether Jamaica is experiencing the changing social gradient in cardiometabolic disease observed elsewhere in the developing world.

International Comparison

Globally, hypertension is a frequent comorbidity among persons living with type 2 diabetes and substantially increases the risk of adverse cardiovascular and renal outcomes. A systematic review of observational studies found that hypertension prevalence was commonly greater than 50% among adults with type 2 diabetes and exceeded 75% in numerous study populations [5]. Although differences in population characteristics and disease definitions limit direct comparison with the present JSLC findings, the international evidence confirms the close epidemiological relationship between these two conditions. Their coexistence is particularly important because hypertension can accelerate vascular

and renal complications associated with diabetes while diabetes can intensify cardiovascular risk among persons with elevated blood pressure. Patients with both conditions consequently represent an important population for early identification, sustained treatment and aggressive risk-factor management. The Jamaican findings should therefore be interpreted within a global body of evidence demonstrating that hypertension-diabetes coexistence constitutes an important clinical and public-health challenge.

The mechanisms connecting hypertension and type 2 diabetes are multifactorial and involve overlapping biological, behavioural and environmental pathways. Both conditions share risk factors that include advancing age, obesity, physical inactivity, unhealthy dietary patterns and metabolic dysfunction. Insulin resistance, vascular dysfunction, inflammation and abnormalities in renal sodium handling may further contribute to the simultaneous development and progression of both diseases. Their coexistence increases cardiovascular and renal risk and may complicate clinical management through polypharmacy, competing therapeutic priorities and greater requirements for monitoring. International evidence consequently supports integrated cardiometabolic risk management rather than parallel services that address hypertension and diabetes independently. The present Jamaican findings provide additional support for this approach because the hypertension-diabetes population also indicated substantial additional morbidity and functional impairment.

Jamaica's principal challenge is translating internationally supported principles of integrated NCD management into a health system responsive to local demographic and socioeconomic realities. The JSLC findings demonstrate that the selected analytical population spans socioeconomic and educational categories rather than being concentrated exclusively within a single disadvantaged group. This distribution indicates that universal population-level prevention remains necessary even when targeted interventions are designed for populations experiencing particular socioeconomic vulnerabilities. Clinical programmes should therefore operate alongside strategies addressing food environments, physical activity, health literacy, medication access and early disease detection. International models of integrated chronic-disease management can provide useful guidance, but they require adaptation to Jamaica's primary-care infrastructure, population structure and available resources. Effective translation of international evidence consequently depends on combining global clinical knowledge with locally generated social and epidemiological data.

Socioeconomic Patterning

One of the more intriguing findings was that 46.4% of the analytical population belonged to the wealthiest two socioeconomic quintiles, compared with 32.5% in the poorest two quintiles and 21.1% in the middle quintile. At first examination, this distribution might appear inconsistent with contemporary literature linking social disadvantage with elevated chronic-disease risk and poorer health outcomes. Such an interpretation would be methodologically inappropriate because the present percentages describe socioeconomic composition within a selected hypertension-diabetes analytical population rather than socioeconomic-specific prevalence across the entire Jamaican population. The number of wealthy participants in the analytical population may partly reflect the underlying distribution of the source population, survival, diagnosis, health-service contact or other characteristics not directly evaluated in the present analysis. Determining whether socioeconomic gradients exist in national hypertension-diabetes prevalence would require appropriate denominators for each

socioeconomic group and application of the relevant survey-design procedures. The present result should therefore be interpreted as evidence of socioeconomic heterogeneity within the analytical population rather than evidence that cardiometabolic disease is intrinsically more prevalent among wealthy Jamaicans.

Nevertheless, the sex-specific findings demonstrate meaningful social differentiation within the analytical population. Women were substantially more represented among poorer participants, whereas men were disproportionately represented within the wealthiest socioeconomic group, and this association was statistically significant at $P < .001$. This pattern suggests that men and women experiencing hypertension-diabetes-related morbidity may occupy different socioeconomic circumstances even where their proportions with the combined condition are not statistically different. Socioeconomic position can influence access to preventive health services, medication affordability, dietary choices, transportation, opportunities for physical activity and the capacity to attend repeated clinical appointments. These mechanisms may affect disease detection, control and long-term outcomes even when socioeconomic status does not directly determine whether an individual initially develops hypertension or diabetes. The intersection of sex and socioeconomic position therefore deserves greater attention in future Jamaican cardiometabolic research and health-policy planning.

The findings illustrate more broadly why cardiometabolic epidemiology should incorporate social determinants alongside conventional biomedical risk factors. Biological diagnoses alone cannot fully explain variation in the onset, management, progression and consequences of chronic disease across population groups. Income, educational attainment, employment, household responsibilities, neighbourhood conditions, food environments and health-care accessibility can influence exposure to risk factors and the resources available for effective disease management. Social disadvantage can also accumulate across the life course, producing prolonged exposure to stressors that may influence both health behaviour and physiological risk. Conversely, socioeconomic advantage does not eliminate cardiometabolic risk where obesity, sedentary behaviour, unhealthy dietary consumption or ageing remain prominent. A comprehensive understanding of hypertension and diabetes in Jamaica must therefore recognise the dynamic interaction between biological vulnerability, behavioural exposure and the social organisation of everyday life.

Functional Health and the Hidden Burden of Disease

Perhaps the most policy-relevant finding is the substantial magnitude of functional impairment within the hypertension-diabetes analytical population. Among participants with valid functional-health information, 46.3% reported at least some degree of functional difficulty, while 25.7% reported either a lot of difficulty or complete inability to perform the relevant function. These findings indicate that a considerable proportion of the selected population experiences health consequences extending beyond the presence of diagnosed or self-reported chronic disease. Conventional epidemiological measures focusing exclusively on disease prevalence may therefore underrepresent the everyday burden experienced by persons living with multiple cardiometabolic conditions. Functional impairment may reflect the accumulated consequences of ageing, arthritis, cardiovascular disease, diabetes-related complications and other coexisting health problems rather than a single diagnostic category. The results consequently support an expanded conceptualisation of NCD burden that includes what individuals are physically able to accomplish in their daily lives.

Functional impairment has important consequences for individuals, households, health services and the wider Jamaican economy. Limitations in mobility and everyday activities can reduce employment capacity, household productivity, independence and the ability to attend health-care appointments or maintain complex treatment regimens. Among older adults, declining functional capacity may increase dependence on relatives, community networks and formal caregivers, thereby transferring part of the chronic-disease burden from patients to households. Functional difficulties can also complicate physical-activity recommendations, dietary preparation, medication collection and routine self-monitoring for hypertension and diabetes. Consequently, an individual may achieve acceptable biomedical disease-control indicators while continuing to experience substantial restrictions arising from accumulated morbidity and disability. Clinical definitions of successful NCD management should therefore incorporate quality of life and functional independence alongside traditional physiological targets.

The functional-health findings make a particular contribution to the Jamaican literature by connecting cardiometabolic morbidity with capability and everyday functioning. Much NCD surveillance is organised around diagnosis, risk-factor prevalence, treatment utilisation, disease control and mortality, while functional consequences may receive comparatively less systematic attention. The JSLC offers an opportunity to bridge this divide because social and health information can be examined within the same analytical framework. Routine surveillance could consequently incorporate measures of functional difficulty, disability, activities of daily living and participation alongside hypertension and diabetes indicators. Such information would allow policymakers to distinguish between persons living independently with well-managed disease and those experiencing substantial limitations despite continued survival. Integrating functional health into NCD surveillance would therefore provide a more complete assessment of the societal burden associated with Jamaica's epidemiological transition.

Multimorbidity Beyond Hypertension and Diabetes

Arthritis was the most prominent additional chronic condition identified in the analytical population, with approximately 21.0% reporting a history of the disease. Heart disease and asthma were also evident, while kidney disease, cancer, sickle-cell disease, depression, dementia, epilepsy and other mental disorders occurred at lower frequencies. Although some of these conditions affected relatively small proportions, their clinical importance should not be dismissed because individual patients may experience several disorders simultaneously. Arthritis is particularly relevant because pain and mobility restrictions may make recommended physical activity more difficult for persons attempting to manage hypertension, diabetes or obesity. Heart and kidney diseases are similarly important because they may represent serious complications or coexisting conditions within cardiometabolic disease trajectories. The overall morbidity profile therefore illustrates that hypertension and diabetes occur within a heterogeneous clinical environment rather than an isolated two-disease framework.

This spectrum of chronic illness indicates that hypertension-diabetes coexistence can form part of more complex multimorbidity requiring coordinated clinical management. Treatment guidelines designed around individual diseases may become difficult to implement when patients simultaneously experience several chronic conditions, functional impairment and complex medication regimens. Recommendations appropriate

for one condition may also become challenging when another illness limits mobility, alters dietary requirements or increases the risk of adverse medication effects. Polypharmacy represents an additional concern because increasing numbers of medications can complicate adherence and heighten the possibility of interactions or treatment burden. Clinical encounters organised around a single disease may therefore fail to capture the totality of health priorities experienced by patients with multimorbidity. The findings support the development of integrated care pathways in which treatment priorities are negotiated according to overall cardiovascular risk, functional capacity, patient preferences and quality of life.

The observed multimorbidity profile supports a person-centred rather than exclusively disease-centred model of NCD management in Jamaica. A patient simultaneously experiencing hypertension, diabetes, arthritis and functional limitation require coordinated assessment of mobility, medication burden, nutrition, cardiovascular risk and capacity for self-management. Such individuals may need input from physicians, nurses, nutrition professionals, pharmacists, rehabilitation practitioners and social-support services rather than isolated disease-specific consultations. Fragmented care can produce duplicated appointments, conflicting therapeutic recommendations, unnecessary costs and increased treatment burden for patients and families. Integrated primary-care systems could reduce these difficulties by organising services around the person rather than requiring individuals to navigate separate pathways for every chronic condition. The current findings therefore provide empirical support for strengthening multimorbidity-oriented primary care as Jamaica's population ages and chronic-disease complexity increases.

Sex and the Cardiometabolic Burden

Women comprised 65.0% of the analytical population, compared with 35.0% for men, demonstrating substantial numerical female predominance within the selected sample. Nevertheless, sex was not significantly associated with the combined hypertension-diabetes indicator, despite 28.0% of women and 23.7% of men being classified with the combined condition. This distinction is methodologically important because a larger number of women in the analytical population does not demonstrate that female sex independently increases the probability of hypertension-diabetes coexistence. The chi-square analysis produced $P=.174$ and Cramer's $V=0.046$, indicating that the observed relationship between sex and the combined indicator was statistically non-significant and weak in magnitude. Consequently, conclusions concerning female susceptibility should not be drawn merely from the overall sex composition of the analytical population. The findings instead suggest that the relationship between sex and cardiometabolic disease may depend on additional demographic, socioeconomic and behavioural factors.

Previous Jamaican research documented substantially greater multimorbidity among women and identified important sex differences in the coexistence of hypertension and diabetes [10,11]. The present findings suggest a more nuanced contemporary pattern in which women remain numerically prominent but do not display a statistically significant excess in the combined hypertension-diabetes indicator. Women were, however, socioeconomically less advantaged within the analytical population, demonstrating that important gender-related inequalities may exist independently of the combined disease indicator. Socioeconomic disadvantage could affect long-term disease management through medication affordability, caregiving responsibilities, transportation costs and differential access to health-promoting resources. Men may simultaneously experience other disadvantages, including lower

preventive health-service utilisation or delayed presentation, that are not adequately captured by the variables examined here. Understanding cardiometabolic inequalities therefore requires investigation of the pathways through which sex interacts with socioeconomic conditions, health behaviours and health-service engagement.

The policy implication is that gender-sensitive NCD interventions remain necessary, but they should not be constructed solely around assumptions of greater female disease prevalence. Women may experience longer durations of chronic disease, socioeconomic disadvantage, caregiving burdens and disability, while men may experience delayed diagnosis, lower health-service utilisation or greater premature mortality. These pathways can produce different disease experiences even when cross-sectional prevalence or comorbidity proportions appear statistically similar. Health-promotion strategies should consequently address the distinct barriers affecting men and women while avoiding overly simplistic biological explanations of observed population differences. Future research should examine interactions among sex, age, socioeconomic status, obesity, health-care utilisation and treatment adherence using multivariable and longitudinal approaches. Such analyses would provide a stronger basis for designing gender-responsive cardiometabolic policies in Jamaica.

Implications for Health Policy and Clinical Practice

The first major implication concerns the need to strengthen integrated screening for hypertension and diabetes within Jamaican health services. Persons diagnosed with either condition should be systematically assessed for the other because hypertension and diabetes share multiple risk factors and frequently coexist. Screening provides an opportunity to identify individuals at elevated cardiometabolic risk before severe cardiovascular, renal or functional complications become established. Primary-care encounters for hypertension could therefore incorporate diabetes risk assessment and appropriate glucose testing, while diabetes care should routinely include blood-pressure assessment and cardiovascular-risk evaluation. Integrated screening may be particularly valuable among older adults because the present study indicated a pronounced concentration of the analytical population among persons aged 60 years and older. Earlier detection combined with coordinated treatment could reduce complications and improve continuity of chronic-disease management.

A second implication is that NCD services should systematically incorporate functional-health assessment alongside biomedical disease monitoring. Clinical evaluation should ask not only whether patients have hypertension or diabetes but whether they experience limitations in mobility, self-care, household activities and other aspects of everyday functioning. The finding that almost half of the analytical population reported some degree of functional difficulty indicates that this dimension cannot reasonably be treated as peripheral to chronic-disease management. Functional limitations may influence medication adherence, physical-activity capacity, clinic attendance and the ability to undertake routine disease self-management. Identifying such difficulties would allow clinicians to adapt treatment recommendations and initiate rehabilitation, caregiver support or social-service referrals where appropriate. Incorporating functional assessment could therefore shift Jamaican NCD services towards a more person-centred model concerned with both disease control and the preservation of independence.

Third, Jamaican primary health care should increasingly adopt multimorbidity-centred clinical pathways rather than organising

care exclusively around individual diseases. The presence of arthritis, heart disease, kidney disease, respiratory conditions and other disorders within the analytical population indicates that many patients may present with health needs extending beyond hypertension and diabetes. Disease-specific clinical pathways can become inefficient when patients are required to attend multiple appointments or receive treatment recommendations that do not adequately account for coexisting conditions. Integrated case management could allow health professionals to prioritise risks, coordinate medications and reduce unnecessary duplication of services. Such an approach may become increasingly important as Jamaica's population ages and the prevalence of multiple chronic conditions rises. Strengthening multidisciplinary primary care should therefore constitute an important component of national NCD policy.

Fourth, interventions should recognise the substantial social heterogeneity indicated within the analytical population. Cardiometabolic morbidity occurred among persons across socioeconomic and educational categories, indicating that universal preventive strategies remain important alongside programmes targeted towards particularly vulnerable groups. Socioeconomic resources can nevertheless shape individuals' capacity to purchase nutritious food, obtain medications, travel to health facilities and sustain recommended lifestyle modifications. The significant relationship between sex and socioeconomic position further suggests that vulnerability may be differently distributed among men and women. Policies addressing hypertension and diabetes should therefore combine clinical care with broader interventions addressing social determinants and barriers to disease self-management. Such an approach would recognise that effective chronic-disease prevention and control depend partly on the conditions in which people live, work and age.

Fifth, population ageing must become central to Jamaica's future NCD planning rather than being treated as a separate demographic concern. The concentration of hypertension-diabetes-related morbidity among older participants indicates increasing potential demand for chronic-disease treatment, rehabilitation, long-term care and caregiver support. Longer life expectancy can represent an important social achievement, but additional years of life accompanied by severe functional impairment can create substantial challenges for individuals, families and health systems. Healthy-ageing strategies should therefore incorporate cardiometabolic prevention beginning earlier in the life course while simultaneously strengthening services for older persons already living with chronic disease. Community-based care, rehabilitation and support for informal caregivers may become increasingly important as the number of older adults with multimorbidity increases. Integrating NCD and ageing policies could help Jamaica maximise healthy longevity rather than simply extending survival with disability.

Finally, Jamaica should continue strengthening the use of nationally collected data for NCD surveillance, policy evaluation and academic research. The JSLC indicates the analytical value of connecting health information with socioeconomic, demographic and functional characteristics within a single national data system. Linking social-survey evidence with clinical, biomedical and mortality data could produce a more comprehensive understanding of disease prevalence, treatment, control, disability and social consequences. Repeated analysis across survey years would additionally permit researchers to determine whether observed patterns are stable or changing over time. Data repositories such as the SALISES Documentation and Data Centre at The

University of the West Indies, Mona Campus, are therefore important components of Jamaica's research infrastructure because they facilitate scholarly secondary analysis of national datasets. Strengthening access, documentation and responsible use of such data could substantially improve evidence-informed NCD policy and Caribbean representation in international health research.

Strengths of the Study

A major strength of this study is its use of contemporary Jamaican data obtained from the 2023 Jamaica Survey of Living Conditions. The recency of the dataset improves the temporal relevance of the analysis compared with investigations relying exclusively on surveys undertaken many years earlier. This is particularly important because Jamaica continues to experience demographic ageing, changing socioeconomic circumstances and an evolving NCD environment. Contemporary data allow researchers to assess whether patterns identified in earlier Jamaican studies remain visible within more recent observations. The JSLC also represents an established national survey infrastructure rather than a narrowly defined clinical dataset obtained from a single hospital or health facility. Consequently, the study provides an important contemporary perspective on hypertension-diabetes-related characteristics within the defined analytical population.

A second strength is the multidimensional nature of the JSLC and the resulting ability to examine health within its wider social context. The dataset contains demographic, socioeconomic, educational, household, geographical and health information that can be analysed simultaneously. This breadth allows chronic disease to be interpreted in relation to the social circumstances within which disease prevention, diagnosis and management occur. Clinical datasets may contain more detailed biomedical measurements but frequently provide less comprehensive information on living conditions and socioeconomic position. The JSLC therefore complements traditional clinical epidemiology by allowing investigation of the social patterning of chronic disease. This feature is especially valuable for research concerned with health inequalities and the social determinants of NCDs.

A third strength is the inclusion of functional health as an explicit dimension of the analysis. Disease counts alone cannot determine whether individuals remain independent, experience moderate limitations or are unable to perform important everyday activities. The functional-health variable consequently provides insight into the lived consequences of morbidity that might otherwise remain hidden behind diagnostic categories. This dimension is particularly relevant in an analytical population dominated by middle-aged and older adults who may experience several chronic conditions simultaneously. Demonstrating the magnitude of functional difficulty strengthens the argument that successful NCD management should be evaluated using broader indicators than disease diagnosis and survival alone. The study therefore contributes to a more comprehensive understanding of health burden by integrating morbidity with functional capability.

A fourth methodological strength is the explicit distinction between the selected analytical population and general-population prevalence. The statistical output was generated after application of a hypertension-diabetes-related filter, meaning that percentages calculated within the resulting 858 cases cannot automatically be generalised to all Jamaicans. Explicitly acknowledging this distinction reduces the risk of presenting a within-filter proportion as though it represented a national disease prevalence estimate. This methodological caution is particularly important for the

26.5% classified by the derived combined hypertension-and-diabetes variable. Clear specification of denominators, filters and analytical populations strengthens transparency and enables readers to interpret the statistical findings appropriately. Such methodological precision enhances the reproducibility and credibility of secondary analyses using complex national datasets.

Limitations

The findings must be interpreted within several important methodological limitations, beginning with the selection of the analytical population. The dataset supplied for the study was filtered according to a hypertension-diabetes-related criterion and therefore does not represent an unrestricted analysis of the entire JSLC 2023 population. Percentages generated after application of this filter describe the composition of the selected analytical population rather than national prevalence across Jamaica. National prevalence estimation would require access to the appropriate unrestricted sample, relevant disease denominators and the survey-design procedures necessary for population inference. Consequently, comparisons between percentages in the present study and prevalence estimates reported in other national or international investigations should be made cautiously. This limitation does not invalidate the internal descriptive findings but defines the population to which they can appropriately be applied.

A second limitation concerns the self-reported nature of much of the health information available in the JSLC. Self-reported disease status depends partly on previous diagnosis, respondents' knowledge of their conditions, memory and willingness to disclose health information. Hypertension and diabetes are especially relevant in this respect because both conditions may remain undiagnosed for substantial periods, particularly when symptoms are absent or health-service contact is limited. Individuals with undiagnosed disease could therefore be classified differently from persons with clinically measured blood pressure or laboratory-confirmed diabetes. Conversely, respondents may accurately report previously diagnosed disease even when clinical measurements at the time of the survey would indicate effective control. Future research combining self-reported survey information with objective clinical measurements would provide a more comprehensive assessment of the true cardiometabolic burden.

Third, the cross-sectional design limits the ability to establish causal or temporal relationships between the variables examined. Associations between sex, socioeconomic position, age and health characteristics indicate statistical relationships within the observed data but cannot establish which factor preceded another. For example, socioeconomic disadvantage could contribute to poor chronic-disease management, but chronic illness and functional limitation could also reduce employment and household economic resources. Cross-sectional data cannot adequately disentangle these reciprocal pathways or determine the duration of exposure to particular risk factors. Consequently, causal language should be avoided when interpreting statistically significant relationships identified in the analysis. Longitudinal Jamaican research would be required to determine trajectories of disease development, socioeconomic change, functional decline and mortality over time.

Fourth, no sampling weights were applied in the statistical output supplied for this analysis. Survey weights are frequently necessary when producing population-level estimates from complex national survey designs because selection probabilities and population distributions may differ across sampled groups. Unweighted analyses can accurately describe the observations included in an

analytical file but may not reproduce the demographic distribution of the wider target population. This limitation further reinforces the need to distinguish the present within-sample percentages from national prevalence estimates. The inferential statistics reported here should therefore be interpreted primarily in relation to the analysed cases rather than automatically extrapolated to all Jamaican residents. Future analyses should incorporate appropriate JSLC weighting and complex-survey procedures when the research objective specifically involves nationally representative estimation.

Fifth, several chi-square analyses involved small expected cell frequencies, particularly where relatively uncommon categories were cross-tabulated by sex. The age-by-sex analysis, for example, contained several cells with expected counts below five because very few members of the analytical population were children or youth. Small expected frequencies can reduce the reliability of the asymptotic chi-square approximation and therefore require caution when interpreting statistical significance. Combining substantively appropriate sparse categories can sometimes address this issue, although categories should not be collapsed merely to obtain a preferred statistical result. Exact procedures may also be considered where suitable, particularly for small contingency tables. Recognition of this limitation is important because statistical significance must be evaluated alongside the assumptions underlying the statistical test.

Finally, the present analysis is predominantly descriptive and bivariate and therefore cannot identify independent predictors of combined hypertension and diabetes. An observed relationship between two variables may be confounded by age, socioeconomic status, education, obesity, health-care utilisation or other characteristics not simultaneously controlled in a cross-tabulation. Multivariable logistic regression would permit estimation of adjusted associations and could determine whether apparent sex or socioeconomic differences persist after controlling for relevant covariates. Interaction terms could additionally test whether relationships differ across combinations of sex, age and socioeconomic position. Survey-weighted regression models would be particularly valuable if the objective were to extend inference to the wider Jamaican population using the full JSLC design. Future research should therefore build on the present descriptive findings through more advanced multivariable and longitudinal analytical approaches.

Answering the Research Gap

The central research gap identified at the beginning of this study concerned the limited contemporary Jamaican evidence integrating hypertension-diabetes coexistence with demographic structure, socioeconomic position, functional health and wider multimorbidity using the JSLC 2023. Previous Jamaican investigations have made important contributions by documenting NCD prevalence, multimorbidity and the coexistence of hypertension and diabetes, but these dimensions have not always been considered simultaneously within recent living-conditions data. International and regional literature has similarly indicated the importance of hypertension-diabetes comorbidity, although much of that research has focused predominantly on clinical disease and conventional biomedical risk factors. The JSLC creates an opportunity to examine chronic disease within a wider social framework because it integrates health information with demographic and socioeconomic indicators. The present analysis therefore sought not simply to demonstrate that hypertension and diabetes coexist but to determine the social, functional and multimorbidity characteristics surrounding that coexistence. In

doing so, the study provides a contemporary Jamaican contribution to a literature increasingly concerned with multimorbidity and person-centred chronic-disease management.

First, the findings demonstrate that the hypertension-diabetes analytical population is strongly concentrated in later life, with 62.5% of participants aged 60 years or older. This result establishes population ageing as an important dimension of the contemporary hypertension-diabetes nexus represented in the JSLC 2023 analytical data. Older age brings increased cumulative exposure to cardiometabolic risk factors while simultaneously increasing the probability of multimorbidity, functional decline and medication complexity. The age distribution therefore helps explain why hypertension and diabetes cannot be addressed independently of Jamaica's wider healthy-ageing agenda. It also indicates that future increases in the older population may place additional demands on primary care, rehabilitation, long-term disease management and family caregiving. The first component of the research gap is consequently answered by establishing the close intersection between cardiometabolic morbidity and later-life demographic structure.

Second, the findings establish that the analytical population is socially heterogeneous rather than confined to a single socioeconomic or educational category. Participants were distributed across poor, middle and wealthy socioeconomic groups, and more than half of those with valid educational information had post-secondary education. Socioeconomic position nevertheless differed significantly by sex, with women more represented among poorer participants and men more represented among wealthier participants. This pattern indicates that cardiometabolic morbidity occurs within a socially differentiated environment even where the combined hypertension-diabetes indicator itself does not differ significantly between men and women. The findings therefore extend purely biomedical interpretations by demonstrating that social position constitutes an important dimension of the population in which these diseases occur. The second component of the research gap is thus answered by locating hypertension-diabetes-related morbidity within Jamaica's broader socioeconomic structure.

Third, the study identifies a substantial functional-health burden that would remain inadequately described if analysis were restricted to disease diagnoses. Some 46.3% of participants with valid information reported at least some degree of functional difficulty, while 25.7% reported either substantial difficulty or complete inability to perform the relevant function. These findings indicate that a considerable proportion of the analytical population experiences limitations extending beyond the formal identification of hypertension, diabetes or other chronic conditions. Functional health is important because it directly affects independence, employment, self-care, physical activity and the ability to manage complex therapeutic regimens. Its inclusion consequently changes the interpretation of cardiometabolic disease from a question of diagnostic coexistence to one involving capability and everyday quality of life. The third component of the research gap is therefore answered by demonstrating that functional limitation constitutes a major dimension of the contemporary hypertension-diabetes burden represented in the JSLC analytical population.

Fourth, the findings demonstrate that hypertension and diabetes occur within a broader environment of multimorbidity involving musculoskeletal, cardiovascular, respiratory, renal, oncological, neurological and mental-health conditions. Arthritis was particularly prominent, while heart disease, asthma, kidney

disease, cancer and several other conditions contributed additional clinical complexity. The coexistence of these disorders indicates that the health needs of affected persons cannot be reduced to simultaneous management of blood pressure and blood glucose. Multiple conditions can influence treatment priorities, medication burden, functional capability, health-service utilisation and overall quality of life. This wider morbidity profile provides empirical justification for person-centred and multimorbidity-oriented approaches within Jamaican primary health care. The fourth component of the research gap is consequently answered by establishing hypertension-diabetes coexistence as one element within a more complex chronic-disease environment.

Taken together, the findings fill the identified gap by demonstrating that contemporary hypertension-diabetes morbidity in Jamaica represents a multidimensional cardiometabolic-social-functional phenomenon rather than simply the coexistence of two diagnoses. The contribution of the study lies in connecting age, socioeconomic characteristics, sex, functional health and additional chronic conditions within one analytical interpretation of recent JSLC 2023 data. This framework moves beyond traditional disease-specific epidemiology by recognising that the significance of hypertension and diabetes depends partly on the social and functional environments in which individuals experience these conditions. The study also contributes a small-island Caribbean perspective to a broader international literature in which evidence from larger countries often predominates. Although additional weighted and multivariable research is necessary, the present findings establish a foundation for understanding the contemporary Jamaican hypertension-diabetes nexus in more holistic terms. The original research gap is therefore answered through empirical demonstration of the demographic, socioeconomic, functional and multimorbidity dimensions surrounding cardiometabolic disease within the selected Jamaican analytical population.

Conclusion

Hypertension and diabetes represent interconnected components of Jamaica's continuing epidemiological and non-communicable disease transition. Analysis of the JSLC 2023 hypertension-diabetes analytical population indicates a pronounced concentration in older age, substantial additional chronic morbidity and considerable functional-health limitation. Women comprised 65.0% of the analytical population and displayed a somewhat higher proportion of combined hypertension and diabetes than men, although the association between sex and the combined indicator was not statistically significant. Sex was, however, significantly associated with age and socioeconomic position, demonstrating that important social and demographic differences exist within the population experiencing cardiometabolic morbidity. These findings indicate that disease burden cannot be understood adequately through hypertension and diabetes diagnoses alone because individuals experience these conditions within broader social, demographic and functional contexts. Jamaica's cardiometabolic challenge should therefore be conceptualised as part of a multidimensional NCD transition involving ageing, multimorbidity, social differentiation and functional consequences.

Comparison with previous Jamaican, Caribbean, Latin American and international research confirms that the coexistence of hypertension and diabetes forms part of a wider global multimorbidity challenge. Previous Jamaican evidence has established the importance of metabolic and vascular disease clustering, while studies elsewhere in the Caribbean have indicated substantial burdens of hypertension and diabetes [8–11]. Latin American and Caribbean research further indicates that these two

conditions occupy central positions within regional definitions and patterns of multimorbidity [6]. International evidence similarly confirms that hypertension is highly prevalent among persons with type 2 diabetes and that coexistence substantially increases cardiovascular and renal risk [5]. The Jamaican evidence adds an important dimension to this literature by situating cardiometabolic disease within living conditions, socioeconomic differentiation and functional health using contemporary national survey data. In this respect, the study strengthens both Jamaican and wider Caribbean representation within international scholarship on multimorbidity and integrated NCD management.

The research gap is therefore answered by demonstrating that the contemporary Jamaican hypertension-diabetes nexus is not merely a clinical comorbidity but an age-related, socially differentiated, functionally consequential and multimorbid health phenomenon. This conclusion extends earlier Jamaican studies that primarily documented disease prevalence and clustering by integrating social and functional characteristics within an analysis of recent JSLC 2023 data. The substantial level of functional difficulty indicates that conventional indicators based solely on diagnosis can underestimate the lived burden of chronic disease. The accompanying presence of arthritis, cardiovascular, respiratory, renal and other conditions further indicate that many affected individuals require management extending beyond two-disease clinical protocols. These findings provide an empirical basis for reconceptualising cardiometabolic disease in Jamaica through a person-centred multimorbidity framework. The principal contribution of the study is therefore its integration of cardiometabolic, demographic, socioeconomic and functional dimensions into a contemporary interpretation of Jamaica's chronic-disease burden.

Jamaica's policy response should consequently move beyond parallel hypertension and diabetes programmes towards integrated cardiometabolic and multimorbidity care. Screening, treatment and surveillance should incorporate cardiovascular and renal risk, functional-health assessment, socioeconomic vulnerability, additional chronic conditions and the specific requirements associated with ageing. Primary-care services should increasingly coordinate prevention, medication management, rehabilitation and patient education rather than requiring individuals with multimorbidity to navigate fragmented disease-specific pathways. National surveillance should similarly combine biomedical disease indicators with information on functional capacity and social circumstances to provide a more comprehensive measure of NCD burden. Continued scholarly utilisation of JSLC data made available through the SALISES Documentation and Data Centre, The University of the West Indies, Mona Campus, Kingston, Jamaica, can contribute importantly to this evidence base. Such an integrated approach would enable Jamaica to respond more effectively to its evolving NCD landscape while contributing valuable Caribbean evidence to the international pursuit of equitable, person-centred chronic-disease care [17].

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