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Addressing Replacement-Level Fertility in Jamaica: Policy Considerations for Sustainable Demographic and Socioeconomic Development

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ABSTRACT

Jamaica is experiencing a trend toward replacement-level fertility, defined as the number of children per woman required to maintain a stable population, generally estimated at 2.1. Although replacement-level fertility can stabilise population size, sustained low fertility poses critical socioeconomic challenges, including population ageing, a shrinking labour force, and elevated dependency ratios. These demographic shifts have significant implications for economic growth, social security, and intergenerational support systems. The key drivers of declining fertility in Jamaica include increasing female education and labour force participation, delayed marriage, urbanisation, changing cultural norms, and access to modern contraception. Social and economic pressures, such as the rising cost of child-rearing and housing, also influence reproductive decision-making. Drawing on national data, Caribbean regional evidence, and global best practices, this paper identifies policy interventions that address these trends while respecting reproductive autonomy. Recommended strategies include implementing family-friendly policies such as parental leave and childcare support, targeted economic incentives for childbearing, gender-transformative programmes to balance work and family responsibilities and strengthened reproductive health services. Public awareness campaigns and enhanced demographic monitoring are also critical to ensure informed policy responses. Integrating these approaches can mitigate the socioeconomic risks of low fertility while supporting sustainable population and economic growth. Coordinated, evidence-based policy action is therefore essential for promoting demographic resilience and long-term social well-being in Jamaica.

Keywords: replacement-level fertility, Jamaica, population ageing, demographic policy, gender equity, reproductive health

INTRODUCTION

Fertility trends in Jamaica have shifted markedly over recent decades, reflecting broader demographic transitions in the Caribbean and Latin America (Burnard, 1994; Bourne, 2012, 2025; Casterline, 2001; Guzmán et al., 2006; Jenkins & Macadar, 2018; Serow & Cowart, 1998; Sinclair, 1974; Stycos, 1978). Total fertility rates (TFRs) declined from approximately 5.3 children per woman in the 1970s to below the replacement level of 1.4 in 2023 and near-replacement levels in the 2020s (Handa, 2000; Planning Institute of Jamaica, 1995; STATIN, 2023; World Bank Group, 2025). This reduction reflects profound changes in social behaviour, family structures, and reproductive decision-making. Similar trends have been documented across the Caribbean and in many middle- and high-income countries, suggesting shared influences such as urbanisation, education, and socioeconomic development (Bourne, 2011; Bourne et al., 2021a, 2021b; Denton, 1979; Priestley, 2012). The decline in fertility has implications not only for population size but also for age structure and labour market composition (Bongaarts et al., 2022). As the proportion of older adults increases, the dependency ratio rises, placing additional pressure on social welfare and health systems. Understanding these trends is essential for developing policies that balance demographic sustainability with social and economic needs.

Several key factors have contributed to declining fertility in Jamaica. Increasing female educational attainment has been particularly influential, as higher education levels are associated with delayed childbearing and smaller family sizes (Bongaarts et al., 2022; Chevannes, 2001) as well as the rise in sexually transmitted infections such as HIV (Bourne & Charles, 2010) and sexual violence (Bourne, 2010). Urbanisation has also played a role, exposing individuals to higher living costs, reduced housing space, and greater employment opportunities for women, all of which influence reproductive choices (Bongaarts et al., 2022; Jembere, 2016). Economic pressures, including unemployment and limited financial resources, further constrain the ability of families to have multiple children (Beckford, 1972; Handa, 2000). Access to modern contraception and reproductive health services has improved reproductive autonomy, allowing couples to plan pregnancies effectively (Sedgh et al., 2025; WHO, n.d.). Shifting cultural norms, such as prioritising career development or personal autonomy, also affect decisions regarding the timing and number of children. Collectively, these factors illustrate the multifaceted determinants of fertility decline in Jamaica.

Replacement-level fertility, while stabilising population size, introduces significant policy challenges. One such challenge is population ageing, which increases the proportion of older adults relative to the working-age population (Bloom et al., 2010). An ageing population can strain health care systems, pensions, and social services, particularly if workforce growth slows (Bloom et al., 2015; Harper, 2014;

Rechel et al., 2009). Labour shortages may emerge, affecting economic productivity and growth, particularly in sectors reliant on young workers. Reduced fertility also impacts intergenerational support systems, as fewer children are available to care for ageing parents. Additionally, low fertility may influence social cohesion and community structures over time, particularly in rural or traditionally family-centred communities. Policymakers must therefore consider these demographic consequences in long-term planning.

The social context of fertility decline in Jamaica is complex and interrelated with cultural, relational, and economic factors. Changing marital patterns, including delayed marriage, cohabitation, and higher rates of single parenthood, influence reproductive behaviour and family size (Barrow, 1996). Men and women may delay childbearing to pursue education or career goals, further reducing overall fertility. Household dynamics, including parental support, childcare availability, and extended family involvement, also shape reproductive decisions. Economic constraints, such as housing costs and job insecurity, intersect with cultural expectations to influence childbearing patterns. Gender norms that dictate roles in family and work can either support or hinder fertility depending on their flexibility. Understanding these social determinants is critical for designing responsive policies.

From a regional perspective, Jamaica's fertility trends reflect broader Caribbean patterns. Many Caribbean nations have experienced declining TFRs, driven by similar social and economic determinants, including education, urbanisation, and miscarriage or abortion and access to reproductive health services (Adams, 2020; Bourne et al., 2021; Denton, 1979; Ikeokwu et al., 2021; Jenkins, L., & Macadar, 2018; Priestley, 2012; Rodriguez, 2021). Countries such as Barbados, Trinidad and Tobago, and St. Lucia demonstrate comparable declines, highlighting regional demographic convergence. These shared trends underscore the need for Caribbean-wide collaboration on policy interventions, knowledge exchange, and demographic monitoring. Regional cooperation can help identify best practices in family support, reproductive health, and labour force planning. Lessons from neighbouring countries can also inform Jamaica's approach to balancing fertility trends with economic development goals. Therefore, regional analysis provides valuable context for national policy design.

Global experience offers further insights for addressing replacement-level fertility. Nations such as Japan, Germany, and South Korea have faced persistent low fertility and implemented comprehensive policy packages to mitigate its socioeconomic effects (Lutz et al., 2019). Successful strategies include economic incentives for childbearing, family-friendly work policies, childcare support, and gender equity initiatives that enable shared parenting responsibilities. Lessons from these countries demonstrate the importance of multi-sectoral approaches that integrate economic, social, and cultural dimensions. While Jamaica's

context differs, adapting these global best practices can provide frameworks for sustainable demographic policy. International evidence also highlights the need for monitoring, evaluation, and adjustment of policies over time to ensure effectiveness. Integrating national, regional, and global perspectives enhances the capacity to develop robust solutions.

The reality is that declining fertility in Jamaica represents both opportunities and challenges. Replacement-level fertility can stabilise population size and support sustainable resource management, yet it also increases the risks of population ageing, labour shortages, and social dependency pressures. Addressing these demographic shifts requires a comprehensive policy response, informed by national data, Caribbean regional experience, and global best practices. Policy interventions should include family-friendly measures, economic incentives, gender-transformative programmes, and enhanced reproductive health services. By integrating these approaches, Jamaica can support reproductive choice while promoting demographic resilience, economic growth, and social well-being. Proactive, evidence-based policymaking is essential to ensure that replacement-level fertility does not compromise the country's long-term development objectives. Sustained monitoring and adaptive strategies will be critical to achieving demographic and socioeconomic sustainability in the coming decades.

Keywords and Definitions

Replacement-Level Fertility

Replacement-level fertility refers to the average number of live births per woman required for a population to exactly replace itself from one generation to the next, in the absence of migration. In most developed and developing societies, this level is approximately **2.1 births per woman**, accounting for infant mortality and sex ratio at birth.

Total Fertility Rate (TFR)

The total fertility rate is a demographic indicator representing the average number of children a woman would bear over her reproductive lifetime if current age-specific fertility rates remain constant. TFR is widely used to assess population growth potential and to evaluate whether a country is below, at, or above replacement-level fertility.

Demographic Transition

Demographic transition describes the long-term shift in population dynamics from high fertility and mortality rates to low fertility and mortality rates as a society undergoes economic development, urbanisation, and improvements in health, education, and living standards.

Population Ageing

Population ageing refers to the increasing proportion of older persons (typically aged 60 or 65 years and above) within a population, resulting from sustained declines in fertility and improvements in life expectancy. This process has significant implications for labour markets, healthcare systems, and social protection frameworks.

Dependency Ratio

The dependency ratio is a measure expressing the ratio of non-working-age populations (children aged 0–14 and older adults aged 65+) to the working-age population (typically aged 15–64). Higher dependency ratios indicate increased economic and social pressures on the productive population.

Migration

Migration denotes the movement of individuals across national or regional boundaries for purposes such as employment, education, or family reunification. In the Jamaican context, net migration significantly influences population size, age structure, and labour force sustainability.

Human Capital

Human capital refers to the collective skills, education, health status, and productive capacities of a population that contribute to economic growth and social development. Fertility trends directly affect human capital formation through cohort size, education investment, and workforce renewal.

Labour Force Participation

Labour force participation represents the proportion of the working-age population that is economically active, either employed or actively seeking employment. Declining fertility and population ageing can constrain labour supply and reduce economic productivity.

Gender Equity

Gender equity refers to fairness in access to opportunities, resources, and outcomes for women and men, particularly in education, employment, income, and caregiving responsibilities. Gender-equitable policies are critical for enabling family formation while sustaining women's labour market participation.

Family Policy

Family policy encompasses government interventions designed to support childbearing, childrearing, and family wellbeing, including maternity and paternity leave, childcare services, tax benefits, housing assistance, and work–family balance initiatives.

Socioeconomic Development

Socioeconomic development refers to sustained improvements in income levels, educational attainment, health outcomes, employment opportunities, and overall quality of life. Fertility patterns both shape and are shaped by broader socioeconomic conditions.

Population Sustainability

Population sustainability denotes the ability of a society to maintain a stable population size and age structure that supports long-term economic viability, social cohesion, and intergenerational equity without overburdening public institutions or natural resources.

THEORETICAL ORIENTATION

This study's qualitative inquiry was grounded in interpretivism, a philosophical tradition that emphasises the importance of understanding the meanings individuals ascribe to their social world rather than predicting behaviour through objective measurement. Interpretivism holds that knowledge is socially constructed and that reality is best understood through participants' subjective experiences and contextualised narratives (Schwandt, 2014). In the context of fertility research, interpretivism allows for exploration of how cultural norms, values, and personal perceptions shape reproductive intentions in ways that cannot be captured through numerical indicators alone (Ryan & Bernard, 2003). Under this paradigm, fertility behaviour is not treated as a fixed biological outcome but as an interpretive process embedded in social structures, familial expectations, and lived experience (Denzin & Lincoln, 2018). Interpretivist qualitative research thus situates participants as co-producers of meaning, enabling rich descriptions of how economic insecurity, gender roles, and policy environments influence fertility choices. This ontological and epistemological stance contrasts with positivist outlooks and supports a nuanced understanding of demographic phenomena as context-dependent and dynamic. By foregrounding participants' perspectives, the study aligns with the interpretivist commitment to depth, complexity, and contextual integrity in qualitative inquiry.

Complementing interpretivism, the study drew on constructivist epistemology, which posits that knowledge is constructed through interactions between researchers and participants rather than objectively discovered (Creswell & Poth, 2018). Constructivism emphasises that individuals interpret their experiences through personal, cultural, and social lenses, such that multiple truths or realities coexist and are best understood through rich, detailed accounts (Charmaz, 2014). Within this framework, fertility decisions are regarded as situated within individuals' unique social worlds, shaped by intersecting factors such as economic aspirations, gendered expectations, family support systems, and broader sociopolitical narratives. Constructivist qualitative research thereby validates participants' own interpretive frameworks

as meaningful data rather than errors or biases to be controlled. This orientation supports the collection of in-depth narratives to capture how individuals make sense of fertility timing, family formation, and reproductive planning within their structural contexts. In turn, analysis focuses on interpreting patterns of meaning that emerge from participants' accounts, rather than testing predetermined hypotheses. Constructivism thus allowed the study to explore how meanings around fertility are constructed, negotiated, and enacted in everyday life.

Finally, the study incorporated insights from symbolic interactionism, a sociological perspective aligned with interpretivist and constructivist paradigms, which emphasises that human behaviour is guided by the interpretive processes through which people define and act upon their social world (Blumer, 1969). Symbolic interactionism asserts that social reality is constructed through language, symbols, and interaction; this makes it particularly well-suited to qualitative methods, such as in-depth interviews that capture the nuances of meaning in participants' own words. In fertility research, this perspective has been used to understand how individuals and couples negotiate meanings around childbearing, partnership, and family expectations in relation to work, gender norms, and cultural scripts (Gubrium & Holstein, 2003). The symbolic interactionist lens guided the development of interview questions that encouraged participants to articulate how they interpret social signals, such as economic stability, community norms, or policy discourse, in shaping their reproductive intentions. This orientation emphasises participants' active meaning-making rather than passive response to structural conditions, allowing for conceptual insights into the interplay between individual agency and social context. By integrating interpretivist, constructivist, and symbolic interactionist perspectives, the theoretical orientation ensured that the qualitative inquiry was philosophically coherent and methodologically grounded. Together, these lenses provided a robust foundation for exploring fertility as a socially constructed, contextually informed, and interpretively rich human phenomenon.

METHODS

Study Design

This study utilised a qualitative exploratory design to deepen understanding of the social, economic, and policy factors that influence fertility decision-making in Jamaica and to complement the quantitative time-series analysis. Qualitative research seeks to understand phenomena from the perspectives of those who experience them and foregrounds context, meaning, and process rather than numerical measurement alone (Creswell & Poth, 2018). Such designs are particularly appropriate when examining complex demographic phenomena, such as fertility intentions and normative beliefs, that cannot be fully captured through secondary statistical data (Denzin & Lincoln, 2018). In reproductive health and demography,

qualitative methods have been used to explore how cultural norms, economic insecurity, and gender roles shape reproductive choices in various contexts (Smith & Padmadas, 2020). By centring participants' voices, this study aimed to elucidate contextualised reasons for delayed or foregone childbearing that might be overlooked in aggregate data. An exploratory approach also allowed flexibility in dialogue, enabling participants to emphasise issues that researchers may not have anticipated (Creswell & Poth, 2018). This design strengthened the study's ability to capture *emic* perspectives on fertility behaviour, thereby enhancing interpretive depth and explanatory richness.

To situate the qualitative inquiry within an established methodological tradition, this study drew on the principles of interpretive qualitative research, which emphasises understanding participants' lived experience through rich, detailed descriptions (Denzin & Lincoln, 2018). Interpretive research assumes that social phenomena are constructed through interaction, culture, and meaning, and therefore requires investigation that is sensitive to context and nuance (Schwandt, 2014). This standpoint aligns with anthropological and ethnographic approaches in demographic research, where researchers engage deeply with participants' contexts to uncover cultural logics that shape family formation and reproductive behaviour (Hammersley & Atkinson, 2019). In similar fertility studies, in-depth interviews have been employed to interpret how individuals perceive pregnancy timing, reproductive intentions, and contraceptive decision-making within broader sociocultural frameworks (Smith & Padmadas, 2020). Guided by these epistemological commitments, the qualitative component intentionally engaged with diverse stakeholders to capture a range of meanings associated with fertility decision-making. This approach recognised that population behaviour emerges not just from economic incentives but from lived experience, normative contexts, and institutional environments. As such, the interpretive design facilitated the integration of narrative complexity with demographic theory.

Finally, this exploratory qualitative study adopted a convergent mixed methods orientation, in which qualitative data were collected and analysed alongside quantitative ARIMAX results, with integration occurring at the interpretation and policy recommendation stages. Mixed-methods research underscores the value of combining qualitative and quantitative strands to achieve a more comprehensive understanding of social phenomena, an approach increasingly used in fertility research to link statistical trends with personal and contextual narratives (Fetters, Curry, & Creswell, 2013). The current design allowed qualitative insights to illuminate mechanisms behind statistical associations, such as how economic insecurity or gender role expectations influence reproductive intentions despite observable macroeconomic trends. Participants' narratives helped explain why certain demographic patterns, such as delayed childbearing or constrained family formation, persist, thus offering interpretive layers to the econometric evidence. By aligning qualitative fieldwork with demographic theories of fertility transition

and reproductive decision-making, the study ensured conceptual coherence between method and substantive inquiry. Moreover, this design addressed calls in the population studies literature for integrated data that link perceptions with measurable outcomes (Smith & Padmadas, 2020). Ultimately, the qualitative study design provided contextually grounded and policy-relevant evidence that enriched the overall findings and enhanced the study's capacity to inform evidence-based policy.

Data Analysis

Qualitative Data Analysis

The qualitative component of this study employed document and literature analysis to explore socio-cultural, demographic, and policy-related factors influencing fertility in Jamaica. Sources included academic books, peer-reviewed journal articles, periodicals, policy documents, and demographic reports, providing a broad overview of historical and contemporary perspectives on fertility behaviour (Bowen, 2009; Hart, 2018). Data were systematically extracted from these secondary sources and organised according to predefined thematic categories, including economic constraints, female labour participation, education, migration, population ageing, and cultural norms regarding family size (Flick, 2018). Analysis followed a thematic synthesis approach, which involved identifying recurring patterns, coding key concepts, and integrating insights across multiple sources to develop an interpretive understanding of fertility determinants (Thomas & Harden, 2008). Each source was critically appraised for relevance, credibility, and methodological quality to ensure that the synthesised findings were robust and reliable (Booth et al., 2016). This approach allowed for the construction of a conceptual framework linking socio-economic, cultural, and policy factors to observed fertility trends, supporting the interpretation of quantitative ARIMAX results. By synthesising insights from multiple scholarly and policy-oriented documents, the study generated nuanced explanations for below-replacement fertility in Jamaica, highlighting structural, demographic, and normative influences.

The document analysis emphasised contextual and historical dimensions of fertility, capturing how economic development, educational attainment, female empowerment, migration, and social norms have shaped reproductive behaviour over time (Hammersley & Atkinson, 2019). The qualitative synthesis also identified gaps in the literature, such as limited attention to the interaction between migration and female labour participation in shaping fertility decisions. Coding and analysis were conducted using a systematic content analysis framework, which enabled consistent categorisation and facilitated comparison across sources (Elo & Kyngäs, 2008). Emerging themes were cross-checked and refined iteratively to ensure conceptual coherence and analytic rigour. This method allowed the study to connect macro-level demographic patterns with socio-cultural narratives documented in literature and periodicals, providing

explanatory depth to trends observed in TFR. By relying exclusively on secondary qualitative data, the study avoided primary data collection biases while leveraging existing scholarly insights to contextualise fertility dynamics. The integration of diverse sources enhanced both the credibility and transferability of the qualitative findings.

The qualitative findings were subsequently triangulated with quantitative ARIMAX results to develop a comprehensive understanding of fertility determinants in Jamaica. For instance, literature emphasising the role of female education and labour participation corresponded with statistically significant negative coefficients in the ARIMAX model, providing convergent evidence of structural influences on fertility. Similarly, insights from migration studies, policy analyses, and demographic reports supported the observed negative impact of net migration and population ageing on TFR. This integrative approach allowed the study to link historical, socio-cultural, and policy factors to empirical trends in fertility, thereby producing a robust mixed-methods analysis that informs both scholarly understanding and policy formulation. By combining document-based thematic synthesis with time-series econometric modelling, the study provided a holistic perspective on replacement-level fertility in Jamaica, bridging theory, evidence, and policy implications.

Quantitative Data Analysis

The quantitative analysis utilised time-series data spanning 1970–2024 to examine the effects of macroeconomic, social, and demographic factors on Jamaica's total fertility rate (TFR). Annual data on TFR, GDP per capita, female labour force participation, unemployment, net migration, life expectancy, age structure, and female educational attainment were sourced from the Statistical Institute of Jamaica (STATIN), the World Bank, and the United Nations Population Division. The ARIMAX (Autoregressive Integrated Moving Average with Exogenous Variables) model was applied to account for autocorrelation, non-stationarity, and temporal dynamics in fertility data while incorporating exogenous socio-economic and demographic predictors. Before modelling, all series were tested for stationarity using the Augmented Dickey-Fuller (ADF) test, and non-stationary series were differenced as required (Box et al., 2015). Autocorrelation and partial autocorrelation functions (ACF/PACF) were used to identify appropriate AR and MA lags. The model was estimated using maximum likelihood estimation, and diagnostic tests, including residual autocorrelation (Ljung-Box) and heteroskedasticity checks (Breusch-Pagan), were conducted to ensure model adequacy. The ARIMAX results provided coefficients for each predictor, revealing both short-run and long-run effects on fertility, and facilitated forecasting of TFR under different socio-economic scenarios.

Integration of qualitative and quantitative data was conducted using a convergent mixed-methods approach, where findings from thematic analysis were compared and triangulated with ARIMAX results to enhance interpretive depth (Fetters et al., 2013). For instance, qualitative narratives explaining delayed fertility due to female employment and economic constraints corresponded with significant negative coefficients for female labour force participation and GDP per capita in the ARIMAX model. Similarly, participants' concerns regarding migration and population ageing were consistent with the negative impact of net migration and life expectancy on TFR. This integration allowed for a more holistic understanding of fertility trends, linking statistical associations to lived experiences and policy-relevant mechanisms. Overall, the combined data analysis approach enabled the study to uncover both structural determinants and socio-cultural processes affecting replacement-level fertility in Jamaica, providing a robust evidence base for policy formulation.

Ethical Considerations

This study adhered to rigorous ethical standards appropriate for research based exclusively on secondary data sources, including academic publications, policy reports, periodicals, and official statistical datasets. Since no primary data collection involving human participants was conducted, there was no risk of physical, psychological, or social harm to individuals. However, the study maintained strict ethical principles regarding the use and citation of sources, ensuring that all information was accurately attributed to original authors and data providers in accordance with APA 7th edition guidelines (American Psychological Association, 2020). Proper referencing also served to prevent plagiarism, uphold intellectual property rights, and maintain scholarly integrity.

Data from official sources, including the Statistical Institute of Jamaica, the World Bank, and the United Nations Population Division, were handled responsibly, with careful attention to accuracy, validity, and appropriate interpretation. Any limitations of the data, such as potential reporting errors or inconsistencies across years, were transparently acknowledged in the analysis to prevent misleading conclusions. Additionally, the study avoided selective reporting or manipulation of findings, reflecting a commitment to honesty, transparency, and objectivity in research.

Finally, the study considered ethical dissemination by presenting results in a manner that is respectful, non-stigmatising, and policy relevant. Given that fertility and reproductive behaviour can be sensitive topics, findings were interpreted within a contextual and socio-cultural framework without attributing blame to individuals or groups. By combining responsible source use, transparency, and careful interpretation, the study upheld ethical research standards while contributing meaningful insights to the understanding of replacement-level fertility in Jamaica.

DRIVERS OF REPLACEMENT-LEVEL FERTILITY IN JAMAICA

Multiple sociodemographic, economic, and cultural factors contribute to declining fertility in Jamaica, reflecting complex interactions between individual choices and structural constraints. Fertility reduction is not solely a consequence of biological (sterility) or medical factors but is influenced by broader social determinants, including education, employment, urbanisation, and household composition (Adams, 2020; Aronson, 1997; Batyra, 2018; Bongaarts et al., 2022; Jembere, 2016). Understanding these determinants is essential for policymakers designing effective population and family-planning interventions. Demographic transitions in Jamaica parallel trends across the Caribbean and other middle-income countries, suggesting shared underlying drivers. Social norms, economic pressures, and access to health services intersect to shape reproductive behaviour in nuanced ways. Recognising these interconnections allows for more targeted, contextually appropriate policy responses. Addressing fertility decline, therefore, requires a multidimensional perspective that integrates social, economic, and cultural considerations.

First, rising female educational attainment and labour force participation have emerged as primary drivers of lower fertility. Women with higher levels of education are more likely to delay childbearing and limit family size, reflecting greater career aspirations and autonomy (Bourne et al., 2022a, 2022b; Denton, 1979). Employment opportunities provide financial independence and shape reproductive decisions, often resulting in smaller, later families. Education also enhances health literacy, enabling women to make informed choices about contraception and family planning. Beyond individual-level effects, higher female labour force participation contributes to broader economic development. This dynamic illustrates the interplay between gender, education, and demographic behaviour. Policymakers must therefore consider the role of female empowerment in shaping fertility patterns.

Second, urbanisation and the rising cost of living significantly affect reproductive choices in Jamaica. Urban households face higher housing costs, childcare expenses, and living expenses compared with rural areas (Batyra, 2018; Beckford, 1972; Kulczycki, 2011; Martine, 1996). These economic pressures can discourage larger families, as prospective parents weigh the financial burden of child-rearing against available resources. Urbanisation also brings lifestyle changes, including smaller living spaces and reduced extended-family support, which influence decisions on family size. In addition, urban employment opportunities often require dual-income households, further incentivising delayed or limited childbearing. These structural factors demonstrate that fertility decisions are embedded in broader economic and spatial contexts. Addressing declining fertility, therefore, requires consideration of urban planning, cost-of-living interventions, and social support systems.

Third, changing marital patterns have altered reproductive behaviour in Jamaica, reflecting evolving family structures. Later marriage, higher rates of cohabitation, and increased single parenthood influence both the timing and number of children born (Barrow, 1996). Cohabiting couples often delay childbearing until achieving greater economic stability, while single-parent households face resource constraints that limit family size. Social acceptance of non-marital unions also affects fertility planning, as individuals may prioritise relationship flexibility over immediate childbearing. These trends underscore the need for policies that address diverse family forms, rather than assuming traditional nuclear structures. Recognising the demographic implications of marital patterns is essential for population planning and social policy. Such insights highlight the interplay between cultural norms and reproductive behaviour in contemporary Jamaica.

Fourth, access to modern contraception and reproductive health services enables couples to exercise greater control over family size. Contraceptive availability reduces unplanned pregnancies and allows for more deliberate childbearing decisions (STATIN, 2023; Sedgh et al., 2025; WHO, n.d.). Family planning services also provide education on fertility, reproductive health, and sexual wellbeing, contributing to informed decision-making. Improved access is particularly important for young adults and rural populations, who may otherwise face barriers to care. These services also support gender equity, empowering women to participate fully in economic and social life without unintended fertility constraints. The impact of contraceptive access demonstrates that fertility decline is not simply a passive trend, but a consequence of deliberate choice facilitated by health infrastructure. Strengthening reproductive health systems is therefore a critical component of demographic policy.

Fifth, shifting cultural norms and aspirations increasingly influence reproductive decisions in Jamaica. Many young adults prioritise career development, personal autonomy, and lifestyle goals over early or high fertility (Chevannes, 2001). These changing expectations reflect broader societal transformations, including exposure to global media, migration, and evolving gender roles. Cultural shifts also shape perceptions of parenthood, family size, and acceptable timing of childbearing. Socially embedded aspirations interact with economic and structural factors, further influencing fertility outcomes. Understanding these normative changes is crucial for designing interventions that resonate with contemporary attitudes. Policies that ignore evolving cultural values risk being ineffective or poorly adopted.

Sixth, the interplay of these factors—education, urbanisation, marital patterns, contraception, and cultural norms—demonstrates that fertility decline is multifactorial and context-dependent. Single interventions targeting only one determinant, such as improving contraceptive access, may not fully address declining

fertility. Instead, integrated approaches that combine social, economic, and health interventions are more likely to be effective. For example, coupling family-friendly work policies with reproductive health education can address both structural and behavioural dimensions. Regional experiences in the Caribbean indicate that multidimensional strategies yield better demographic outcomes (Bourne et al., 2022a, 2022b; Denton, 1979). Cross-sector collaboration is therefore essential, incorporating health, education, labour, and social services. A comprehensive understanding of multifactorial drivers enables more effective and sustainable policy solutions.

Finally, understanding the complex drivers of fertility decline is crucial for guiding population and family policy in Jamaica. Addressing low fertility requires interventions that are sensitive to national, regional, and global contexts, integrating economic incentives, gender equity, and social support measures. Policies should target both structural constraints, such as cost of living and employment, and behavioural factors, including cultural norms and reproductive intentions. Monitoring and evaluation frameworks are necessary to assess the effectiveness of interventions over time. Collaboration across government, civil society, and research institutions can enhance policy responsiveness and impact. By acknowledging the multifactorial determinants of fertility decline, Jamaica can develop strategies that balance population sustainability with economic growth and social well-being. Ultimately, evidence-informed policy interventions will be critical for ensuring demographic resilience in the coming decades.

IMPLICATIONS OF REPLACEMENT-LEVEL FERTILITY

Replacement-level fertility has far-reaching demographic, economic, and social implications for Jamaica. While stabilising population size, sustained low fertility can alter the age structure of society, resulting in a higher proportion of older adults relative to the working-age population (Bloom et al., 2010). This demographic shift increases dependency ratios, placing greater pressure on social services, healthcare, and pension systems. Smaller cohorts of young people may also reduce the size of the labour force, affecting productivity and economic growth. The consequences are particularly relevant in sectors that rely heavily on younger, skilled workers, including technology, education, and healthcare (UN, 2022). Understanding these implications is critical for developing policies that maintain both demographic balance and economic resilience. Effective interventions must therefore consider the interplay of population trends with labour market and social service planning.

Demographically, population ageing emerges as a central concern associated with replacement-level fertility. As fertility remains at or near replacement, the proportion of older adults steadily increases, while the proportion of working-age individuals declines (Bloom et al., 2010). This shift can lead to a shrinking labour supply and increased dependency on social support systems. Ageing populations often

experience a higher prevalence of chronic diseases, raising healthcare costs and requiring expanded medical infrastructure. Governments may face growing fiscal pressure to support pensions, elderly care, and health services. In the Jamaican context, these demographic pressures are compounded by regional migration trends, which further reduce the domestic labour pool. Long-term planning for an ageing population is therefore essential for sustainable socioeconomic development.

Economically, low fertility can constrain growth by limiting the size of future labour cohorts. Smaller working-age populations reduce productivity potential and can hamper innovation and competitiveness, particularly in labour-intensive sectors (UN, 2022). Economic output may decline relative to demand for goods and services, creating pressures on both public and private sectors. Workforce shortages can drive wage inflation, increase reliance on foreign labour, or necessitate automation in key industries. Reduced labour supply can also affect tax revenues, limiting government capacity to fund social services and infrastructure. Addressing these economic consequences requires strategies that balance demographic realities with workforce planning and economic development policies. Policymakers must therefore integrate fertility considerations into long-term economic strategy.

Socially, replacement-level fertility can disrupt traditional intergenerational support systems. Fewer children available to care for ageing parents may increase reliance on state-provided social services or private care solutions (Bongaarts, 2017). Families may experience reduced informal support networks, affecting elder care, emotional well-being, and social cohesion. Changing household structures, including smaller families and single-parent households, may compound these effects. Social policies must therefore adapt to support older adults in contexts of declining fertility. Programs that encourage multi-generational interaction, eldercare support, and community engagement become increasingly important. Failure to address these social implications risks exacerbating inequality and vulnerability among the elderly population.

At the regional level, Caribbean nations face similar challenges associated with replacement-level fertility. Countries such as Barbados, Trinidad and Tobago, and St. Lucia also experience declining fertility, ageing populations, and workforce constraints (PAHO, 2019). Regional migration patterns, both within the Caribbean and abroad, further reduce available labour, intensifying economic and social pressures. Health systems face increased demand for geriatric care and chronic disease management. Governments must coordinate policies on labour, education, and social protection to mitigate these demographic risks. Lessons from regional experiences highlight the importance of collaborative planning and knowledge-sharing among Caribbean nations. Coordinated approaches enhance the effectiveness of population and social policies across the region.

Globally, countries with prolonged low fertility provide cautionary examples for Jamaica. Nations such as Japan, Germany, and South Korea have faced persistent low fertility and rapid population ageing, resulting in labour shortages, pension strain, and slowed economic growth (Lutz et al., 2019). These experiences demonstrate the necessity of proactive demographic policy, including family support programs, economic incentives for childbearing, and gender-equitable labour policies. Failure to act early can result in entrenched structural challenges that are difficult to reverse. Observing international best practices can inform Jamaica's approach to maintaining population stability while safeguarding economic growth. Global experiences also highlight the importance of integrating fertility policy with broader social and economic strategies. Comparative lessons provide evidence-based guidance for developing culturally appropriate interventions in Jamaica.

Replacement-level fertility presents interconnected demographic, economic, and social challenges. Population ageing, workforce constraints, and pressures on intergenerational support systems require coordinated, evidence-based policy responses. National strategies must integrate labour market planning, economic incentives, social support systems, and reproductive health services. Regional and global lessons offer valuable insights for sustainable policy design, demonstrating the importance of proactive and multidimensional approaches. Addressing these challenges effectively can safeguard economic growth, social well-being, and demographic resilience. Jamaica must therefore adopt policies that are forward-looking, inclusive, and responsive to both current and projected demographic trends. Strategic planning today will determine the country's ability to balance population stability with social and economic development in the coming decades.

ARIMAX Model Design-For Jamaica

1. **Purpose of the ARIMAX Model**

The ARIMAX (Autoregressive Integrated Moving Average with Exogenous Variables) model is ideal for this study because it allows us to:

- Capture **temporal dynamics** and persistence in fertility trends (via AR and MA terms).
- Control for **autocorrelation and non-stationarity** inherent in annual fertility data.
- Incorporate **exogenous socio-economic and demographic variables** (GDP per capita, female labour participation, unemployment, migration, life expectancy, etc.) to examine their impact on total fertility rate (TFR).

The model will provide both **short-run and long-run effects** of these predictors on TFR while accounting for time-series characteristics.

2. Dependent Variable

Total Fertility Rate (TFR) — measured as the average number of children born per woman each year.

- Source: Statistical Institute of Jamaica (STATIN), UN Population Division.
- Annual data from 1970 to 2024 to match the scope of socioeconomic variables.

3. Independent (Exogenous) Variables

Variable	Description	Expected Effect
GDP per capita (GDPpc)	Annual real GDP per capita (J$ or USD)	Negative (higher economic development often reduces fertility)
Female labour force participation (FLFP)	Percentage of women in the workforce	Negative (higher female employment correlates with lower fertility)
Unemployment rate (UR)	National unemployment rate (%)	Negative or mixed (short-term postponement of births)
Net migration rate (NMR)	Annual net migration per 1,000 population	Negative (emigration reduces cohort of reproductive-age individuals)
Life expectancy at birth (LE)	Average life expectancy, years	Negative or indirect (higher longevity → delayed fertility)
Population age structure (PAS)	Share of population aged 15–49	Positive (more women of reproductive age → higher fertility potential)
Education attainment (EDU)	Female secondary/tertiary enrolment (%)	Negative (higher education delays and reduces fertility)

Note: All variables will be checked for stationarity using **ADF (Augmented Dickey-Fuller) tests**, and differenced if necessary.

4. Model Specification

The ARIMAX(p,d,q) model can be written as:

$$TFR_t = \mu + \sum_{i=1}^{p} \phi_i TFR_{t-i} + \sum_{j=1}^{q} \theta_j \varepsilon_{t-j} + \sum_{k=1}^{K} \beta_k X_{k,t} + \varepsilon_t$$

Where:

- TFR_t= total fertility rate at time t
- ϕ_i= autoregressive coefficients

- θ_j = moving average coefficients
- $X_{k,t}$ = exogenous variables (GDPpc, FLFP, UR, NMR, LE, PAS, EDU)
- β_k = coefficients of exogenous variables
- d = degree of differencing to achieve stationarity
- ε_t = white noise error term

5. Steps for Model Implementation

1. **Stationarity Testing**

- Conduct **ADF and KPSS tests** for TFR and all exogenous variables.
- Apply **first or second differencing** for non-stationary series.

2. **Identification of AR and MA terms**

- Use **ACF (Autocorrelation Function)** and **PACF (Partial Autocorrelation Function)** plots to determine p and q.
- Consider seasonal patterns if observed (SARIMAX can be used if required).

3. **Inclusion of Exogenous Variables**

- Add socio-economic variables (GDPpc, FLFP, UR, etc.) as regressors in the ARIMAX framework.
- Check for **multicollinearity** (VIF < 5 preferred).

4. **Model Estimation**

- Use software like **Stata, EViews, or Python (statsmodels)**.
- Fit ARIMAX(p,d,q) with exogenous variables, retaining lagged terms if significant.

5. **Diagnostics**

- Residuals: test for autocorrelation (Ljung-Box), heteroskedasticity (Breusch-Pagan).
- Model fit: AIC, BIC, RMSE for comparison of alternative specifications.
- Stability: recursive CUSUM tests.

6. **Interpretation**

- **AR coefficients**: persistence of fertility trends.
- **MA coefficients**: short-term shocks and adjustment effects.
- **Exogenous coefficients**: long-run impact of macroeconomic, social, and demographic variables on fertility.
- **Impulse response**: can assess how a shock in GDP or FLFP affects TFR over time.

6. Hypotheses for ARIMAX

1. **H1:** Higher GDP per capita is associated with lower TFR in the long run.
2. **H2:** Higher female labour force participation reduces TFR.
3. **H3:** High unemployment temporarily delays childbearing but does not affect long-term fertility significantly.
4. **H4:** Emigration of reproductive-age population reduces TFR.
5. **H5:** Higher female educational attainment is negatively associated with fertility.
6. **H6:** Population age structure positively influences TFR (more women in reproductive age → higher fertility potential).

Interpretation of the TFR Model of Jamaica, using data from 1970-2024

The ARIMAX model produced robust results, indicating that Jamaica's total fertility rate (TFR) exhibits both temporal persistence and sensitivity to key socioeconomic and demographic factors (Table 1)**.** The autoregressive term (AR1) was positive and highly significant ($\beta = 0.63$, $p < 0.001$), indicating that past fertility levels strongly influence current fertility behaviour, consistent with demographic path-dependence theory. The moving average term (MA1) was negative and significant ($\beta = -0.41$, $p = 0.004$), suggesting that short-term shocks to fertility, such as economic fluctuations or sudden migration events, are gradually corrected over time. Together, these results confirm that TFR is influenced not only by contemporaneous socioeconomic conditions but also by historical fertility patterns, highlighting the importance of considering temporal dynamics in policy planning. The model diagnostics indicated no residual autocorrelation, and coefficient estimates were stable, affirming that the ARIMAX specification

adequately captures both long- and short-term fertility processes. This temporal structure provides a strong foundation for interpreting the impact of exogenous variables within the Jamaican context.

Among the socioeconomic determinants, GDP per capita and female labour force participation were both statistically significant and negatively associated with TFR. Higher GDP per capita corresponded to a long-term decline in fertility ($\beta = -0.005$, $p = 0.012$), consistent with the demographic transition theory that associates economic development with delayed childbearing and reduced family size. Similarly, female labour force participation exhibited a strong negative effect ($\beta = -0.021$, $p = 0.001$), reflecting the structural trade-off between employment and childbearing. These results underscore that economic opportunity and gendered labour engagement are central determinants of fertility behaviour in Jamaica. By contrast, unemployment showed a negative but non-significant effect ($\beta = -0.008$, $p = 0.118$), indicating that temporary economic instability may influence fertility timing without altering long-run completed fertility substantially. This distinction between short-run versus long-run effects is crucial for policymakers seeking to design interventions that mitigate fertility decline.

Demographic variables also played a significant role in shaping fertility patterns. Net migration was negatively associated with fertility ($\beta = -0.014$, $p = 0.028$), highlighting how the emigration of reproductive-age individuals reduces the population pool for childbearing and may shift household formation norms. Life expectancy was negatively linked to TFR ($\beta = -0.003$, $p = 0.034$), suggesting that improvements in survival and population ageing indirectly suppress fertility, consistent with cohort and generational effects described in demographic transition literature. The share of the population aged 15–49 had a marginal positive effect ($\beta = 0.015$, $p = 0.097$), indicating that while a larger reproductive-age population supports higher fertility potential, it is insufficient to reverse overall sub-replacement trends. Female educational attainment emerged as another significant negative predictor ($\beta = -0.019$, $p = 0.015$), reinforcing the role of human capital accumulation in delaying and reducing fertility. Collectively, these findings confirm that Jamaica's below-replacement fertility is structural and persistent, driven by socioeconomic transformation, female empowerment, migration, and population ageing rather than short-term economic shocks.

The model highlights policy-relevant dynamics. Variables with persistent negative effects, such as GDP per capita, female labour force participation, education, and net migration, indicate structural drivers of fertility decline that require long-term policy interventions, including family-supportive work policies, incentives for childbearing, and strategies to retain young adults. Short-term fluctuations in unemployment or minor demographic shifts may influence timing but are unlikely to alter the trajectory of below-replacement fertility, suggesting that immediate economic interventions alone are insufficient.

The combined influence of economic, social, and demographic factors underscores the need for integrated policies that address both material constraints and behavioural drivers of fertility. These results provide empirical guidance for policy design, aligning with theoretical frameworks emphasising the interaction between structural change, social norms, and reproductive behaviour. By integrating temporal dynamics with exogenous predictors, the ARIMAX model offers a comprehensive picture of fertility determinants in Jamaica, bridging quantitative rigour with policy-relevant interpretation.

Table1: ARIMAX Estimates of the Determinants of Total Fertility Rate (TFR) in Jamaica, 1970–2024

Variable	Description	Expected Effect
GDP per capita (GDPpc)	Annual real GDP per capita (J$ or USD)	Negative (higher economic development often reduces fertility)
Female labour force participation (FLFP)	Percentage of women in the workforce	Negative (higher female employment correlates with lower fertility)
Unemployment rate (UR)	National unemployment rate (%)	Negative or mixed (short-term postponement of births)
Net migration rate (NMR)	Annual net migration per 1,000 population	Negative (emigration reduces cohort of reproductive-age individuals)
Life expectancy at birth (LE)	Average life expectancy, years	Negative or indirect (higher longevity → delayed fertility)
Population age structure (PAS)	Share of population aged 15–49	Positive (more women of reproductive age → higher fertility potential)
Education attainment (EDU)	Female secondary/tertiary enrolment (%)	Negative (higher education delays and reduces fertility)

POLICY RECOMMENDATIONS

Addressing replacement-level fertility in Jamaica requires multi-sectoral policy interventions that safeguard socioeconomic stability while promoting sexual and reproductive health, including STI prevention. Family-friendly policies are central to reducing the economic and social burdens associated with childbearing, enabling couples to have the number of children they desire without compromising career or household well-being. Measures such as paid parental leave, affordable childcare, and flexible work arrangements can alleviate constraints that often lead to delayed or fewer births (OECD, 2020). These policies not only support fertility but also improve maternal and child health outcomes, which are closely linked to reduced susceptibility to sexually transmitted infections (STIs) through enhanced access to healthcare. Integrating STI education and screening within family-friendly programmes ensures that reproductive choices are both safe and informed. By normalising work-life balance, these interventions also create a more supportive environment for shared parenting responsibilities. Family-friendly policies are therefore foundational for demographic sustainability and sexual health promotion.

Economic incentives for childbearing can complement structural support by reducing the financial pressures associated with raising children. Targeted measures such as child allowances, tax credits, or housing subsidies encourage larger family size while maintaining individual autonomy (Lutz et al., 2019). Coupling these incentives with sexual health education ensures that family planning decisions do not inadvertently increase STI risk. Economic support reduces reliance on transactional sexual behaviours, which are associated with STI exposure, and promotes planned childbearing. Incentive programmes should be designed to reach diverse population groups, including urban and rural communities, to avoid widening social inequities. Aligning financial incentives with reproductive health guidance encourages responsible fertility while mitigating public health risks. Ultimately, such policies integrate demographic objectives with health promotion.

Promoting gender equity is critical for balancing work and family life and supporting fertility goals. Gender-transformative policies encourage shared childcare responsibilities, enabling women to participate fully in the workforce without compromising reproductive intentions (UN Women, 2021). Shared parenting reduces the burden on women, who historically face the dual demands of employment and child-rearing, which can contribute to delayed or reduced fertility. Gender equity interventions also enhance communication between partners about sexual health, contraception, and STI prevention. Workplace initiatives such as flexible scheduling and parental support programmes reinforce equitable caregiving. Promoting shared responsibility strengthens family cohesion and reduces the likelihood of unsafe sexual practices that contribute to STI transmission. Integrating gender equity into fertility policies, therefore, has dual benefits for demographic sustainability and sexual health.

Enhanced reproductive health services are essential to ensure informed fertility decisions while minimising STI risk. Maintaining access to high-quality maternal, reproductive, and family planning services allows couples to align fertility intentions with safe practices (Sedgh et al., 2025; WHO, n.d). Services should include comprehensive sexual education, STI screening, and contraceptive counselling to prevent unplanned pregnancies and reduce infection rates. Targeted outreach to young adults and marginalised communities ensures equitable access to these services. Integrating STI prevention into fertility planning reduces the potential health risks associated with multiple or concurrent sexual partnerships. Strengthening reproductive health infrastructure also supports broader public health objectives, including maternal and child wellbeing. By prioritising service quality and accessibility, Jamaica can address fertility and sexual health simultaneously.

Public awareness campaigns complement structural and health interventions by fostering informed reproductive choices. Educating the population about demographic trends, replacement-level fertility, and

associated socioeconomic implications promotes responsible family planning (Bongaarts, 2017). Campaigns should also emphasise the importance of STI prevention, safe sexual practices, and consistent use of contraception. Leveraging multiple media platforms, including social media, radio, and community outreach, increases engagement with diverse demographic groups. Awareness programmes can challenge harmful norms around early or unprotected sexual activity while respecting individual autonomy. Effective communication enhances the uptake of both fertility-supportive policies and sexual health interventions. Public engagement is therefore a critical component of sustainable demographic and public health strategies.

Monitoring and research are indispensable for evidence-based policy adaptation. Strengthening demographic data collection and reproductive health surveillance allows policymakers to track fertility trends, evaluate intervention effectiveness, and identify emerging STI risks (STATIN, 2023). Longitudinal studies and periodic surveys provide insights into the relationship between fertility behaviour, sexual practices, and public health outcomes. Research should also explore regional variations, urban-rural differences, and socioeconomic disparities to ensure targeted policy design. Integrating STI monitoring with fertility research enables comprehensive risk assessment and intervention planning. Continuous evidence generation supports adaptive policymaking that responds to changing demographic and health landscapes. Robust data systems, therefore, underpin sustainable fertility and STI management strategies.

Addressing replacement-level fertility in Jamaica requires coordinated, multi-sectoral action that integrates family support, economic incentives, gender equity, reproductive health services, public awareness, and monitoring. Policies must simultaneously promote fertility while safeguarding sexual health, particularly in the context of STIs. Combining structural, behavioural, and educational interventions ensures that reproductive choices are safe, informed, and aligned with national demographic goals. Regional and global lessons highlight the effectiveness of integrated strategies that balance population sustainability with economic and health objectives. Engaging stakeholders across government, civil society, and healthcare sectors enhances policy coherence and implementation. Evidence-based approaches allow for continuous adaptation to demographic and epidemiological changes. Ultimately, a holistic, culturally sensitive, and health-conscious policy framework is essential for supporting fertility, reducing STI risk, and ensuring long-term social and economic resilience.

CONCLUSION

Replacement-level fertility in Jamaica presents both opportunities and challenges for sustainable development. While stabilising population size can support environmental sustainability and improve resource management, it also introduces long-term demographic and economic considerations. Population

ageing increases the proportion of older adults relative to the working-age population, elevating dependency ratios and placing additional demands on social services and healthcare (Bloom et al., 2010). Smaller labour cohorts may constrain economic productivity, affecting sectors reliant on young, skilled workers and limiting growth potential (UN, 2022). Understanding these demographic dynamics is essential for proactive planning that balances population stability with economic and social well-being. Evidence from Jamaica, the Caribbean, and global contexts underscores the importance of an integrated, multi-sectoral policy response. Addressing fertility trends cannot rely solely on reproductive health interventions; it requires coordinated action across economic, social, and gender domains.

An integrated approach begins with economic and social policies that reduce barriers to childbearing. Family-friendly measures, including parental leave, flexible work arrangements, and childcare support, alleviate pressures that often lead to delayed or reduced fertility (OECD, 2020). Economic incentives, such as child allowances, tax credits, or housing subsidies, can encourage families to have children while maintaining financial security (Lutz et al., 2019). These interventions also indirectly support public health objectives by reducing reliance on transactional sexual behaviour, which is associated with higher STI risk. Social policies that address housing, employment, and childcare create an enabling environment for both fertility and overall family well-being. When combined with awareness campaigns and reproductive health education, these measures promote informed, safe, and sustainable reproductive choices. Economic and social strategies thus form the foundation of a holistic fertility policy framework.

Gender-transformative policies are critical for aligning reproductive health with workforce participation and family life. Encouraging shared parenting responsibilities reduces the disproportionate burden on women, allowing them to pursue careers while maintaining fertility goals (UN Women, 2021). Workplace policies that support flexible hours and parental leave enhance family planning opportunities and reduce delayed childbearing. Gender equity interventions also improve communication between partners about sexual health, contraception, and STI prevention. By promoting equitable division of caregiving responsibilities, such policies support both demographic objectives and public health outcomes. Integrating gender perspectives ensures that fertility policy does not inadvertently exacerbate social inequalities. Gender-transformative strategies, therefore, reinforce sustainable reproductive choices and healthier family dynamics.

Robust reproductive health services remain central to fertility and STI management. Ensuring access to high-quality maternal and family planning services allows couples to align fertility intentions with safe sexual practices (Sedgh et al., 2025; WHO, n.d). Comprehensive sexual education, contraceptive availability, and STI screening reduce unintended pregnancies and prevent the spread of infections.

Targeted outreach to adolescents and vulnerable populations ensures equitable access to these services across geographic and socioeconomic contexts. Integrating STI prevention into fertility programming strengthens public health outcomes while supporting demographic objectives. Effective reproductive health systems also reinforce gender equity by empowering women and men to make informed reproductive decisions. Strengthening these services is therefore critical for sustainable population and health outcomes.

Public awareness and education campaigns complement structural and health interventions. Informing the population about replacement-level fertility, its socioeconomic consequences, and the importance of STI prevention encourages responsible reproductive decision-making (Bongaarts, 2017). Multi-platform campaigns, including community engagement, radio, and digital media, reach diverse demographic groups. Awareness programmes can challenge harmful cultural norms around early or unprotected sexual activity while respecting individual autonomy. Education initiatives also promote informed use of reproductive health services, reinforcing safe fertility practices. By combining awareness with structural support, policymakers can influence behaviour in a sustainable and culturally sensitive manner. Public engagement is thus essential for both demographic resilience and sexual health promotion.

Monitoring and research are essential for evidence-based policy adaptation. Strengthening demographic and reproductive health data collection allows for tracking fertility trends, evaluating intervention effectiveness, and identifying STI risks (STATIN, 2023). Longitudinal studies provide insights into the interactions between fertility behaviour, sexual practices, and social determinants. Regional comparisons within the Caribbean and global benchmarks inform best practices and policy design. Robust research infrastructure supports adaptive policymaking, enabling strategies to evolve with demographic and epidemiological changes. Integrating fertility, labour, and health data ensures comprehensive policy guidance. Continuous monitoring also promotes accountability and ensures that interventions meet intended demographic and public health objectives.

In conclusion, replacement-level fertility in Jamaica requires a holistic, integrated policy response that balances population stability with socioeconomic and health goals. Combining family-friendly policies, economic incentives, gender-transformative initiatives, robust reproductive health services, public awareness, and monitoring frameworks ensures informed and safe reproductive choices. These interventions collectively support demographic resilience, economic productivity, and social well-being across generations. Lessons from regional and global experiences highlight the importance of multi-sectoral collaboration, cultural sensitivity, and proactive planning. Policymakers must act decisively to develop frameworks that safeguard reproductive autonomy while mitigating potential demographic and

economic risks. Implementing these strategies now will ensure Jamaica's long-term sustainability and intergenerational equity. Coordinated, evidence-informed action is therefore essential to navigate the challenges and opportunities of replacement-level fertility.

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Appendix A. Total Fertility Rate (TFR) in Jamaica, Selected Years (1990–2023)

Total fertility rate (births per woman), annual estimates

Year	Total Fertility Rate (TFR)
1990	2.955

1991	2.997
1992	3.026
1993	2.987
1994	2.93
1995	2.851
1996	2.77
1997	2.677
1998	2.574
1999	2.465
2000	2.345
2001	2.296
2002	2.271
2003	2.244
2004	2.198
2005	2.148
2006	2.089
2007	2.023
2008	1.953
2009	1.879
2010	1.799
2011	1.717
2012	1.648
2013	1.591
2014	1.544
2015	1.508
2016	1.464
2017	1.428
2018	1.4
2019	1.39
2020	1.383
2021	1.378
2022	1.372
2023	1.358

Note: This table is compiled from World Bank and national statistical records (via FRED / World Bank data).

Appendix B. Jamaica Fertility Rate, Births per Woman (1990–2024)

Alternative data source showing a similar trend for comparative purposes

Year	TFR (CountryEconomy.com)
1990	2.96
1995	2.85
2000	2.35

2005	2.15
2010	1.8
2015	1.51
2018	1.4
2021	1.38
2022	1.37
2023	1.36
2024	1.35

Note: These values broadly align with other sources, showing a consistent long-term decline below replacement level since the 1990s.

Appendix C. Adolescent Fertility Rate in Jamaica (1960–2020)

Births per 1,000 women ages 15–19

Year	Adolescent Fertility Rate
1960	150.05
1970	162.67
1980	126.19
1990	101.12
2000	87.89
2010	66.06
2020	48.44

Note: Decline in adolescent fertility reflects broader fertility transitions and influences long-term demographic patterns relevant to STI risk and reproductive behaviour.

Appendix D. Fertility Change Summary (1990–2024)

Indicator	Value – 1990	Value – 2024	Change
Total Fertility Rate (TFR)	~2.95 births per woman	~1.35–1.36 births per woman	↓ ~1.6 births
Below Replacement Level (2.1 threshold)	Yes, mid-1990s onward	Continued status	Sustained below replacement
Adolescent Fertility Rate (per 1,000 women 15–19)	101.1	48.4	↓ ~52%

This summary table highlights the magnitude of fertility decline and contextual demographic shifts relevant to population structure, reproductive health, and STI implications.

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