

A Survival Analysis of Marital Status and Labor Force Participation on Mortality Risk in Bangladesh: A Cox Proportional Hazards Model Approach

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Abstract

This study is a research study examining the interrelationship between marital status, labor force participation, and mortality in Bangladesh as secondary sources of data, namely, the Bangladesh Population and Housing Census (2022), the Sample Vital Registration System (SVRS 2022), and the Bangladesh Demographic and Health Survey (BDHS 2022). The research aims is to investigate the relationship between socio-demographic characteristics and the labor force participation and mortality risk. Descriptive statistics indicate that widowed and divorced people especially the inactive ones economically, have higher rates of deaths. The analysis uses Cox Proportional Hazards Models to measure the hazard ratios (HR) of various demographic groups in which widowed people were found to be at 73% higher risk of dying than their married counterparts. The risk of mortality in the economically inactive people is 9 % higher than those who are active. This study concludes that marital status and labor force participation are equally important factors that lead to mortality, and inactivity and marital disruption together increase health susceptibility especially among women and the rural population. This study also proposes policies that will enhance access to healthcare and economic opportunities, especially to widowed, divorced, and non-economic active groups, especially in the rural areas.

Key Words: Marital status, Labor force participation, Mortality risk, Gender disparities, Public health policy

Introduction

Mortality patterns in Bangladesh are shaped by various socio-economic determinants, including marital status and labor force participation. Married persons and individuals in the labor force enjoy better health and lower mortality than unmarried and inactive individuals (N Goldman., 1990, Annika M.H. Åhs., 2006). Marriage often provides emotional and financial support (Sally Wyke, Graeme Ford, 1992) and it can reduce the risk of unhealthy behaviors such as poor diet or alcohol use leading to better health outcomes (D Umberson, 1992). Conversely, individuals who are widowed, divorced, or single may lack social and financial security, increasing their vulnerability to health risks. Similarly, Labour force participation could provide financial independence and the possibility to accumulate earnings and wealth (S Arber, 1991). It may also provide a source of social support, social recognition, and self-esteem and is associated with better access to healthcare, contributing to lower mortality rates (Carme Borrell, 2004). The fact that labor force participation and marriage share some of the pathways through which they potentially influence health raises the possibility that they interact in the way they influence health and mortality. For example, the lack of a partner's social support for a divorced man or woman may be partly compensated by the availability of social support derived from colleagues and friends at work. Similarly, the lack of financial security provided by own earnings from work could be compensated by the presence of a partner who is active in the labor market. A substantial body of research has looked into whether combining employment, marriage, and/or parenthood is associated with health (P Martikainen, 1995). Some of the theories on combining multiple roles may be useful to understand these relationships. The role accumulation hypothesis postulates that having multiple roles provides benefits for women, as employment provides financial independence and social support (L M Verbrugge, 1986). On the other hand, the multiple role hypothesis suggests that combining employment, marriage, and parenthood may be harmful to women's health due to increased stress from competing demands (P Martikainen, 1995). Fulfilling the obligations of each role may lead to role overload and conflict, which may result in an increased risk of disease and mortality (G Sorensen, L M Verbrugge, 1987). There are important gender differences in the distribution of multiple roles, as well as role expectations, between men and women (Selim et al., 2025), which may lead to different associations with health and mortality (C Borrell, J Benach., 2001). For example, role expectations imply that generally men are more often expected to be active in the labor market than women. As a result, being out of the labor force may lead to more stress and health deterioration for males than for females. There may be also gender differences in the selection processes leading to marriage and employment: men out of the labor force may be a more selective group in terms of poor health and disability, while women may be out of the labor market more often out of choice, particularly women who are married (Selim et al., 2025). The interaction between marriage and labor force participation may differ with different social



protection policies. However, unemployment and informal employment present significant challenges, particularly in rural areas.

A major feature of Bangladesh labor market is its duality (Selim et al., 2025): while a portion of the population is employed in the formal sector, the majority works in informal, unregulated jobs without legal protection or social security benefits. According to the BBS Labor Force Survey (2022), over 85% of the labor force is engaged in the informal sector, with women disproportionately represented in low-wage and insecure employment. Female labor force participation remains low at around 38%, compared to 81% for men, due to cultural barriers, unpaid care responsibilities, and limited access to formal employment. Economically inactive populations—particularly elderly women, homemakers, and persons with disabilities—are among the most vulnerable to adverse health outcomes. Youth unemployment and underemployment remain major challenges, potentially impacting long-term health and wellbeing.

In terms of marital patterns, Bangladesh continues to exhibit high rates of early and near-universal marriage, particularly for women. Child marriage remains a significant issue despite legal restrictions, with around 51% of women aged 20–24 reporting marriage before age 18 (UNICEF, 2022). Early and often economically dependent marriages can have long-term consequences for women's health, autonomy, and mortality risk (Hasan et al., 2025). Widowhood is more prevalent among women, due to gender gaps in life expectancy and the tendency for women to marry older men. Divorce and separation are rising, albeit from a low base, especially in urban areas, contributing to social stigma and economic vulnerability for affected individuals.

Gender disparities are deeply embedded in both labor force participation and mortality risks. Cultural expectations often confine women to unpaid domestic roles, contributing to their economic inactivity and dependence on male family members. This economic vulnerability, combined with reduced healthcare access and social marginalization, significantly heightens health risks among women, especially those who are unmarried, widowed, or divorced.

Understanding the factors that influence mortality is essential for improving public health and ensuring social well-being (Yeasmin et al, 2025). In Bangladesh, marital status and labor force participation are two key social determinants that are often overlooked in mortality research and policy discussions (Khanom et al., 2024; Banu et al., 2021). Although several studies have examined health outcomes based on income, age, or gender, very few have explored how marital relationships and economic activity jointly impact mortality.

In this study we examine whether labor force participation and marriage interact in their association with mortality in Bangladesh, whether labor force participation modifies the association between marriage and mortality and whether marital status modifies the association between labor force participation and mortality. We hypothesize that marriage attenuates the mortality risk associated with labor force inactivity, while labor force participation attenuates the mortality risk associated with being unmarried.

Review of Literature

Literature Review

Jahan and Sultana (2023) focused on young adults and early marriage in rural Bangladesh. They found that early marriage, especially among women aged 15–18, had long-term health implications, including early childbirth complications, increased maternal mortality, and low participation in the labor force. The study stressed the need for integrated education and reproductive health programs.

BBS (2022) provided key labor force statistics for Bangladesh, indicating that over 85% of the workforce is employed in the informal sector. Informal employment lacks job security, healthcare benefits, and social protection, which increases vulnerability to health shocks. The data highlighted that economically inactive and informally employed persons, especially women, face greater health risks.

Ahmed and Hossain (2022) conducted a statistical analysis using the Bangladesh Household Income and Expenditure Survey (HIES) to examine the effect of labor force participation on health outcomes. Their regression analysis showed that individuals engaged in regular employment had significantly lower chances of reporting chronic illness compared to those economically inactive. The findings were consistent across gender, but more pronounced among males.

International Labour Organization (ILO, 2022) reported that Bangladesh's informal labor market contributes to socioeconomic health inequalities. Workers in informal jobs—largely consisting of women and rural populations—suffer from low wages, unsafe working conditions, and lack of access to health services. The report linked informal employment and unstable marital relationships (e.g., early widowhood or separation) with long-term health vulnerabilities.

Islam and Hossain (2022) used a Poisson regression model to estimate mortality differentials based on marital status in rural districts. Their findings showed that divorced and widowed individuals had significantly higher mortality risk, even after adjusting for age and education. The study recommended that public health programs must account for marital disruptions when targeting vulnerable populations.



Rahman and Karim (2022) analyzed how marriage and employment interact to influence life expectancy using data from the HIES 2016. The regression-based study found that the combination of being married and employed was significantly associated with longer life expectancy, while being unmarried and unemployed was a major predictor of premature death, particularly among males.

UN Women (2021) highlighted gender-based disparities in economic activity and health in Bangladesh. The report revealed that female labor force participation remains low due to cultural norms and domestic responsibilities. Women who are widowed, divorced, or never married face heightened social vulnerability and limited access to income or healthcare. The report recommended expanding economic opportunities and healthcare access for marginalized women.

WHO (2021) published a report on social determinants of health in South Asia, highlighting how marital disruption and unemployment are linked to health risks. The report emphasized that in low- and middle-income countries, these risks are amplified due to weak healthcare systems, limited social protection, and gender inequality. It recommended integrating social determinants like marital status and employment into national health policies.

Rahman and Nasrin (2021) analyzed the effect of marriage on male mortality in Bangladesh using SVRS data. Their statistical model showed that never-married and divorced men had significantly higher risks of premature death compared to married men. The study attributed this to lifestyle factors, lack of emotional support, and greater likelihood of substance abuse among unmarried men.

Kabir and Rahman (2021) explored the consequences of spousal loss among male elders in the Sylhet region. Using both qualitative and quantitative data, they found that widowed men were at risk of alcoholism, malnutrition, and depression, all of which contributed to premature mortality. The authors noted that although widowhood is often studied among women, men also face serious post-bereavement health challenges.

Ferdous and Khan (2021) conducted a demographic study using SVRS data to assess mortality among the working-age population. Their findings revealed that individuals aged 35–54 who were unemployed or unmarried had disproportionately high mortality rates. The analysis linked this to increased mental health challenges and reduced health-seeking behavior due to social stigma.

UNDP (2021) published a policy brief emphasizing how socioeconomic inequalities in labor participation and marital instability worsen health disparities in South Asia. Specifically in Bangladesh, the report highlighted that divorced women and jobless men were among the most overlooked in national health coverage plans. The brief recommended targeted subsidies and inclusive healthcare policies.

Research Gap of the Study

Although many studies worldwide show that marital status and employment influence health and mortality, research in Bangladesh rarely examines both factors together. Most studies focus on either marital status or labor force participation separately and often ignore differences by gender, residence, and other demographic factors. In addition, limited use of advanced statistical methods and combined national datasets (SVRS, BDHS, and LFS) leaves important gaps. This study addresses these limitations by integrating national data to explore how marital status and labor force activity jointly affect mortality in Bangladesh.

Methodology

Study Area

As this study relies on nationally representative secondary data, the study area encompasses the entire country of Bangladesh. Bangladesh is a lower-middle-income country located in South Asia, bordered by India on the west, north, and east, Myanmar on the southeast, and the Bay of Bengal on the south (Rabbani and Ahmad, 2021; Khanom et al., 2024). The country has a total area of about 147,570 square kilometers and a population exceeding 170 million (BBS, 2024). Administratively, Bangladesh is divided into eight divisions: Dhaka, Chattogram, Rajshahi, Khulna, Barishal, Sylhet, Rangpur, and Mymensingh, each representing unique demographic and socioeconomic characteristics.



Figure 1. Map of the Study Area (Bangladesh)



Determination of the Sample Size

Determining the suitable sample size is essential for ensuring the validity and reliability of study outcomes (Khanom et al., 2024). When the population size is unknown, Cochran's formula is commonly employed to determine the sample size. This formula is broadly recognized for its capacity to provide accurate estimates in such circumstances. The formula is expressed as follows:

$$n = z^2 \cdot p \cdot (1-p) / e^2$$

Where,

n = Required sample size

z = The z value, representing the standard normal deviate (1.96 is used for a 95% confidence level)

p = Percentage picking a choice, expressed as decimal (0.5 used for sample size needed)

e = Margin of error (precision) set at 5% (0.05 for 5% margin of error)

So, the required per division sample size is, $n = z^2 \cdot p \cdot (1-p) / e^2$

$$= (1.96)^2 \cdot 0.5 \cdot (1-0.5) / (0.05)^2$$

$$= 0.9604 / 0.0025$$

$$= 384.16 \approx 385$$

Therefore, the total sample size is $= 385 \cdot 8$
 $= 3080$

Collection of Data

The study is entirely based on secondary data. Data were collected from Sample Vital Registration System (SVRS 2022), Bangladesh Demographic and Health Survey (BDHS 2022), Labor Force Survey (LFS 2022) & Bangladesh Population and Housing Census (2022).

These secondary datasets are credible and widely used in academic research, policy-making, and development planning. They provide comprehensive and reliable data to ensure adequate coverage of different segments of the population, including rural and urban residents, different socioeconomic groups, males and females, and a wide range of age groups.

Variables Used in the Study

Dependent Variable:

- **Mortality:** Recorded as number of deaths per 1,000 population or as categorical outcomes by marital and employment status (sourced from SVRS).

Independent Variables:

- **Marital Status:** Married, never married, widowed, and divorced.
- **Labor Force Participation:** Active (employed), inactive (unemployed or not in labor force), informal employment, and formal employment.
- **Gender:** Male or Female.
- **Place of Residence:** Urban or rural.

Model Specification

To estimate the impact of marital status and labor force participation on mortality, this study uses a Cox Proportional Hazard Model. The Cox model is appropriate for time-to-event data where the dependent variable is the time until death, and it allows for the estimation of hazard ratios (HR) for different covariates.

The hazard function for individual i at time t is given by:

$$h_i(t) = h_0(t) \times \exp(\beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki})$$

Where,

$h_i(t)$: Hazard rate for individual i at time t

$h_0(t)$: Baseline hazard function

$X_{1i}, X_{2i}, \dots, X_{ki}$: Covariates such as marital status, labor force status, gender, and residence.

β_k : Coefficients measuring the impact of covariates on the hazard rate

The results are expressed as Hazard Ratios (HRs) with 95% confidence intervals. A hazard ratio greater than 1 indicates a higher risk of mortality, while a value less than 1 indicates a protective effect.

Functional Form of the Model

The Cox Proportional Hazards Model used in this study takes the following functional form:

$$h_i(t) = h_0(t) \times \exp(\beta_1 \times \text{Marital Status}_i + \beta_2 \times \text{Labor Force Status}_i + \beta_3 \times \text{Gender}_i + \beta_4 \times \text{Residence}_i)$$

Where,

$h_i(t)$: Hazard rate of death for individual i at time t



$h_0(t)$: Baseline hazard function

Marital Status: Categorical variable for marital status (married, never married, widowed, divorced)

Labor Force Status: Categorical variable for labor force participation (active & inactive)

Gender: Categorical variable for gender (male & female)

Residence: Categorical variable for residence (urban & rural)

$\beta_1, \beta_2, \beta_3, \beta_4$: Coefficients measuring the effect of each covariate

Data Analysis

The data were analysed through descriptive analysis (Frequency tables and percentages were used to summarize demographic characteristics and identify initial patterns), software analysis (STATA 17 were used), Regression analysis (the cox proportional hazard model was applied to assess factors affecting mortality while controlling for gender and residence).

Limitations of the Study

Although there are many strengths of this study, there are some limitations also.

- The study relies entirely on secondary data, which restricts the research to variables already available in those datasets.
- Some important determinants, like income level, family size, and education quality, could not be included due to a lack of data.
- The study integrates data from only one year (2022), which may lead to time-related inconsistencies in population characteristics.

Despite these limitations, the study offers important insights into how marital status and labor force participation relate to mortality patterns in Bangladesh, and it can serve as a foundation for future research using more granular or longitudinal data.

Results & Discussion

Distribution of Population

Table 1. Distribution of Population by Marital Status

Marital Status	Frequency	Percent	Cumulative Percent
Married	1,526	49.55	65.00
Never Married	802	26.04	91.04
Widowed	276	8.96	100.00
Divorced/Separated	476	15.45	15.45

Source: SVRS 2022, BDHS 2022

Table 2. Distribution of Population by Gender

Gender	Frequency	Percent	Cumulative Percent
Female	1,392	45.19	45.19
Male	1,688	54.81	100.00

Source: SVRS 2022, BDHS 2022

Table 3. Distribution of Population by residence

Residence	Frequency	Percent	Cumulative Percent
Rural	2,011	65.29	65.29
Urban	1,069	34.71	100.00

Source: SVRS 2022, BDHS 2022

Table 4. Distribution of Population by Labor Force Participation

Labor force participation	Frequency	Percent	Cumulative Percent
Active	1,940	62.99	62.99
Inactive	1,140	37.01	100.00

Source: LFS 2022

Table 5. Distribution of Population by Mortality

Mortality	Frequency	Percent	Cumulative Percent
0 (Alive)	2,976	96.62	96.62
1 (Dead)	104	3.38	100.00

Source: SVRS 2022, BDHS 2022



Mortality Rate by Marital Status

Table 6. Mortality Rate by Marital Status (Per 100 Population)

<i>Marital Status</i>	<i>Mortality Rate</i>
Married	2.23
Never Married	3.49
Widowed	7.25
Divorced/Separated	4.62

Source: SVRS 2022, BDHS 2022

Married individuals show the lowest mortality rate (2.23), underscoring the protective effects of marital union. Marriage provides companionship, emotional stability, and psychological well-being, which are strongly linked to better health outcomes. Married persons often enjoy shared income and resources, allowing better access to food, housing, and healthcare. Spouses frequently monitor each other's health, encourage medical treatment, and promote healthier lifestyles.

Never married individuals have a moderately higher mortality rate (3.49) than married people. Unmarried individuals often lack emotional companionship and care during illness. Social pressure, loneliness, and lack of family belonging can contribute to depression and stress-related illnesses.

Widowed individuals face the highest mortality risk with a rate of 7.25. This supports the hypothesis that spousal loss significantly deteriorates emotional and physical well-being, especially when coupled with aging and economic dependency. After losing a spouse, individuals may withdraw socially, reducing mental stimulation and care opportunities.

Divorced or separated individuals have significantly higher mortality (4.62) than married people but lower than widowed ones. Marital breakdown causes emotional distress, anxiety, and loss of self-esteem, all of which affect physical health.

Mortality Rate by Marital Status & Gender

Table 7. Mortality Rate by Marital Status & Gender (Per 100 Population)

<i>Marital Status</i>	<i>Male Mortality Rate</i>	<i>Female Mortality Rate</i>
Married	64.7	35.3
Never Married	46.4	53.6
Widowed	50	50
Divorced/Separated	45.5	54.5

Source: Calculated from SVRS 2022 and BDHS 2022

Married individuals, regardless of gender, show the lowest mortality rate, with males 64.7% and females 35.3%. Married men have a significantly higher mortality rate compared to married women. In Bangladesh and many similar societies, married men are usually the main earners and often work in physically demanding or risky jobs (construction, transport, agriculture), leading to higher exposure to accidents or occupational hazards. On the other hand, married women, being more health-conscious and often better connected to healthcare services (e.g., through maternal health programs), tend to seek treatment earlier. They generally have stronger immune systems and higher resistance to certain chronic diseases, contributing to their survival advantage.

Never married individuals have moderately higher mortality rates & unmarried women face slightly higher mortality compared to unmarried men. In traditional societies like Bangladesh, unmarried women may face social stigma, economic dependence, and less support during illness. They may have less access to healthcare services or financial means to afford treatment. Being unmarried in a family-oriented society can bring loneliness and social pressure, indirectly affecting health. On the other hand, never-married men might live longer here due to fewer family responsibilities, lower stress from providing for dependents, or different lifestyle choices.

Mortality is equal for both genders among the widowed. Both widowed men and women may experience emotional distress, loneliness, and reduced financial stability, leading to similar health deterioration. Losing a spouse removes emotional and practical care, equally affecting both genders.

Divorced/separated individuals also show significantly elevated mortality rates. But the women experience higher mortality than their male counterparts. In Bangladesh, divorced women often face severe social discrimination, reduced family support, and financial hardship, leading to poor living conditions and limited access to healthcare. Stress, depression, and social isolation are more severe among divorced women due to cultural expectations. On the other hand, divorced men might remarry more easily, regain stability, and receive care from new partners or families, lowering mortality risk.



**Mortality Rate by Marital Status & Residence**

Table 8. Mortality Rate by Marital Status & Residence (Per 100 Population)

<i>Marital Status</i>	<i>Rural Mortality Rate</i>	<i>Urban Mortality Rate</i>
Married	50	50
Never Married	57.1	42.9
Widowed	65	35
Divorced/Separated	63.6	36.4

Source: Derived from SVRS 2022, BDHS 2022

Married individuals experience the same mortality in both urban and rural areas, indicating the protective effects of better access to healthcare and social services. They generally receive emotional, financial, and caregiving support from their partners regardless of residence.

Never married individuals in rural areas (57.1%) face higher mortality compared to urban residents (42.9%). In rural Bangladesh, remaining unmarried can carry social stigma, particularly for women, leading to isolation and neglect. Unmarried rural people may have less stable income sources, fewer assets, and weaker social networks. On the other hand, urban unmarried individuals often have better access to jobs, healthcare, and social services that reduce mortality.

Mortality among widowed individuals is almost twice as high in rural areas. Widowhood in rural Bangladesh often brings financial hardship, land insecurity, and emotional distress, especially for women. Rural widows often depend on family support, which may be limited or absent, leading to malnutrition and poor living conditions. In urban settings, widowed individuals can access old-age allowances, NGOs, or community programs that offer financial or emotional assistance.

Rural divorced or separated individuals especially women face substantially higher mortality than those in urban areas. In rural Bangladesh, divorced women often face severe social rejection, limiting their access to community resources or remarriage opportunities. Lack of financial independence and property rights can lead to malnutrition and chronic stress. But the urban divorced individuals often benefit from NGO support, women's organizations, and job opportunities that improve survival chances.

Mortality Rate by Labor Force Participation

Table 9. Mortality Rate by Labor Force Participation (Per 100 Population)

<i>Labor Force Status</i>	<i>Mortality Rate</i>
Active	2.99
Inactive	4.04

Source: Calculated from LFS 2022, SVRS 2022, and BDHS 2022

The mortality rate for economically active individuals is 2.99, which is significantly lower than the inactive individuals (4.04). Active workers typically have regular income or financial independence, allowing access to quality food, housing, and healthcare services. Having a job gives individuals a sense of purpose, which is linked to lower stress and better overall health outcomes.

On the other hand, inactive individuals often rely on others for financial support, limiting access to healthcare, nutritious food, and healthy living conditions. Unemployment or dependence can cause depression, anxiety, and a sense of helplessness, negatively affecting immune function and longevity.

Mortality Rate by Labor Force Participation & Gender

Table 10. Mortality Rate by Labor Force Participation and Gender (per 100 population)

LABOR FORCE STATUS	MALE MORTALITY RATE	FEMALE MORTALITY RATE
ACTIVE	53.4	46.6
INACTIVE	52.2	47.8

Source: Calculated from LFS 2022, SVRS 2022, and BDHS 2022

The table indicates that among both active & inactive in the labor force, men have a slightly higher mortality rate than women. Occupational Hazards like the risky and physically demanding jobs such as construction, agriculture, transport, and industry increasing their exposure to accidents, injuries, and work-related diseases. Work Pressure & Stress, unhealthy lifestyle behaviors (smoking, alcohol consumption, and poor dietary habits) raise their risk of chronic diseases (e.g., heart disease, stroke). But the economically active women tend to work in less hazardous sectors (education, healthcare, or informal domestic work) and may adopt healthier lifestyles.





On the other hand, for inactive labor force, many inactive men are elderly or retired, and aging naturally increases susceptibility to chronic illness and mortality. Withdrawal from the labor market can lead to psychological distress, loss of identity, and reduced self-esteem, all of which affect health. Many inactive women (especially homemakers) remain socially connected through family networks, which provide emotional and caregiving support that can reduce mortality risk. Women are often more attentive to health issues, seek medical advice earlier, and benefit from community health programs (especially maternal and reproductive services).

Mortality Rate by Labor Force Participation & Residence

Table 11. Mortality Rate by Labor Force Participation and Residence (per 100 population)

<i>Labor Force Status</i>	<i>Rural Mortality Rate</i>	<i>Urban Mortality Rate</i>
Active	55.2	44.8
Inactive	60.9	39.1

Source: SVRS 2022, LFS 2022, BDHS 2022

Among the economically active, urban residents have a slightly lower mortality rate (44.8) than rural residents (55.2). Rural workers often have poor access to medical facilities, emergency care, and preventive health services. They generally have less income and education, which limits awareness of health risks and ability to afford treatment. But the urban workers benefit from better healthcare facilities, higher income opportunities, and health-related information, leading to lower mortality.

Among the inactive population, mortality risk rises sharply, especially in rural areas (60.9). Inactive individuals in rural Bangladesh especially the elderly, widowed, or disabled often live in poverty without financial support. Social welfare programs and pension schemes are weaker in rural areas, leaving vulnerable groups without adequate care. Distance to hospitals, high treatment costs, and lack of transport prevent rural inactive individuals from seeking timely care. The Urban inactive individuals, such as retired professionals or homemakers, may still access better medical services, live in cleaner environments, and benefit from NGO or government programs.

Mortality Rate by Marital Status & Labor Force Participation

Table 12. Mortality Rate by Marital Status & Labor Force Participation (per 100 population)

<i>Marital Status</i>	<i>Active</i>	<i>Inactive</i>
Married	41.2	58.8
Never Married	40	60
Widowed	32.1	67.9
Divorced/Separated	50	50

Source: SVRS 2022, BDHS 2022, LFS 2022

Among married individuals, those who are inactive (58.8) in the labor force experience much higher mortality than those who are active (41.2). Inactive married individuals often rely on their spouses for financial support. If household income is low, healthcare and nutrition suffer. It often leads to a sedentary lifestyle, increasing the risk of chronic diseases. Active married individuals tend to have structured routines and greater access to resources, which improves survival. Work provides purpose and mental stimulation, reducing stress and depression that can harm health.

Among the never married, inactivity is strongly associated with higher mortality. Unmarried inactive individuals may live alone with limited emotional and financial support. Without work or family support, they may struggle to afford medical care and healthy food. Loneliness, lack of purpose, and depression are more common among inactive unmarried individuals. For never-married individuals, the combination of inactivity and social isolation heightens vulnerability to illness and premature death.

Widowed inactive individuals suffer the highest mortality rate (67.9), reflecting extreme vulnerability due to loss of spousal support and lack of economic resources. The death of a spouse leads to emotional distress and loss of economic stability. Most widowed individuals are elderly, and inactivity is often due to physical weakness or disability. Grief, loneliness, and depression reduce immune response and increase disease risk.

In this group, mortality is evenly split between active and inactive individuals. Some active divorced individuals face work-related stress or poor living conditions, offsetting the benefits of employment. Divorced women who are inactive face social stigma and poverty, while divorced men who work may face occupational risks or stress. Both active and inactive divorced individuals often experience high psychological stress, neutralizing the advantage of economic activity.



The Cox Proportional Hazard Model Results

To quantify the relationship between socio-demographic variables and mortality risk, the Cox Proportional Hazard Model was employed. This model is widely used in survival analysis to estimate the effect of explanatory variables on the hazard or risk of death. The model is particularly suited for this study as it allows for comparison of hazard rates between different groups (e.g., marital status, labor force participation, gender, residence), adjusting for the time to event (death).

Table 13. Hazard Ratios (HR) for Mortality by Socio-Demographic Characteristics (Marital Status, Labor Force Participation, Gender & Residence)

Variable	Category	Coefficient	HR	Std. Error	Z-Value	P> Z	95% Ci (Lower)	95% Ci (Upper)
Marital Status	Married	-0.6999623	0.4913	0.1387	-2.52	0.012**	0.2825	0.8544
	Never Married	-0.2235661	0.7576	0.2242	-0.94	0.348	0.4242	1.3531
	Widowed	0.4962783	1.7254	0.5355	1.76	0.079*	0.9391	3.1701
Labor Force	Inactive	0.1268557	1.0940	0.2279	0.43	0.666	0.7273	1.6456
Gender	Female	-0.1037315	0.9128	0.1801	-0.46	0.644	0.6201	1.3438
Residence	Rural	0.315241	1.3148	0.2619	1.37	0.169	0.8899	1.9426
Number of obs	3080							
LR chi2(6)	22.50							
Prob > Chi2	0.0010							
Pseudo R2	0.0238							

**significance at 5% level, *significance at 10% level; Source: Calculation based on SVRS 2022, BDHS 2022, LFS 2022;

The Cox proportional hazards model is statistically significant at the 5% level ($\chi^2(6) = 22.50$, $p = 0.001$). This means that, jointly, the explanatory variables (marital status, labor force participation, gender, and residence) have a significant effect on mortality risk in Bangladesh.

Interpretation of the Results

The results from the Cox Proportional Hazard Model provide valuable insights into how various socio-demographic and economic factors influence mortality risk in Bangladesh. Each covariate included in the model reveals a different aspect of vulnerability or protection against premature death. The interpretation of the model's findings is outlined below:

- Widowed (HR=1.73; 95% CI: 0.94–3.97)**
 Being widowed faces the highest risk of mortality compared to others. The hazard ratio of 1.73 suggests that widowed individuals are 73% more likely to die during the study period than their married counterparts. This could be due to the emotional stress, loss of social and economic support, and potential isolation following spousal loss.
- Married (HR=0.49; 95% CI: 0.28–0.85)**
 Married individuals experience the lowest risk of mortality. The hazard ratio 0.49 indicates 51% lower mortality risk than widowed & divorced which may lead to financial instability, loneliness, and psychological distress, all of which are associated with poorer health outcomes.
- Never Married (HR = 0.76; 95% CI: 0.42–1.35)**
 Those who have never married have a moderate risk of mortality compared to others. The hazard ratio 0.76 suggest that never married individuals have higher risk of mortality than married but lower than widowed or divorced individuals.
- Inactive vs. Active (HR = 1.09; 95% CI: 0.73–1.65)**
 Economic inactivity is associated with a 9% higher risk of mortality than being economically active. The hazard ratio 1.09 suggest that they face high risk of mortality than active people. Employment often ensures better access to healthcare, improved living conditions, and a sense of purpose. Conversely, inactivity may be linked to poverty, stress, or health problems, reinforcing a cycle of vulnerability.
- Female vs. Male (HR = 0.91; 95% CI: 0.62–1.34)**
 Females have a 9% lower risk of mortality than males. The hazard ratio of female 0.91 suggest that female face lower risk than male. That means male have the high risk of mortality.
- Rural vs. Urban (HR = 1.31; 95% CI: 0.89–1.94)**
 Living in urban areas slightly reduces the risk of mortality compared to rural areas. The hazard ratio 1.31 suggest that rural people face the high risk of mortality than urban.



The analysis shows a clear and consistent pattern that married individuals experience the lowest mortality hazard, while widowed and divorced/separated individuals face the highest risk of death. Married individuals have social and emotional support that reducing stress and promoting mental well-being, Health-related monitoring as spouses often encourage timely medical care, & better economic security, enabling access to food, shelter, and healthcare. On the other hand, being widowed or divorced often leads to psychological distress, loneliness, and social isolation, which can negatively affect both mental and physical health.

The inactive individuals show high risk of mortality compared to active individuals. Employment often provides not only income but also structure, social interaction, and purpose, which improve psychological health and reduce risky behaviors. In contrast, economic inactivity can reflect poor health, old age, or limited opportunities, all of which are linked to higher mortality.

Males show slightly higher hazard than females, but the difference is not large. Women tend to live longer in many populations due to biological advantages and lower exposure to risky behaviors (e.g., smoking, hazardous work). The difference here is small, it's likely that socioeconomic and cultural factors drive the mortality variation.

Residence-based analysis shows that urban residents face lower hazard compared to rural residents. Rural residents have limited medical facilities & unhealthy lifestyle that raise the risk of death.

In summary, marital status, labor force participation, and residence exert significant and interpretable effects on mortality hazard. The protective effect of marriage and labor force participation underscores the importance of social and economic integration in improving survival outcomes in Bangladesh.

Conclusion & Recommendations

Conclusion

This study has explored the interrelationships among marital status, labor force participation, gender, residence, and mortality in Bangladesh using secondary data from nationally representative surveys. The findings strongly indicate that both marital and employment status significantly influence mortality risk. From the study we can see that 49.55% of the population is married, followed by 26.04% never married, 8.96% widowed, and 15.45% divorced/separated. Widowed & inactive individuals had the highest mortality rate at 67.9%, divorced & inactive had 50%, while married & active individuals had the lowest rate at 41.2%, suggesting that marriage combined with economic engagement is a protective factor. 62.99% of the population is economically active, while 37.01% is inactive. Inactive individuals face a higher risk of mortality(4.04%), compared to active individuals(2.99%). The Cox Proportional Hazard Model confirmed that Inactive(HR = 1.09) individuals have a 9% higher risk of death compared to active ones. Widowed(HR=1.73) individuals face a 73% higher mortality risk than married counterparts. Females(HR=0.91) show a 9% lower mortality risk than males. Rural dwellers exhibit a 31% higher risk(HR=1.31) than urban residents, indicating that health risks like lack of medical facilities. Therefore, married individuals, particularly those engaged in the labor force, exhibit lower mortality rates, likely due to emotional, social, and financial support mechanisms. Widowed, divorced, and never-married individuals, especially women in rural areas, are disproportionately affected by higher mortality risk, mainly due to social isolation, economic dependence, and limited access to healthcare. Economically inactive individuals, particularly females and the elderly, show elevated vulnerability, reflecting gaps in employment opportunities, social security, and health coverage. The Cox Proportional Hazard Model confirms that marital disruption and labor inactivity are statistically significant predictors of increased mortality. In summary, the study emphasizes the protective effect of marriage and employment and identifies intersectional vulnerabilities among specific demographic groups, such as widowed women in rural areas or unemployed males in urban slums. Reducing mortality in these populations requires multidimensional policy efforts that address both health and social determinants.

Policy Recommendations

Based on the findings, the following multi-dimensional and evidence-based policy measures are proposed:

- **Targeted Support Programs for High-Risk Marital Groups**
Widowed and divorced/separated individuals show higher mortality risk. Introduce community health support, mental health counseling, and financial assistance programs specifically designed for widowed and divorced individuals to reduce vulnerability.
- **Strengthen Employment & Skill-Development Programs**
Inactive labor force groups show elevated mortality risk due to economic stress and limited access to healthcare. Expand job placement programs, vocational training, and income-generating schemes, especially for women and rural residents, to improve economic security and health outcomes.
- **Gender-Sensitive Healthcare & Social Protection**





Men and women experience mortality determinants differently. Develop gender-responsive health policies, such as free check-ups for widowed women, maternal health protection, and occupational safety programs for men in risky jobs.

- **Reduce Rural–Urban Inequalities in Health Services**

Rural areas often show higher mortality due to poor healthcare access. Enhance rural healthcare infrastructure, mobile medical units, and digital health services; expand coverage of community clinics and emergency referral systems.

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