

## Widow and Widower Mortality in India

Babul Hossain, PhD Candidate, International Institute for Population Sciences,  
[bhossain399@gmail.com](mailto:bhossain399@gmail.com)

Megan N. Reed, Assistant Professor, Emory University, [megan.nicole.reed@emory.edu](mailto:megan.nicole.reed@emory.edu)

Aashish Gupta, Marie Skłodowska-Curie Fellow, University of Oxford,  
[aashish.gupta@sociology.ox.ac.uk](mailto:aashish.gupta@sociology.ox.ac.uk)

Srinivas Goli, Associate Professor, International Institute for Population Sciences,  
[srinivasgoli@iipsindia.ac.in](mailto:srinivasgoli@iipsindia.ac.in)

K.S. James, Director & Sr. Professor, International Institute for Population Sciences,  
[ksjames@iipsindia.ac.in](mailto:ksjames@iipsindia.ac.in)

JULY 2023 DRAFT

### Abstract

Widowhood has been shown to be associated with elevated mortality risk in a number of contexts. This is the first study to quantify the mortality risk associated with widowhood for men and women in India. We do so by using data on individuals interviewed in the first wave of the India Human Development Survey (2004-5), whose survival status was observed seven years later in wave 2 of the survey. Accounting for differences in age, socioeconomic status, and residence type explains the higher risk of mortality for both widowed women and men aged 60 and above, but not for those aged 25 to 59. Despite the unique vulnerabilities experienced by Indian widows, we find that the risk of mortality for widowed women compared to married women is slightly lower than the mortality risk for widowed men compared to married men in the 25-59 age group. In this age group, we also document a survival disadvantage for widows exposed to conservative and less egalitarian gender norms, and for less educated widowers. These findings suggest that despite India's similarity to other contexts with survival disadvantages for both widowed men and women, unequal gender norms still shape life chances for Indian widows.

### Keywords

Widowhood; mortality; India; gender norms

### Acknowledgements

This research was supported by grants from the Leverhulme Trust (Grant RC-2018-003) for the Leverhulme Centre for Demographic Science, the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie Individual Fellowship (agreement No. 101027598), and the National Institute of Child Health and Human Development (NIH T32 HD007242). The authors would also like to thank Bussarawan Teerawichitchainan and Kriti Vikram for their helpful comments.

## **Introduction**

The death of one's spouse is a major life shock that can cause changes in the health of surviving spouses. A significant body of research documents the association between widowhood and health outcomes (Fagundes et al. 2019; Hossain et al. 2021; Iwashyna & Christakis 2003; Perkins et al. 2016; Rico-Urbe et al. 2018; Stroebe et al. 2007; Siflinger 2017; Williams 2004).

A vital health indicator on which a considerable difference between widowed and married individuals has been observed is mortality. Both widowed men and women have a higher risk of mortality than married persons, a phenomenon known in the literature as the "widowhood effect" (Dabergott 2021; Moon et al. 2011; Shor et al. 2012). Most of the evidence on the link between widowhood and mortality is from high-income countries, where longitudinal data allow measurement of survival after widowhood. However, recent research suggests that a similar widowhood effect may also be present in other contexts (Wang et al. 2020).

Though it has received limited attention in the widowhood effects literature, India is an important case to study widowhood as a social determinant of mortality risk. First, widowhood takes on unique cultural meanings in the Indian context. The low status of women in India, documented widely in the literature (Coffey et al. 2022; Kashyap & Behrman, 2020; Weitzman, 2020), is compounded for female widows, who experience added stigmatization (Abdul Azeez et al. 2023). Female widow remarriage is taboo in Indian society, a reflection of historical traditions of seclusion and ostracism of widows (Chen 2000; Lamb 2000). Because of the uniquely vulnerable position of widows in India, there is reason to suspect that patterns of widowhood effects documented in other countries may not be found in India. Second, the widowed population in India is large both in absolute size and as a share of the population. At the time of

the 2011 census, India's most recent, there were 43 million widowed women and 12 million widowed men (Government of India 2011). With 7.4% of Indian women widowed, a significant portion of the Indian female population may be vulnerable to the heightened mortality risk associated with widowhood. Recent literature has explored widowhood effects on employment (Reed 2020) and health (Agrawal et al. 2020; Prasad et al. 2021) in India. However, due to data limitations, the effect of widowhood on mortality, a first order human development priority, has not yet been quantified.

Men often experience a higher risk of mortality after widowhood than women (Shor et al. 2012; Stroebe et al. 2007). This gender gap in widowhood effects has been explained by age, SES, anticipation, and coping strategies (Angel et al. 2007; Dabergott 2021; Shor et al. 2012). We examine how these patterns differ, if at all, in the Indian context, a setting where female widows face unique vulnerabilities due to cultural practices of widow seclusion and ostracism. In the previous literature, female Indian widows have been found to have much worse health than married women (Agrawal et al. 2020; Chen & Dreze 1992; Jensen 2005). Given this health disadvantage, female widows might also be expected to experience high mortality risk. Alternatively, Indian widows may experience a mortality advantage relative to widowers like what has been observed in other social contexts.

Our study makes an important contribution to the literature as the first to document gaps in mortality by widowhood status for both women and men. The previous literature on widowhood in India has not included widowers and has not been able to study mortality due to data constraints. Following the prior literature, we measure how widow mortality varies by gender and age and then test whether region and socioeconomic status can explain the mortality gaps between married and widowed individuals. We then examine whether local gender norms

and education contribute to survival differences by widowhood status. We do this using nationally representative data from the India Human Development Survey, which has been used extensively to study both gender and mortality in India such as the relationship between socioeconomic status and mortality (Barik et al. 2018), early marriage and health at mid-life (Vikram 2021), and fertility decline and gender norms (Allendorf 2020). This panel dataset presents a unique opportunity to track mortality by marital status through following households and individuals over time with a large sample of over 86,000 individuals.

### **Widowhood Effects on Health and Mortality**

There are multiple mechanisms through which widowhood may impact mortality risk. Existing studies have documented that widowhood may influence mortality through the psychological and physical stress associated with bereavement and end-of-life care work as well as post-widowhood changes to health behaviors like alcohol consumption, smoking, diet, and exercise (Ding et al. 2021; Ennis & Majid 2019; Manzoli et al., 2007; Rosenbloom & Whittington 1993; Shor et al., 2012; Stahl et al. 2016; Trivedi 2009; Vesnaver et al. 2016). Whether the death was anticipated or sudden plays an important role in mediating the bereavement process and subsequent mortality risk, with more sudden deaths having a larger widowhood effect, especially for men (Siflinger 2017; Sullivan & Fenelon 2014; Vable et al. 2015).

Many recent studies have focused on the role of socio-economic indicators as either a mediator or a moderator of widowhood effects on mortality. Individuals in a vulnerable economic or social position are not only more likely to be widowed but simultaneously more prone to die, independent of any widowhood effect (Bowling 1987). In the United States, evidence suggests social marginalization is associated with an elevated risk of mortality after

widowhood, an effect which is at least partially mediated by economic resources (Angel et al. 2007; Liu et al. 2020). Widowhood itself may also be associated with a decline in economic status, especially for female widows and those from socially marginalized backgrounds (Angel et al. 2007; Bound et al. 1991; Cornman et al. 2012; Ha 2008; Lloyd-Sherlock et al. 2015; Zick & Smith 1991). This may jeopardize access to and utilization of healthcare as well as decrease the quality of care received (Jin & Chrisatakis 2009; Smith & Zick 1996).

### **Widowhood Effects by Gender**

One of the most significant and widespread findings in the widowhood effects literature is that the excess mortality risk associated with widowhood is more pronounced for men than women (Moon et al. 2011; Shor et al. 2012; Wang et al. 2020). With a few exceptions (Manzoli et al. 2007; Sullivan & Fenelon 2014), studies across the US (Bulanda et al. 2016; Gove 1973; Liu et al. 2020; Moon et al. 2014; Smith & Zick 1996) and Europe (Brenn & Ytterstad 2016; Dabergott 2021; Kalediene et al. 2007; Martikainen & Valkonen 1996; Nystedt 2002) have found larger widowhood effects on mortality for widowers compared to widows. The gender gap in widowhood effects is often more pronounced at younger ages than at older ages (Shor et al. 2012). One of the primary objectives of this study is to measure whether this same pattern can also be found in the Indian context, a setting with unique gender norms associated with widowhood.

To explain why widowers face a larger mortality risk than widows, researchers typically draw on one of two different theories, emphasizing either gendered coping behaviors or the impact of household gender roles. The grief model argues that the surviving spouses' response to losing their marital partner differs by gender because coping strategies for bereavement are often

gendered (Stroebe et al. 1993a; Stroebe 1993b). For instance, men may attempt to distract themselves from the grieving process, distance themselves from others, or engage in negative coping behaviors such as smoking, drinking, unhealthy diet, or drug use (Lin & Brown 2020; Utz et al. 2012). This unaddressed grief could increase the risk of long-term mental health issues such as depression. By contrast, women may be more likely to reach out for support and comfort from others during the bereavement process, which may decrease the risk of mortality.

Others emphasize gender roles in marriages as a possible explanation for why men often face a higher risk of mortality after widowhood. Classic texts argue that, due to gender specialization in some households, men may be dependent on their wives' skills for daily household tasks and care work (Kalish 1971; Smith & Zick 1986; Smith & Zick 1996). With their wife's death, widowers often are forced to increase their housework labor as they attempt to fill the void left by their wife's activities and skillset (Utz et al 2004). Some widowers may supplement with services provided by their children, through outsourcing household labor to domestic workers, or through re-partnering.

The gender roles perspective could also be applied to describe situations where widows face a larger mortality risk than widowers. Especially when the husband was the sole breadwinner, widows may lose substantial income at the time of widowhood, placing them at a higher risk of poverty. Historical records from Europe suggest that young widows with small children face extremely high mortality risk, at least partially due to the household's loss of an essential income earner (Alter et al. 2007). This may be especially relevant in the Indian context, where many women are economically dependent on their husband's income due to very low rates of female labor force participation (Lahoti & Swaminathan 2016).

Based on the existing literature on the status of widows in India, we expect that, contrary to findings in other social contexts, Indian widows may face greater survival disadvantage than widowers. Most studies of widowhood in the South Asian context focus only on female widows because of the especially marginalized position that they hold in society. Ethnographic evidence describes how Hindu widows in India often face strict norms of “perpetual mourning,” which can lead to discrimination and restrictions on her dress, movement, diet, and ability to work outside of the home (Abdul Azeez et al. 2023; Chen & Dreze 1992; Chen 1998; Chen 2000; Lamb 2000). In addition, widow remarriage remains extremely taboo, even for women widowed at younger ages (Abdul Azeez et al. 2023). South Asian widows are often reliant on their adult sons for their care and maintenance (Agarwal 1998; Rahman et al. 1992; Vlassoff 1990) and widow-headed households face high rates of poverty (Drèze & Srinivasan, 1997). Widowed Indian women are also at greater risk of living alone, which may negatively impact mental health (Dommaraju et al. 2015).

Studies on widow health suggest that Indian female widows suffer from worse health when compared to married women as measured by nutritional status, mental health, cognitive ability, and the presence of chronic disease (Agrawal et al. 2020; Chen & Dreze 1992; Jensen 2005; Lloyd-Sherlock et al. 2015; Perkins et al. 2016). Older widows may face constrained access to healthcare due to altered family structures and loneliness (George et al. 2021). Widowhood has been shown to be negatively associated with economic independence, leading to worse health outcomes (Pandey & Kumar 2012). Dhakad & Saikia (2023) document that, especially in the case of the death of adult men, the impacts on household income and consumption can be large and contribute to the poverty of the surviving household.

Most of the literature on widowhood in South Asia focuses on health outcomes but two important mortality studies, using indirect methods, by Rahman et al. (1992) and Mari Bhat (1994) find some evidence of widowhood effects on mortality for women in Bangladesh and India respectively. Furthermore, none of the widow mortality studies and few of the widow health studies include widowers. As a result, it remains unclear if India faces similar gender gaps in widowhood effects on mortality as documented in other countries. Of the few studies which have looked at Indian widowers, one study found that elderly widowers did not face an increased risk for poor health relative to married men, except on cognitive decline (Perkins et al. 2016). On the other hand, Srivastava et al. (2021) found that both widowed men and women were at a greater risk of depression, especially when living alone. Another study found that widows receive less health care services than widowers (Agrawal & Keshri 2014). Given the robust evidence on the vulnerable position of female widows in India, widows may face a larger widowhood effect on mortality than widowers, making India an outlier compared to other countries where the gender gap in widowhood effects typically favors women.

### **Gender Norms, Education, and Widow/Widower Mortality**

In addition to documenting gaps in mortality between the widowed and married population for both genders, this study aims to examine how excess widow/widower mortality varies across India's diverse populations. We examine how both local gender norms and individual human capital are related to survival disadvantage for widows and widowers.

An emerging literature suggests that gender norms may be an important determinant of health inequalities and poor health outcomes. Studies in India, China, and Bangladesh have linked conservative gender norms with higher prevalence of hypertension, inflammation, obesity,



and poor self-rated health among women (Ahmed & Sen 2018; Stroope 2015; Reynolds et al. 2020; Alvarez-Saavedra et al. 2023; Stroope 2015b; Stroope et. al. 2020). Health inequalities by gender, especially those related to cardiovascular diseases and obesity, may result from lifestyle factors exacerbated by female seclusion norms which limit women's physical mobility (Stroope 2015). Physical and emotional violence and unequal distribution of household resources may be other mechanisms through which conservative gender norms may result in negative health consequences for women (Sedlander et al. 2021). Significant research in the Indian context has also documented how women may receive limited access to healthcare due to gender discrimination in healthcare expenditure within the household, a reflection of gender norms which favor men's health needs over women's (Dupas & Jain 2021; Moradhvaj and Saikia 2019). Less research has linked gender norms to mortality outcomes; however, a study by Lyell et al (2023) using data from 75 countries found a correlation between biased gender social norms and cardiovascular disease mortality for both men and women.

We hypothesize that widows may face worse survival odds in places with more conservative gender norms and practices. Places with conservative gender norms may also be those where female widows face the most severe forms of stigmatization and deprivation due to cultural beliefs which see women's value as deriving from their role as wives. We do not hypothesize gender norms impacting widower health. This study allows us to make an important contribution to the emerging literature on the link between local gender norms and health. The case of widow mortality is an especially valuable addition to the literature due to the well-documented but geographically disparate gender inequalities in India and the dearth of evidence linking gendered norms to mortality.

This study also examines whether education is related to survival disadvantage for widows and widowers. Some evidence in other social contexts has suggested that socioeconomic resources may attenuate widowhood effects, especially for widowers (Choi & Marks 2011; Kalediene et al. 2007; Kung 2020; Nystedt 2002). Education, an important marker of human capital, may be one such resource with the potential to protect against the higher risk of mortality after the death of one's spouse, especially given that more educated populations overall tend to have lower mortality. Sullivan and Fenelon (2014), using the Health and Retirement Study, found exactly that. However, other studies have found either no post-widowhood mortality differences by educational status (Martikainen and Valkonen 1998) or that higher levels of education are actually associated with a higher relative risk of mortality for the widowed, especially widowers (Dabergott 2021; Lusyne, Page, & Lievens 2001; Ostergren, Fors, & Rehnberg 2002). Dabergott (2021) proposes a number of potential explanations for the higher relative risk of post-widowhood mortality for more educated men in Sweden including that the benefits of education for health are frequently mediated through marriage for men.

We anticipate the opposite relationship in the Indian context, that lower levels of human capital, as measured by education, will be associated with higher relative mortality for the widowed. Mortality risk in India has been found to decrease with education (Barik et al 2018). Few studies on India have looked at how widowhood effects might vary by education. However, Agrawal, Lalji, & Pakrashi (2020) found that widowhood was associated with lower BMI for female Indian widows only among the less educated. No study, to our knowledge, has examined how either widower mortality or health may vary by education. We hypothesize that for both widows and widowers in India, lower levels of human capital will be associated with larger survival disadvantage relative to their married peers.

## **Material and Methods**

### **Data**

We use data from the India Human Development Survey (IHDS), one of the first large-scale nationally representative panel studies in India large enough to empirically estimate demographic rates (Desai, Vanneman, & NCAER 2012). To date, the IHDS has completed two waves, IHDS 1 in 2004-2005 and IHDS 2 in 2011-2012. For this analysis, we use the individual data file from IHDS 1, which contains information on all household members in surveyed households using data collected in the household roster. We then match individuals observed in IHDS 1 with their survival status in the tracking data file in IHDS 2.

IHDS 1 collected information on 41,554 households and 215,754 individuals across 1,503 villages and 971 urban areas from 33 states. In 2011-12, IHDS 2 was able to reinterview 83% of the households. In the second wave, a tracking sheet was completed for individuals observed in IHDS 1. This tracking sheet contains the information on survival used in our analysis. The tracking sheet provides detailed information on the deaths of household members including years since the death of the individuals at the time of the second wave. It also includes the educational, marital, and employment status of the deceased individuals at their time of death.

Our analysis uses data from the individual data file in IHDS 1 as well as the tracking sheet in order to calculate mortality rates between IHDS 1 and 2. From the 215,754 individuals in the individual data file, we first restrict to the 104,774 individuals who were aged 25 years and older in IHDS 1. We then limit our sample to only those individuals who are listed as married or widowed in IHDS 1. This drops another 6,730 individuals. Since our analysis focuses on

mortality between IHDS 1 and 2, we further restrict our sample to only those individuals that we have data on for IHDS 2, which removes 5,650 individuals for whom the IHDS team was unable to complete a tracking sheet or re-survey. We also dropped 5,947 individuals whose marital status changed between IHDS 1 and 2. This left a final sample of 86,447 individuals for analysis. Of these, 7,275 individuals (8.4%) died between IHDS 1 and 2. Table 1 provides summary statistics for the analytical sample.

## **Measures**

Our outcome variable in this study is mortality. The survival status of individuals between the two IHDS waves is observed in the tracking sheet. We model the probability of death of individuals observed in IHDS 1 (2004-2005). Our main independent variable is whether the person was married or widowed when observed in IHDS 1. In all of our analyses, we stratify our results by age-group (ages 25-59 and ages 60+) and gender. The age of the individual used in the analysis is measured in IHDS 1.

In addition to these primary variables, we include several controls and interaction variables. In addition to stratifying the results by broad age groups (25-59 and 60+), we also include a more refined age control using 5-year age intervals measured from reported age in IHDS 1. The last age category, 85+, is open-ended. We also include controls for region through state dummy variables and an indicator of rural/urban residence. We include several controls for socioeconomic status (SES) based on the literature which suggests that it is an important determinant of widow mortality (Choi & Marks 2011; Kalediene et al. 2007; Kung 2020; Martikainen & Valkonen 1998; Nystedt 2002). The SES controls include a measure of monthly per capita household consumption, a count of household assets, and social group (caste/religion).

We next seek to understand how widow and widower survival disadvantage varies by individual human capital and household and regional gender norms. We test how mortality risk varies across different levels of individual human capital through interactions of the widowhood effects with measures of education level. Education is measured in IHDS 1 through the total years of schooling of the individual. The range of values is from 0 years of schooling to 15 or more years.

We use three different measures of gendered social norms. First, we use a measure of whether women in the household practice any form of head covering known as *purdah*, *ghunghat*, or *pallu*. This measure captures a heterogeneous set of gender practices often associated with female seclusion (Desai & Andrist 2010). The other two measures of gender norms are at the community-level, rather than the household-level. First, we use an indicator of whether the family lives in an area where rice was historically the dominant crop. Previous research has found that the predominantly rice growing regions of India have more egalitarian gender norms which is speculated to be due, in part, to the important role played by women in rice cultivation (Bardhan 1974; Boserup 1970; Miller 1982). Based on data from the India's 2011 National Sample Survey (NSSO 2014), we classified the following states and union territories as rice-dominant: Jammu and Kashmir, Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Assam, West Bengal, Jharkhand, Odisha, Chhattisgarh, Daman & Diu, Dadra-Nagar Haveli, Andhra Pradesh/Telangana, Karnataka, Goa, Kerala, Tamil Nadu, and Puducherry. The final indicator of gender norms comes from a set of questions asked to a woman in each household of the IHDS 1 regarding the prevalence of domestic violence in their community. Women were asked if it is common in their community for men to beat their wives if 1) they get no dowry, 2) the wife neglects the house or children, 3) if the wife does not cook

the food properly, 4) if he suspects his wife of having extramarital relations. We calculate a sum across these four variables and create three categories to measure the prevalence of wife beating in the community from not prevalent to very prevalent. Details on the prevalence of domestic violence across the four types can be found in Appendix Table A1.

## **Methodology**

Our main empirical strategy relies on descriptive analysis of the probability of death for widowed and married individuals. We stratify all results by age group and gender. To understand the extent to which differences in characteristics such as age, socioeconomic status, and residence can explain differences in mortality between widowed and married individuals, we use a logistic regression framework. Our logistic regressions model the odds of death of widowed individuals relative to the odds of death of married individuals. We use stratified regressions and interactions to explore how the odds or probability of death vary by gender norms and education level, respectively. All our estimates are weighted using national IHDS 1 individual weights. We cluster our standard errors at the level of the primary sampling unit.

## **Results**

### **Mortality Differences by Widowhood Status**

To understand if those who are widowed have a higher likelihood of dying than those who are married, we first examine descriptive patterns in Figure 1. This figure shows male and female probability of dying by marital status in broad age groups with 95% confidence intervals depicted in the vertical lines. Across both age groups, widowed individuals had a higher probability of dying than married individuals. The probability of dying was 9 percent higher for

widowers aged 25 to 59 years than for married males in the same age group, while widowers aged 60+ had a 13 percent greater chance of dying than married men in the same age group. These differences are both statistically significant and substantively meaningful. As expected, mortality among women is lower than that among men with relatively large gaps between widows and married women. Seven percent of the widowed women aged 25-59 at the time of IHDS 1 had died by the time of IHDS 2, compared to only 3 percent of married women. Among older women, widows were 9 percent more likely to have died than married women.

Figure 2 shows the odds ratio of mortality by widowhood status from logistic regressions, stratified by gender and broad age categories. Detailed results from the regressions are available in the Appendix Tables A1 and A2. The vertical lines in Figure 2 reflect 95% confidence intervals which account for clustering at the level of the primary sampling unit. Blue circles and lines represent odds ratios from the model with no controls. Among younger individuals, widowed men and women have about three times higher odds of mortality compared to married men and women respectively, without factoring in any controls. The odds of death are also higher for older widows and widowers relative to their married peers, but the magnitude is much smaller. Accounting for age, by adding dummies for five-year age groups to the model, explains a substantial portion of the mortality gap between widowed and married individuals as shown with the red diamonds in the second model. This suggests that married individuals are, on average, younger than widowed individuals. Since mortality rises with age, this is an important demographic control. However, even accounting for age, younger widowers are about 1.9 times more likely to die than younger married men. Among younger women, these odds are about 1.4 times. For older individuals aged 60 and above, accounting for age explains the survival

disadvantage of both widows and widowers, such that differences between widowed and married individuals are no longer statistically significant.

Further controls, for region (depicted in the green triangles) as well as SES (orange squares) do not change the results substantially. The regional controls, which included state dummies and an indicator of rural/urban status, did not make a meaningful impact on the odds ratios. Adding controls for SES had a small effect, lowering the odds of widow mortality relative to married individuals for each of the gender and age groups. The SES controls include measures for social group, asset wealth, and per capita household consumption. In the fully controlled model presented as the orange squares, widowed men aged 25-59 have about 1.6 times the odds of mortality of married men in the same age group. Widowed women aged 25-59 have 1.3 times the odds of mortality of married women of the same age. This is contrary to what was hypothesized, which was that widowed women would face a greater survival disadvantage than widowed men. Instead, we find that, among those aged 25-59, the survival disadvantage associated with widowhood is slightly larger for men than women. Among those aged 60 and above, however, widowed men and women do not have a statistically significant difference in mortality compared to married individuals after controlling for age.

### **Local Gender Norms and Widow Mortality**

The results presented in Figures 1 and 2 show that widowhood status is associated with higher odds of mortality for both widows and widowers when they are aged 25-59. We next examine if widow or widower mortality varies by local gender norms.

Given the history of social exclusion of widowed women in India, we expect that widow mortality is more likely to be elevated in places with more conservative local gender norms. We



compare the odds of mortality of widows relative to married individuals using three different measures of gender norms in Figure 3. Each graph in Figure 3 represents separate groups of stratified logistic regressions. All control variables from Figure 2 are included in the models used in these analyses and standard errors are clustered at the primary sampling unit. The results in Figure 3 are restricted to only those aged 25-59, the group for which there were statistically higher odds of mortality associated with widowhood. Results for the older age group can be found in Appendix Figure A1.

The first set of analyses use a measure of whether women in the household practice *purdah*, *ghunghat*, or *pallu*, a marker of female seclusion. The findings indicate that widowed women aged 25-59 face higher odds of mortality relative to married individuals only in households where women practice *purdah*, *ghunghat*, or *pallu*. There is no difference in the odds ratio of mortality for widowers by the practice of veiling in the household. The next two measures of gender norms capture community, rather than household- level gender practices.

The second row of analyses in Figure 3 uses a set of individual level questions in the IHDS about perceptions of prevalence of domestic violence in the community. In households which reported that it usual in their community for men to beat their wives in 2 or more of the cases listed, there was a significantly higher odds of mortality associated with widowhood relative to being married for women. There was no statistically significant difference in mortality by widowhood status for women in households who reported lower community prevalence of domestic violence. Widower mortality did not differ in a meaningful way by the prevalence of domestic violence.

The final row of analyses in this table depicts the odds ratio of mortality associated with widowhood in traditionally rice-growing areas compared to areas where another crop was dominant, such as wheat. Scholars have hypothesized that rice-growing regions of India have more egalitarian gender relations due to women's important role in rice cultivation relative to the cultivation of other crops (Bardhan 1974; Boserup 1979; Miller 1982). Widowed women aged 25-59 have statistically higher odds of mortality than married women only in regions where rice was not the primary crop traditionally. Widowers have similar odds ratios of mortality relative to married men in both regions.

Taken together, the results in Figure 3 support the idea that the excess mortality of widowed women aged 25-59 is associated with less equal gender norms. Places with less egalitarian and more conservative gender practices were the only places where a statistically significant mortality gap by widowhood status were found. Widower mortality, however, did not vary by local or household gender norms.

### **Education and Widower Mortality**

We next examine the influence of education on excess widow and widower mortality for those aged 25-59. Figure 4 depicts the predicted probabilities of death by gender, years of education, and widowhood status from a logistic regression model which interacts years of education with widowhood status. For each year of education, we have included a 95% confidence interval of the predicted probabilities of death depicted in the vertical lines. The confidence intervals account for clustering of observations at the level of the primary sampling unit. The models include all controls from Figure 2 including household asset wealth and per capita consumption.

Results for the older age group, which were non-significant, can be found in Appendix Figure A1.

Consistent with prior research (Barik et al. 2018), and regardless of gender and widowhood status, higher education is associated with lower mortality. The least educated, those with no formal schooling, have the highest probability of death for both men and women as shown in Figure 4. This group is substantial in size, comprising 29.5% of all men and 57.5% of all women in the sample.

The upper portion of Figure 4 depicts the predicted probabilities of death for men aged 25-59. There is a statistically significant difference in the mortality of widowed and married men for those with zero, one, or two years of schooling. For those with three or more years of schooling, there is no statistically significant difference in mortality between widowers and married men as shown through the overlapping confidence intervals in the upper portion of Figure 4.

The lower portion of Figure 4 depicts the predicted probabilities of death for women aged 25-59. While mortality does decrease with education for women, there is no statistically significant difference in the mortality probability for married and widowed women across different levels of education. Figure 4 shows that excess widower, but not widow, mortality relative to the married population varies across the educational spectrum. This differs from our hypothesis that education would influence both widow and widower mortality.

## Discussion

This study examined the relationship between widowhood, gender, and mortality in India. Using survey data that observed individuals in 2004-05 and their survival seven years later, we document a higher mortality risk for widowed men and women relative to the married population. However, a large proportion of the observed differences in mortality between widows and married individuals can be explained by differences in age distribution. Both widows and widowers are, on average, older than the married population. Once age is controlled for, we do not observe a statistically higher mortality risk for either widowers or widows aged 60 and above. In the younger ages, however, a significant mortality gap remains, even after controlling for age, region, and household SES. Among those aged 25-59, widowers had 60% higher odds of death and widows had 30% higher odds of death relative to the married population.

From a comparative perspective, the mortality gaps between married and widowed people in India are similar in magnitude to what has been observed in high income countries (Gove 1973; Hu & Goldman 1990; Bulanda et al., 2016; Liu et al. 2020). Furthermore, we find that, as observed in other settings, widowhood poses a greater mortality risk to men than women. Though this has been found in other social contexts, it is surprising to find in the Indian context where literature has documented how female widows face unique vulnerabilities associated with the stigma of widowhood (Lamb 2000, Chen 2000). As documented in other contexts, the larger impact of widowhood on the mortality of men may be due to gendered bereavement practices, such as greater reliance of men on unhealthy coping strategies, or due to household gender roles which make the loss of their wife's essential domestic labor especially consequential for men. In

addition, these results could suggest that marriage may not be especially protective to the health of Indian women, given their smaller survival advantage relative to widows.

However, there is one possible explanation for why Indian widowers face higher mortality risk than widow which is particular to India. A contributing factor may be the unobserved selection processes in to or out of the status of widowed. Prior literature on widowhood has suggested that men who do not re-marry after widowhood may be a more negatively “selected” group. This is because remarriage is common and socially accepted for young widowers while it is considered taboo for widows in India (Abdul Azeez et al. 2023; Chen 1998; Dreze & Chen 1992; Lamb 2000). More advantaged widowers, who may also be in a higher position on the remarriage market, are likely to select out of widowhood status through re-marriage. This is especially the case for young widowers who remain in the prime ages for family formation. This could result in the widower population being negatively selected on traits which determine marriageability such as wealth, land ownership, and education. Since so few widows re-marry, the Indian widowed population is both larger and less selected than the population of widowers. Most Indian women who become widowed remain in that status for the rest of their lives due to strong taboos on widow remarriage (Jensen 2005, Chen 2000). This selection effect may explain why widowhood is associated with slightly higher odds of mortality relative to the married population for widowers compared to widows. Future research could potentially quantify the contribution of different factors, including selection, in explaining the survival disadvantage faced by widowed Indians.

Even after controlling for age, region, and SES, education was found to be an important influence on the survival disadvantage faced by widowers aged 25-59. It was only among men with the lowest levels of human capital, those with 0-2 years of education, that there was a gap in

mortality by widowhood status. Widowers with high levels of human capital had no statistically significant difference in mortality risk compared to their married peers. This was a gendered result as no difference in female widow mortality by education was found. Our findings differ from those found in Europe where it was actually the most educated men who faced the greatest relative widowhood effect on their mortality (Dabergott 2021; Lusyne, Page, & Lievens 2001; Ostergren, Fors, & Rehnberg 2002). In the Indian context, younger men with the lowest levels of human capital may be unable to replace the lost, but essential, labor of their wives through remarriage, hiring help, or relying on kin support. In particular, uneducated men may face an especially difficult time on the remarriage market, leading them to be even more negatively selected than the rest of the widower population. This is one potential explanation for why a mortality gap by widowhood status only emerges for the least educated men; however, more research is needed to uncover the reason for the association between human capital and widower mortality in the Indian context.

For female widows in India aged 25-59, excess mortality risk was found to be associated with more conservative local gender norms and practices. Higher odds of mortality associated with widowhood were only found when women practice *pardah*, where domestic violence is most prevalent, and in non-rice-growing regions where gender relations have historically been less egalitarian. These findings suggest local gender norms may impact women's mortality risk after widowhood, with only those in more conservative and less gender egalitarian regions facing elevated mortality risk. These results fit with the qualitative evidence which documents the extreme deprivations and stigma that some young widows in India face (Abdul Azeez et al. 2023; Chen & Dreze 1992; Chen 1998; Chen 2000; Lamb 2000).

In line with previous research in high income countries, we find that widowed people under 60 had a higher relative risk of mortality than older widowed adults (Brenn & Ytterstad 2016; Martikainen & Valkonen 1996). In fact, there remained no excess mortality associated with widowhood at older ages in India after controlling for age. Previous research has also found that the survival disadvantage associated with widowhood narrows with age. A spouse's death at a younger age is more likely to be unexpected and may cause more socio-emotional stress, resulting in a higher mortality risk for younger widowed people (Bowling 1987; Moon et al. 2014). It has been documented that older people are better able to cope with bereavement, and the death of a spouse is often anticipated when it happens in old age because it is more likely to be caused by a long-term illness (Zick & Smith 1991; Moon et al. 2011). Thus, widowhood is often less of a shock for older persons. Furthermore, spousal death at older ages frequently implies less severe economic implications than when it occurs at younger ages when the spouse may have been an essential income earner or homemaker in the household. Our findings are the first to document this important age pattern of mortality among the widowed in the Indian context.

This study has some important limitations. Although the IHDS is a panel survey, we only examine the mortality risk associated with marital status as it is reported at baseline (IHDS 1). These associational findings, thus, cannot be interpreted as the causal mortality impact of widowhood. In addition, we lack full marriage history data which could tell us whether any of the married individuals had previously been widowed and remarried or how long the respondents had been widowed. Marriage history data, which is currently unavailable for this sample, could potentially help researchers in the future to study the selection into and out of widowhood as well as whether the risk of mortality differs for those more recently widowed. Finally, this study does

not examine cause of death, due to data constraints. Studying differences in cause of death by widowhood status in future research may help illuminate the mechanisms through which younger widowers and widows face a survival disadvantage.

This research demonstrates the relevance of examining marital status as the key determinant of mortality in the Indian context. We are the first to empirically document differences in mortality by widowhood status using nationally representative data with mortality follow-up and the first to compare widow and widower survival disadvantage in the Indian context. Furthermore, this study provides novel evidence of linkages between local gender norms and mortality risk for Indian women. Importantly, the findings suggest that a reduction in inequalitarian gender norms could potentially reduce mortality gaps between widowed and married women in younger ages.

The findings of this study are especially relevant in the wake of the COVID-19 pandemic which left millions of Indians individuals widowed (Banaji & Gupta 2022). Emerging research suggests that those widowed during the pandemic face especially large mental health consequences (Wang et al. 2022). Future research should examine how the pandemic impacted patterns of widowhood effects on mortality both in India and in other social contexts.



## References

- Agarwal, B. (1998). Widows versus daughters or widows as daughters? Property, land, and economic security in rural India, *Modern Asian Studies* 32(01): 1–48.
- Agrawal, A., Lalji, C. & Pakrashi, D. (2020). He Has Gone to a Better Place, but She Has Not: Health Status of Hindu Widows in India, *Journal of Development Studies* 00(00): 1–22. <https://doi.org/10.1080/00220388.2020.1802008>.
- Agrawal, G., & Keshri, K. (2014). Morbidity Patterns and Health Care Seeking Behavior among Older Widows in India, *PLoS ONE* 9(4): e94295. <http://dx.plos.org/10.1371/journal.pone.0094295>.
- Ahmed, T., & Sen, B. (2018). Conservative outlook, gender norms and female wellbeing: Evidence from rural Bangladesh. *World Development*, 111, 41–58. <https://doi.org/10.1016/j.worlddev.2018.06.017>
- Allendorf, K. (2020). Another Gendered Demographic Dividend: Adjusting to a Future without Sons. *Population and Development Review*, 46(3), 471–499.
- Alter, G., Dribe, M., & Van Poppel, F. (2007). Widowhood, family size, and postreproductive mortality: A comparative analysis of three populations in nineteenth-century Europe, *Demography* 44(4): 785–806.
- Alvarez-Saavedra, V., Levasseur, P., & Seetahul, S. (2022). The role of gender inequality in the obesity epidemic: a case study from India. *The Journal of Development Studies*, 0(0), 1–17. <https://doi.org/10.1080/00220388.2023.2191778>
- Angel, J. L., Jiménez, M.A., & Angel, R.J. (2007). The economic consequences of widowhood for older minority women, *The Gerontologist* 47(2): 224–34.
- Azeez E. P, A., Negi, D. P., Mishra, N., Sharma, J., Nair, A. S., & Mathew, M. (2023). “Life after him was just hell”: Young rural women’s lived experiences of widowhood in Rajasthan, India. *Death Studies*, 0(0), 1–12. <https://doi.org/10.1080/07481187.2023.2171160>
- Banaji, M. and Gupta, A. (2022). Estimates of pandemic excess mortality in India based on civil registration data. *PLOS Global Public Health* 2(12).
- Bardhan, P. K. (1974). “On life and death questions,” *Economic and Political Weekly* 9: 32–34.
- Barik, D., Desai, S., & Vanneman, R. (2018). Economic Status and Adult Mortality in India: Is the Relationship Sensitive to Choice of Indicators? *World Development*, 103, 176–187.
- Boserup, E. (1970). *Woman's Role in Economic Development*, New York: St. Martin's Press.
- Bowling, A. (1987). Mortality after bereavement: a review of the literature on survival periods and factors affecting survival. *Social Science & Medicine*, 24(2), pp.117-124.

- Bound, J., Duncan, G.J., Laren, D.S. & Oleinick, L., (1991). Poverty dynamics in widowhood. *Journal of Gerontology*, 46(3), pp.115-S124.
- Brenn, T. & Ytterstad, E., (2016). Increased risk of death immediately after losing a spouse: cause-specific mortality following widowhood in Norway. *Preventive Medicine*, 89, pp.251-256.
- Bulanda, J.R., Brown, J.S. & Yamashita, T., (2016). Marital quality, marital dissolution, and mortality risk during the later life course. *Social Science & Medicine*, 165, pp.119-127.
- Chen, M.(Ed.) (1998). *Widows in India: Social Neglect and Public Action*, New Delhi: Sage Publications India Pvt Ltd.
- Chen, M., & Dreze, J. (1992). Widows and Health in North India, *Economic and Political Weekly* 27(43/44).
- Chen, M. (2000). *Perpetual Mourning: Widowhood in Rural India*. New Delhi: Oxford University Press.
- Choi, H. & Marks, N.F., (2011). Socioeconomic status, marital status continuity and change, marital conflict, and mortality. *Journal of Aging and Health*, 23(4), pp.714-742.
- Coffey, D., Khera, R., & Spear, D. (2022). Mothers' Social Status and Children's Health: Evidence From Joint Households in Rural India. *Demography*, 59(5), 1981–2002.
- Cornman, J.C., Goldman, N., Collins, A.L., Gleib, D.A., Hurng, B.S. & Weinstein, M., (2012). Do adults adjust their socioeconomic status identity in later life? *Ageing & Society*, 32(4), pp.616-633.
- Dabergott, F., (2021). The gendered widowhood effect and social mortality gap. *Population Studies*, pp.1-13.
- Desai, S., & Andrist, L. (2010). Gender scripts and age at marriage in India. *Demography*, 47(3), 667–687.
- Desai, S., Vanneman, R., & National Council of Applied Economic Research (NCAER). (2019). India Human Development Survey Panel (IHDS, IHDS-II), 2005, 2011-2012. <https://doi.org/10.3886/ICPSR37382.v1>
- Dhakad, M. & Saikia, N. (2023) The impact of adult death on household consumption, expenditure, and income in India: Evidence from a nationally representative longitudinal survey, *Adult Mortality in India: Trends, Socio-economic Disparities, and Consequences*, Springer.
- Ding, D., Gale, J., Bauman, A., Phongsavan, P. & Nguyen, B., (2021). Effects of divorce and widowhood on subsequent health behaviours and outcomes in a sample of middle-aged and older Australian adults. *Scientific Reports*, 11(1), pp.1-10.

- Dommaraju, P., Yeung, J.J., and Cheung, A.K. (2015). One-person households in India. *Demographic Research* 32:1239–1266.
- Dupas, P., & Jain, R. (2021). *Women left behind: gender disparities in utilization of government health insurance in India* (No. w28972). National Bureau of Economic Research.
- Drèze, J., & Srinivasan, P. V. (1997). Widowhood and poverty in rural India: Some inferences from household survey data. *Journal of Development Economics*, 54(2), 217–234.
- Ennis, J. & Majid, U., (2019). "Death from a broken heart": A systematic review of the relationship between spousal bereavement and physical and physiological health outcomes. *Death Studies*, pp.1-14.
- Fagundes, C.P., Brown, R.L., Chen, M.A., Murdock, K.W., Saucedo, L., LeRoy, A., ...Heijnen, C., (2019). Grief, depressive symptoms, and inflammation in the spousally bereaved. *Psychoneuroendocrinology*, 100, pp.190-197.
- George, M. S., Gaitonde, R., Davey, R., Sukumaran, V., Mohanty, I., & Upton, P. (2021). Social networks and their impact on access to health care: Insights from older widows living alone in Kottayam, South India. *Ageing and Society*, 1141–1163.  
<https://doi.org/10.1017/S0144686X21001100>
- Gove, W.R., (1973). Sex, marital status, and mortality. *American Journal of Sociology*, 79(1), pp.45-67.
- Government of India. (2011). Census of India 2011: Primary Census Abstract.
- Ha, J.H., (2008). Changes in support from confidants, children, and friends following widowhood. *Journal of Marriage and Family*, 70(2), pp.306-318.
- Hossain, B., Yadav, P.K., Nagargoje, V.P., & Joseph, K.J.V., (2021). Association between physical limitations and depressive symptoms among Indian elderly: marital status as a moderator. *BMC Psychiatry*, 21 (1).
- Hu, Y. & Goldman, N., (1990). Mortality differentials by marital status: an international comparison. *Demography*, 27(2), pp.233-250.
- Iwashyna, T.J. & Christakis, N.A., (2003). Marriage, widowhood, and healthcare use. *Social Science & Medicine*, 57(11), pp.2137-2147.
- Jensen, R. (2005). Caste, culture, and the status and well-being of widows in India, In *Analyses in the Economics of Aging*, ed. David A. Wise. University of Chicago Press, 357–76.
- Jin, L. & Chrisatakis, N.A., (2009). Investigating the mechanism of marital mortality reduction: the transition to widowhood and quality of health care. *Demography*, 46(3), pp.605-625.
- Kalediene, R., Petrauskiene, J. & Starkuviene, S., (2007). Inequalities in mortality by marital status during socioeconomic transition in Lithuania. *Public Health*, 121(5), pp.385-392.

- Kalish, R.A., (1971). Sex and marital role differences in anticipation of age-produced dependency. *The Journal of Genetic Psychology*, 119(1), pp.53-62.
- Kashyap, R., & Behrman, J. (2020). Gender Discrimination and Excess Female Under-5 Mortality in India: A New Perspective Using Mixed-Sex Twins *Demography*, 2143–2167.
- Kaprio, J., Koskenvuo, M. & Rita, H., 1987. Mortality after bereavement: a prospective study of 95,647 widowed persons. *American Journal of Public Health*, 77(3), pp.283-287.
- Kung, C.S.J. (2020). Health in widowhood: The roles of social capital and economic resources, *Social Science and Medicine* 253(August 2019): 112965. <https://doi.org/10.1016/j.socscimed.2020.112965>.
- Lahoti, R., & Swaminathan, H. (2016). Economic Development and Women's Labor Force Participation in India. *Feminist Economics*, 22(2), 168–195.
- Lamb, S. (2000). *White Saris and Sweet Mangoes: Aging, Gender, and Body in North India*. Los Angeles: University of California Press.
- Lin, I.F. & Brown, S.L., (2020). Consequences of Later-Life Divorce and Widowhood for Adult Well-Being: A Call for the Convalescence Model. *Journal of Family Theory & Review*, 12(2), pp.264-277.
- Liu, H., Umberson, D., & Xu, M. (2020). Widowhood and mortality: gender, race/ethnicity, and the role of economic resources, *Annals of Epidemiology* 45: 69-75.e1. <https://doi.org/10.1016/j.annepidem.2020.02.006>.
- Lloyd-Sherlock, P., Corso, B. & Minicuci, N., (2015). Widowhood, socioeconomic status, health and wellbeing in low and middle-income countries. *The Journal of Development Studies*, 51(10), pp.1374-1388.
- Lusyne, P., Page, H., & Lievens, J. (2001). Mortality following conjugal bereavement, Belgium 1991-96: The unexpected effect of education. *Population Studies*, 55(3), 281–289. <https://doi.org/10.1080/00324720127701>
- Lyell, I., Khan, S., Limmer, M., O'Flaherty, M., & Head, A. (2022). OP67 The association between country-level gender social norms and cardiovascular disease mortality and life expectancy: an ecological study. *BMJ Open*. <https://doi.org/10.1136/jech-2022-ssmabstracts.66>
- Manzoli, L., Villari, P., Pirone, G.M. & Boccia, A., (2007). Marital status and mortality in the elderly: a systematic review and meta-analysis. *Social Science & Medicine*, 64(1), pp.77-94.
- Mari Bhat, P.N., (1994). Widows and widowhood mortality in India. *Widows in India: Social Neglect and Public Action*, pp.173-188.

- Martikainen, P. & Valkonen, T., (1996). Mortality after death of spouse in relation to duration of bereavement in Finland. *Journal of Epidemiology & Community Health*, 50(3), pp.264-268.
- Martikainen, P. & Valkonen, T., (1998). Do education and income buffer the effects of death of spouse on mortality? *Epidemiology*, pp.530-534.
- Moradhvaj, & Saikia, N. (2019). Gender disparities in health care expenditures and financing strategies (HCFS) for inpatient care in India. *SSM - Population Health*, 9(October 2018), 100372. <https://doi.org/10.1016/j.ssmph.2019.100372>
- Miller, B. (1982). Female Labor Participation and Female Seclusion in Rural India: A Regional View. *Economic Development and Cultural Change* 30(4): 777-794.
- Moon, J.R., Kondo, N., Glymour, M.M. & Subramanian, S.V., (2011). Widowhood and mortality: a meta-analysis. *PloS one*, 6(8), p.e23465.
- Moon, J.R., Glymour, M.M., Vable, A.M., Liu, S.Y. & Subramanian, S.V., (2014). Short-and long-term associations between widowhood and mortality in the United States: longitudinal analyses. *Journal of Public Health*, 36(3), pp.382-389.
- National Statistical Services Office (NSSO). (2014). *NSS Report No.558: Household Consumption of Various Goods and Services in India, 2011-12*
- Nystedt, P., (2002). Widowhood-related mortality in Scania, Sweden during the 19th century. *The History of the Family*, 7(3), pp.451-478.
- Östergren, O., Fors, S., & Rehnberg, J. (2022). Excess Mortality by Individual and Spousal Education for Recent and Long-Term Widowed. *Journals of Gerontology - Series B Psychological Sciences and Social Sciences*, 77(5), 946–955. <https://doi.org/10.1093/geronb/gbab227>
- Pandey, M.K., & Kumar, A. (2012). Widowhood and health of elderly in India: examining the role of economic factors using structural equation modeling, *International Review of Applied Economics* 26(1): 111–24.
- Perkins, J.M., Lee, H.Y., James, K.S., Oh, J., Krishna, A., Heo, J., Lee, J.K. & Subramanian, S.V., (2016). Marital status, widowhood duration, gender and health outcomes: a cross-sectional study among older adults in India. *BMC Public Health*, 16(1), pp.1-12.
- Prakash, R., & Singh, A. (2014). Who Marries Whom? Changing Mate Selection Preferences in Urban India and Emerging Implications on Social Institutions. *Population Research and Policy Review*, 33(2), 205–227. <https://doi.org/10.1007/s11113-013-9294-5>
- Prasad, RD., Ram H., & Goli, S. (2021). The multitud effects of intersection of gender, marital status and Economic dependency on Health status of Elder in India. *Journal of Social and Economic Development*, (Forthcoming).

- Rahman, O, A Foster, & J Menken. (1992). Older Widow Mortality in Rural Bangladesh, *Social Science & Medicine* 34(1): 89–96.  
<http://www.sciencedirect.com/science/article/pii/0277953692900707>.
- Reed, M.N. (2020). The labor force participation of Indian women before and after widowhood, *Demographic Research* 43(24): 673–706.
- Reynolds, A. Z., Wander, K., Sum, C. Y., Su, M., Thompson, M. E., Hooper, P. L., ... Mattison, S. M. (2020). Matriliney reverses gender disparities in inflammation and hypertension among the Mosuo of China. *Proceedings of the National Academy of Sciences of the United States of America*, 117(48), 30324–30327. <https://doi.org/10.1073/pnas.2014403117>
- Rico-Urbe, L.A., Caballero, F.F., Martín-María, N., Cabello, M., Ayuso-Mateos, J.L. & Miret, M., (2018). Association of loneliness with all-cause mortality: A meta-analysis. *PloS one*, 13(1), p.e0190033.
- Rosenbloom, C.A. & Whittington, F.J., (1993). The effects of bereavement on eating behaviors and nutrient intakes in elderly widowed persons. *Journal of Gerontology*, 48(4), pp.223-S229.
- Sedlander, E., Talegawkar, S., Ganjoo, R., Ladwa, C., DiPietro, L., Aluc, A., & Rimal, R. N. (2021). How gender norms affect anemia in select villages in rural Odisha, India: A qualitative study. *Nutrition*, 86, 111159. <https://doi.org/10.1016/j.nut.2021.111159>
- Shor, E., Roelfs, D.J., Curreli, M., Clemow, L., Burg, M.M. & Schwartz, J.E., (2012). Widowhood and mortality: a meta-analysis and meta-regression. *Demography*, 49(2), pp.575-606.
- Siflinger, B. (2017). The Effect of Widowhood on Mental Health - an Analysis of Anticipation Patterns Surrounding the Death of a Spouse, *Health Economics* 26(12): 1505–23.
- Smith, K.R. & Zick, C.D., (1986). The incidence of poverty among the recently widowed: Mediating factors in the life course. *Journal of Marriage and the Family*, pp.619-630.
- Smith, K.R. & Zick, C.D., (1996). Risk of mortality following widowhood: Age and sex differences by mode of death. *Social Biology*, 43(1-2), pp.59-71.
- Srivastava, S., Debnath, P., Shri, N., & Muhammad, T. (2021). The association of widowhood and living alone with depression among older adults in India. *Scientific Reports*, 11(1), 1–13. <https://doi.org/10.1038/s41598-021-01238-x>
- Stahl ST, Arnold AM, Chen JY, Anderson S, & Schulz R. (2016). Mortality after bereavement: the role of cardiovascular disease and depression. *Psychosomatic Medicine*, 78(6):697.
- Stroebe, M.S., Stroebe, W. and Hansson, R.O. eds., (1993a). *Handbook of bereavement: Theory, research, and intervention*.

- Stroebe, M., (1993b). Coping with bereavement: A review of the grief work hypothesis. *OMEGA-Journal of Death and Dying*, 26(1), pp.19-42.
- Stroebe, M., Schut, H. & Stroebe, W., (2007). Health outcomes of bereavement. *The Lancet*, 370(9603), pp.1960-1973.
- Stroope, S. (2015a). Disease and Dowry: Community Context, Gender, and Adult Health in India. *Social Forces*, 93(4), 1599–1623. <https://doi.org/10.1093/sf/sov010>
- Stroope, S. (2015b). Seclusion, decision-making power, and gender disparities in adult health: Examining hypertension in India. *Social Science Research*, 53, 288–299. <https://doi.org/10.1016/j.ssresearch.2015.05.013>
- Stroope, S., Kroeger, R. A., & Fan, J. (2020). Gender contexts, dowry and women’s health in India: a national multilevel longitudinal analysis. *Journal of Biosocial Science*, 508–521. <https://doi.org/10.1017/S0021932020000334>
- Sullivan, A.R. & Fenelon, A., (2014). Patterns of widowhood mortality. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 69(1), pp.53-62.
- Trivedi, J.K., Sareen, H., & Dhyani, M., (2009). Psychological aspects of widowhood and divorce. *Mens sana monographs*, 7(1), p.37.
- Utz, R.L., Reidy, E.B., Carr, D., Nesse, R. & Wortman, C., (2004). The daily consequences of widowhood: The role of gender and intergenerational transfers on subsequent housework performance. *Journal of Family Issues*, 25(5), pp.683-712.
- Utz, R.L., Caserta, M. & Lund, D., (2012). Grief, depressive symptoms, and physical health among recently bereaved spouses. *The Gerontologist*, 52(4), pp.460-471.
- Vable, A.M., Subramanian, S.V., Rist, P.M., & Glymour, M.M. (2015). Does the “widowhood effect” precede spousal bereavement? Results from a nationally representative sample of older adults, *American Journal of Geriatric Psychiatry* 23(3): 283–92. <http://dx.doi.org/10.1016/j.jagp.2014.05.004>.
- Vesnaver, E., Keller, H.H., Sutherland, O., Maitland, S.B. & Locher, J.L., (2016). Alone at the table: Food behavior and the loss of commensality in widowhood. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 71(6), pp.1059-1069.
- Vikram, K. (2021). Early marriage and health among women at midlife: Evidence from India. *Journal of Marriage and Family*, 83(5), 1480–1501.
- Vlassoff, C. (1990). The Value of Sons in an Indian Village: How Widows see it, *Population Studies* 44(1): 5–20.
- Wang, H., Smith-Greenaway, E., Bauldry, S., Margolis, R., and Verdery, A.M. (2022). Mourning in a Pandemic: The Differential Impact of COVID-19 Widowhood on Mental

Health. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences* 77(12):2306–2316.

Wang, Y., Jiao, Y., Nie, J., O'Neil, A., Huang, W., Zhang, L.,...Woodward, M., (2020). Sex differences in the association between marital status and the risk of cardiovascular, cancer, and all-cause mortality: a systematic review and meta-analysis of 7,881,040 individuals. *Global Health Research and Policy*, 5(1), pp.1-16.

Weitzman, A. (2020). The Sex of Firstborn Children and Intimate Partner Violence in India. *Violence Against Women*, 26(6–7), 590–613.

Williams, K., (2004). The transition to widowhood and the social regulation of health: Consequences for health and health risk behavior. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 59(6), pp.343-S349.

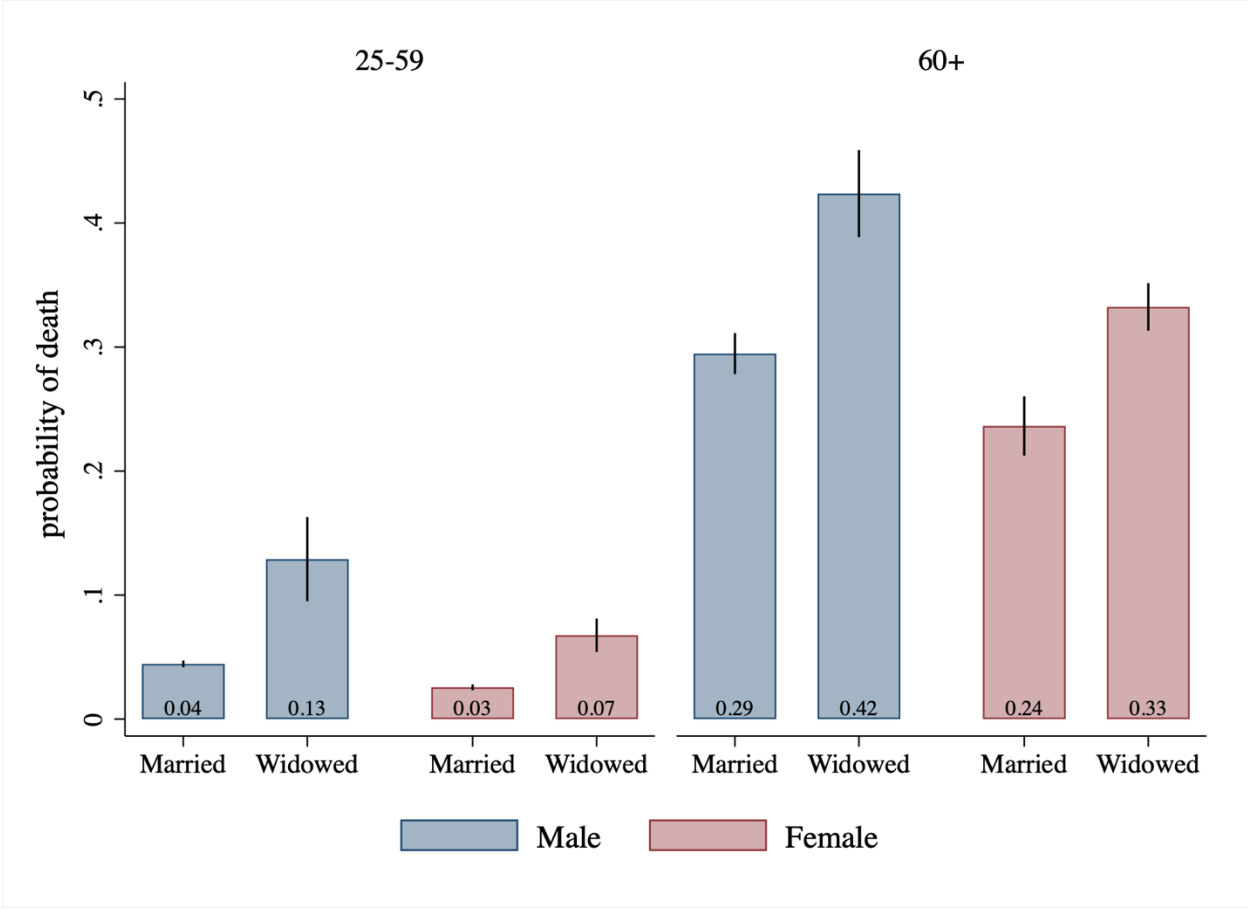
Zick, C.D. & Smith, K.R., (1991). Patterns of economic change surrounding the death of a spouse. *Journal of Gerontology*, 46(6), pp.310-S320.



**Table 1: Summary statistics, IHDS I & II**

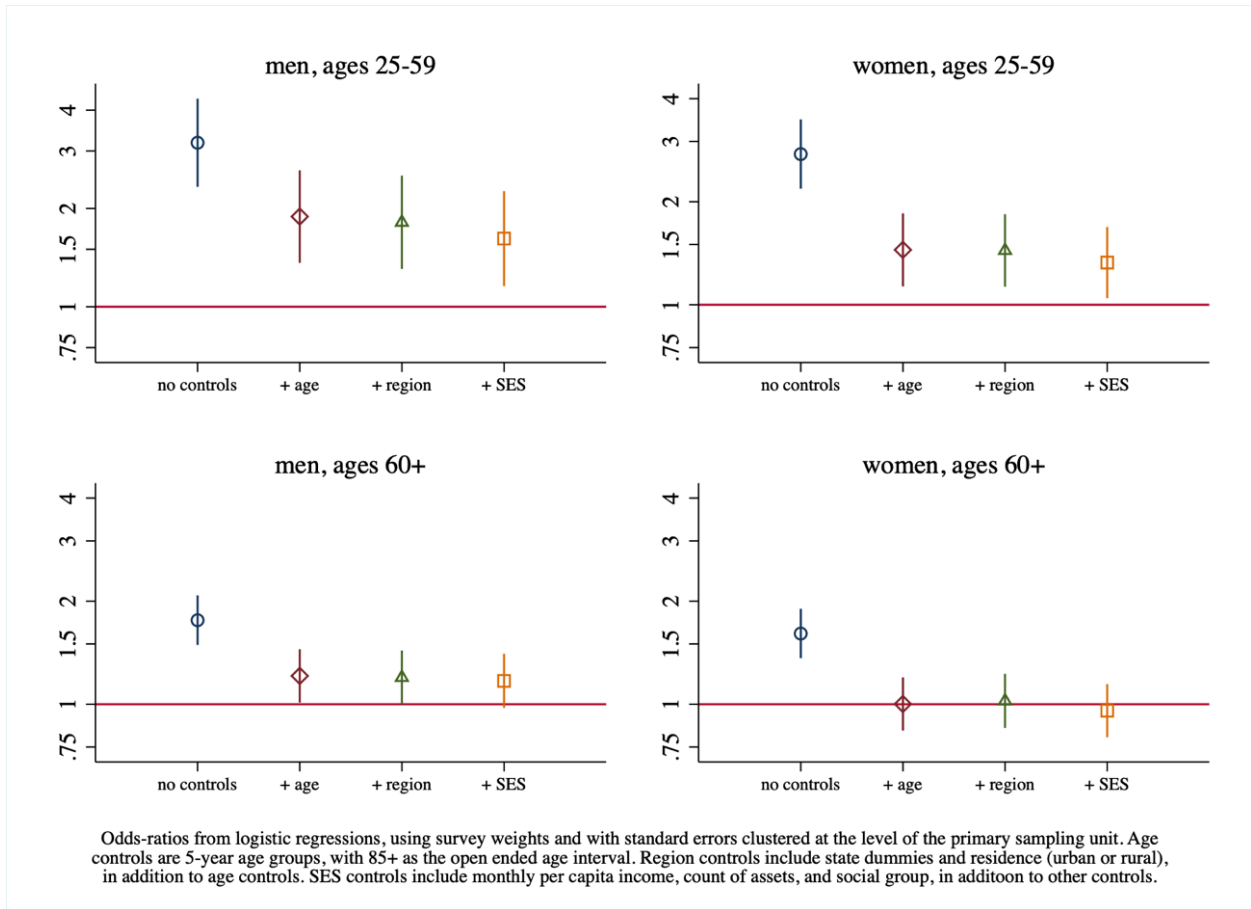
	Widowed		Married	
	Women	Men	Women	Men
<i>Age group (col %)</i>				
25-59	38.6	30.4	92.4	84.7
60+	61.2	69.6	7.6	15.3
<i>Residence type (col %)</i>				
Rural	71.4	79.4	71.2	71.4
Urban	28.7	20.6	28.8	28.6
<i>Monthly per capita consumption (Rs., median)</i>				
	601	600	628	620
<i>Count of assets owned (mean, out of 30)</i>				
	11.3	10.5	12.0	11.9
<i>Region (col %)</i>				
Predominantly rice	47.5	35.4	43.5	44.1
Other states	52.6	64.6	56.5	55.9
<i>Household practices purdah / ghunghat (col %)</i>				
Practice	53.5	62.4	57.9	58.1
Don't practice	46.5	37.7	42.1	41.9
<i>Cases (of 4) when domestic violence is usual in community (col %)</i>				
0	35.7	37.6	26.2	26.1
1	32.0	30.7	36.2	36.2
2 or more	32.2	31.6	37.6	37.8
<i>Years of education (mean, capped at 15)</i>				
	1.5	3.2	4.0	6.3
Total	7,535	1,904	34,209	41,257
% of overall sample	9.9	2.4	40.3	48.4

**Figure 1:** Probability of death between IHDS I and II for men and women by widowhood status

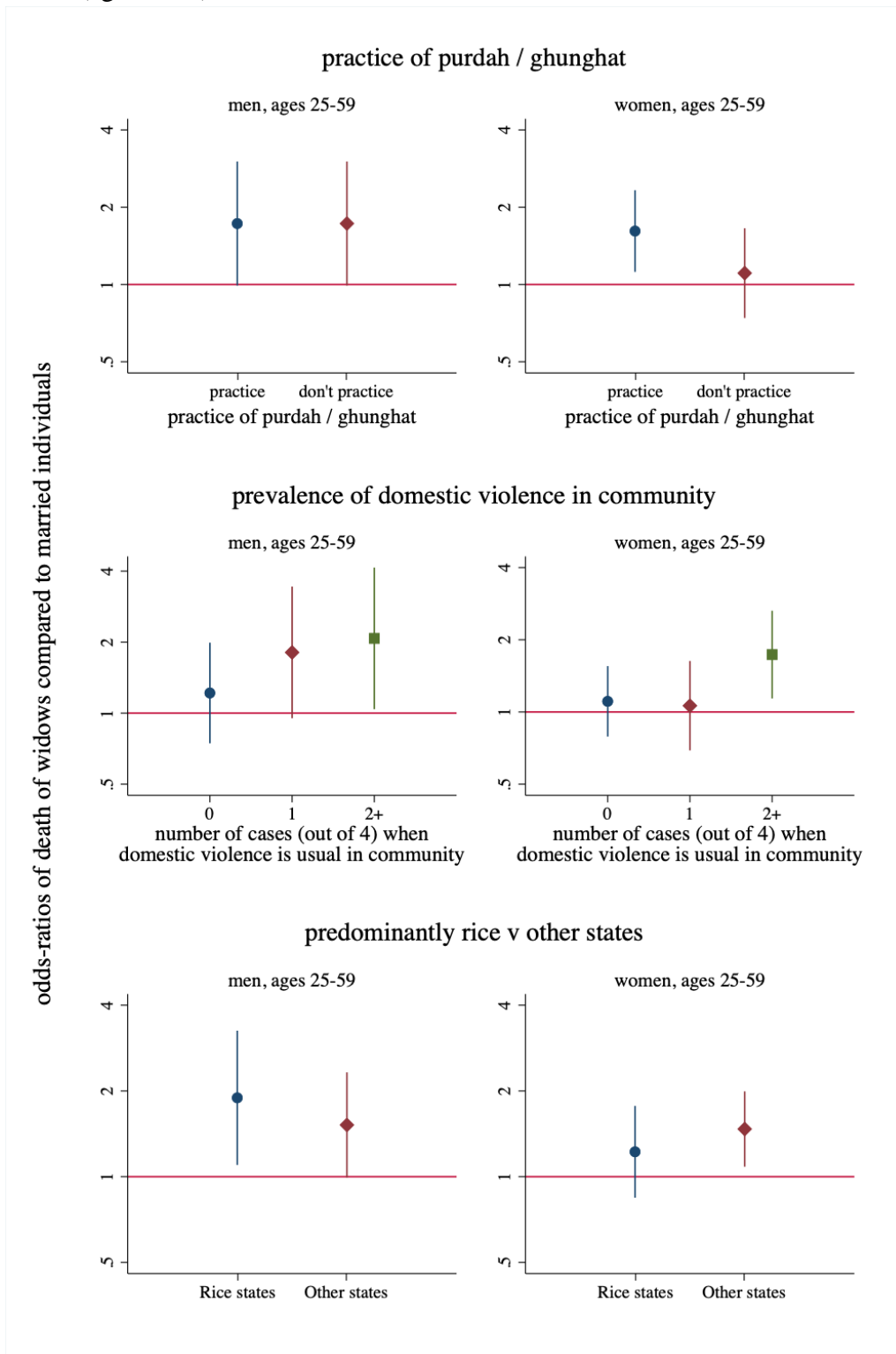


Model includes survey weights. Lines depict 95% confidence interval calculated from clustered standard errors.

**Figure 2:** Odds ratios from separate logistic regressions of widowed mortality relative to married individuals, by gender and age group

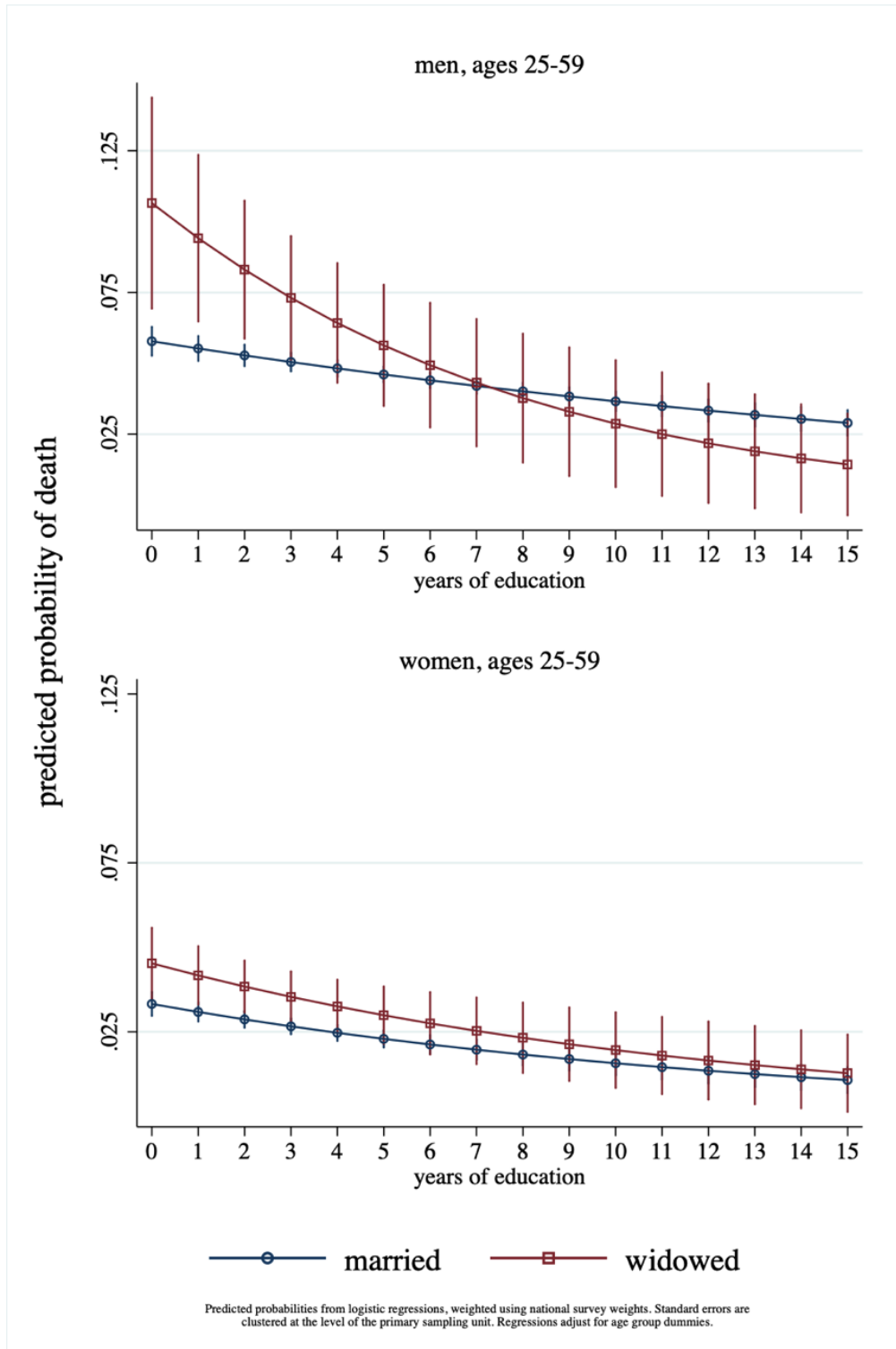


**Figure 3:** Odds ratios of death of widows compared to married individuals by gender norms for younger adults (age 25-59)



Odds ratios from logistic regressions with an interaction between widowhood and measure of gender norm. Models include age, region, and SES controls and use survey weights and cluster standard errors at the primary sampling unit. Bars depict the 95% confidence interval.

**Figure 4:** Predicted probability of death by gender, years of education, and widowhood status for younger adults (aged 25-59)



**Table A1:** Reported prevalence of domestic violence in the community (%), IHDS-1 (2004-05)

	Widowed		Married	
	Women	Men	Women	Men
<i>husband usually beats if</i>				
no dowry	28.4	28.8	29.1	29.3
wife neglects house/children	33.8	36.8	35.0	35.0
wife doesn't cook food properly	29.0	31.1	29.6	29.8
he suspects wife of extramarital relations	82.4	86.9	83.9	83.9
Total	7,535	1,904	34,209	41,257
% of overall sample	9.9	2.4	40.3	48.4

**Table A2: Odds ratio of death for women and men aged 25-59 from logistic regressions**

<b>Women, ages 25-59</b>	Odds ratio of death			
	1	2	3	4
Widowed	2.755*** (0.327)	1.447** (0.181)	1.441** (0.179)	1.329* (0.162)
Urban residence			0.747** (0.074)	1.144 (0.135)
Count of household assets				0.955*** (0.010)
Per capita household consumption				1.000* (0.000)
5-year age group dummies		X	X	X
State dummies			X	X
Dummies for social group				X
<b>N</b>	<b>34,480</b>	<b>34,480</b>	<b>34,224</b>	<b>34,224</b>
<b>Men, ages 25-59</b>	Odds ratio of death			
	1	2	3	4
Widowed	3.179*** (0.504)	1.889*** (0.314)	1.814*** (0.304)	1.617** (0.276)
Urban residence			0.859* (0.061)	1.214* (0.104)
Count of household assets				0.957*** (0.007)
Per capita household consumption				1 (0.000)
5-year age group dummies		X	X	X
State dummies			X	X
Dummies for social group				X
<b>N</b>	<b>35,471</b>	<b>35,471</b>	<b>35,471</b>	<b>35,471</b>

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Standard errors in parentheses clustered at the primary sampling unit. N varies after the inclusion of state dummies due to absence of deaths in some categories.

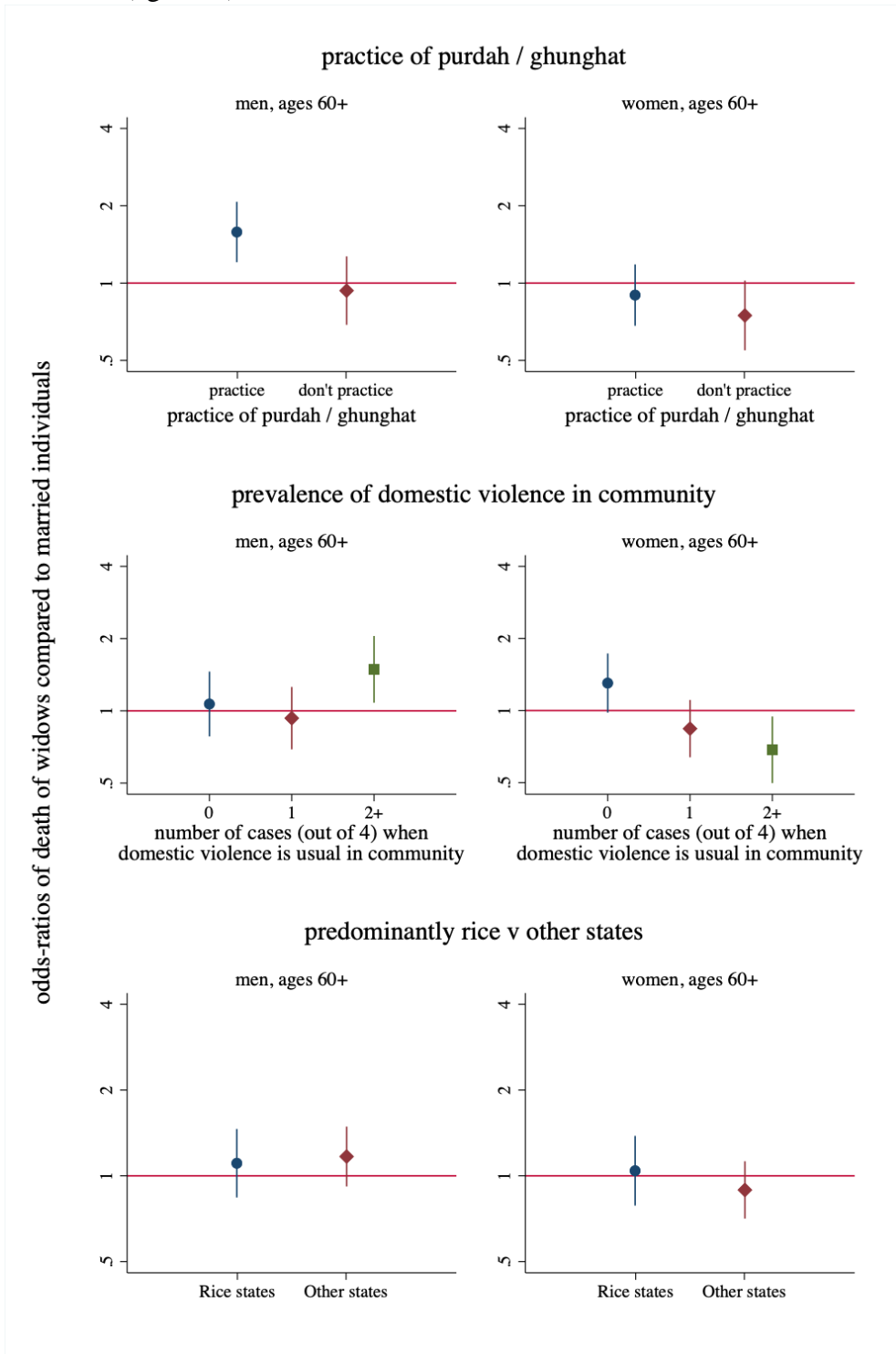
**Table A3:** Odds ratio of death for women and men aged 60+ from logistic regressions

<b>Women, ages 60+</b>	Odds ratio of death			
	1	2	3	4
Widowed	1.609*** (0.136)	1.002 (0.092)	1.023 (0.095)	0.958 (0.088)
Urban residence			0.913 (0.069)	1.075 (0.092)
Count of household assets				0.993 (0.008)
Per capita household consumption				1.000** (0.000)
5-year age group dummies		X	X	X
State dummies			X	X
Dummies for social group				X
<b>N</b>	<b>7,264</b>	<b>7,264</b>	<b>7,252</b>	<b>7,252</b>
<b>Men, ages 60+</b>	Odds ratio of death			
	1	2	3	4
Widowed	1.760*** (0.149)	1.210* (0.111)	1.197+ (0.111)	1.170+ (0.109)
Urban residence			0.956 (0.069)	1.297** (0.111)
Count of household assets				0.965*** (0.007)
Per capita household consumption				1.000 (0.000)
5-year age group dummies		X	X	X
State dummies			X	X
Dummies for social group				X
<b>N</b>	<b>7,690</b>	<b>7,690</b>	<b>7,690</b>	<b>7,690</b>

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Standard errors in parentheses clustered at the primary sampling unit. N varies after the inclusion of state dummies due to absence of deaths in some categories.



**Figure A1:** Odds ratios of death of widows compared to married individuals by gender norms for older adults (age 60+)



Odds ratios from logistic regressions with an interaction between widowhood and measure of gender norm. Models include age, region, and SES controls and use survey weights and cluster standard errors at the primary sampling unit. Bars depict the 95% confidence interval.

**Figure A2:** Predicted probability of death by gender, years of education, and widowhood status for older adults (aged 60+)

