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Death of a child and parental wellbeing in old age: Evidence from Taiwan

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Abstract

The death of a child is one of the most traumatic events that a parent can experience. The psychological and physical consequences of bereavement are well established, and the consequences are more severe for mothers than fathers. However, little is known about how the death of an adult child affects parental wellbeing in old age or how the deceased child's sex may moderate the association. We use data from the Taiwanese Longitudinal Study of Aging (TLSA) to investigate how the death of a son or a daughter differentially affects the wellbeing of older parents, measured by depressive symptoms and self-rated health. We find that for mothers, a son's death is associated with an increase in depressive symptoms and a decline in self-rated health, but fathers' health is not adversely affected by a son's death. There is little evidence that a daughter's death has a negative effect on either maternal or paternal wellbeing. We situate these findings within their social and cultural contexts and discuss social policies that would reduce gender and health inequality.

Keywords

Death of a child; sex; wellbeing; depressive symptoms; self-rated health; Taiwan

Introduction

Almost everyone encounters the death of a loved one, but the death of a child is rare, particularly in developed countries. The impact of losing a child is devastating and can last for decades, resulting in intense grief (Fletcher, 2002), poor psychological and physical health (Rogers et al., 2008), and high rates of both natural and non-natural death (e.g., suicide) (Rostila et al., 2012). Mounting research has indicated that a parent's sex is a key predictor of adjustment and long-term wellbeing after the death of a child. Bereaved mothers report higher levels of grief and psychiatric symptoms and are at greater risk of death than

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bereaved fathers (Li et al., 2005; Wijngaards-de Meij et al., 2005). However, few studies have examined how the sex of the deceased child affects parental wellbeing.

We investigate this question in the context of Taiwan, where particular social and cultural factors may affect how parents respond to the death of a son versus a daughter. In Taiwan, older generations have followed Confucian patriarchal ideals, preferring sons over daughters and investing more household resources in their sons. In return, an adult son—most often the oldest married son and his family—is expected to take care of his parents until their death (Chu & Yu, 2009; Lee et al., 1994). Conversely, when daughters marry, the demands of their new family take precedence over their obligations to their biological parents (Greenhalgh, 1985; Lundberg, 2005). Given that older parents depend mainly on the financial resources of their sons, a son's death may be more distressing to parents than a daughter's death. Taiwanese mothers may be especially vulnerable to a son's death because, among older cohorts, women are more socially disadvantaged (e.g., less education, lower income, and their lack of inherited property). Mothers are more likely than fathers to rely on the financial support of their children (Gupta et al., 2003).

Using data from the Taiwanese Longitudinal Study of Aging (TLSA), we test whether the sex of a deceased adult child differentially affects maternal and paternal wellbeing in old age, and discuss socioeconomic and cultural factors that might account for the observed differences. Our results contribute to the literature on gender and health inequality by identifying a significant link between negative major life events and wellbeing in later life.

Death of a child and parental wellbeing

Few events have a bigger emotional impact than losing a loved one and research has shown that the death of a child is particularly devastating (Fletcher, 2002; Sanders, 1979). Losing a child adversely affects multiple domains of parental wellbeing, including health and marital quality (Bolton et al., 2013). For instance, parents who outlive their children are more likely to have poorer self-reported health than those who do not experience the death of a child (Murphy et al., 1999). They are at higher risk of developing anxiety and depressive disorders (Kreicbergs et al., 2004), cardiovascular disease (Li et al., 2002), diabetes (Olsen et al., 2005), and certain types of cancer (Levav et al., 2000). Bereaved parents are more likely than non-bereaved parents to have suicidal thoughts (Murphy et al., 2003), to commit suicide (Chen et al., 2012), and to die earlier (Li et al., 2003; Rostila et al., 2012). Compared with non-bereaved parents, bereaved parents report poorer marital quality and are more likely to divorce (Najman et al., 1993). The feeling of loss may never dissipate, threatening parents' wellbeing for decades after the death of their child (Rogers et al., 2008).

Maternal vs. paternal wellbeing following the death of a child

Adjusting to the death of a child is more difficult for mothers than fathers. Compared with fathers, mothers who lose their children report higher levels of depression (Wijngaards-de Meij et al., 2005), are more likely to be hospitalized for psychiatric disorders (Li et al., 2005), and have higher mortality rates (Rostila et al., 2012). The duration of grief also lasts longer for mothers (Vance et al., 1995). The difference in maternal and paternal grief may be attributed in part to gender differences in expressing psychological stress. Gender

socialization theories suggest that women and men often express grief and cope with sadness in different ways: whereas women are more likely to use "emotion-focused coping," men are more likely to use "problem-focused coping" (Ptacek et al., 1994). For example, Cook (1988) finds that bereaved fathers tend to suppress negative emotions by "blocking out" thoughts about their deceased child, focusing instead on their responsibility to manage the grief of other family members.

Attachment theory (Bowlby, 1988), which focuses on psychological distress following separation from a loved one, provides a useful way to interpret parents' responses to the loss of a child. The affectional bond in child–parent dyads is associated with children's as well as parents' sense of security. Losing a child may destroy a parent's sense that all is well, leaving them emotionally distressed and feeling a severe sense of loss (Wijngaards-de Meij et al., 2007). Mothers are more likely than fathers to have direct contact with children; they carry them during pregnancy and typically serve as children's primary caretaker from infancy through young adulthood. Thus, we expect that losing a child would cause greater emotional distress for mothers than fathers.

Importance of a deceased child's sex for maternal and paternal wellbeing

One question that has rarely been investigated by prior studies is whether the sex of a deceased child affects parental wellbeing. Although the death of a child is a particularly traumatic event in all cultures (Parkes et al., 1997), we would expect that parental responses to the death of a son versus a daughter would vary by their culture's preference for male or female children. Studies using data from Western countries have not found any evidence that the sex of a deceased child predicts parental wellbeing. For example, using data from an 18-year follow-up study of parents (average age 32) who lost a young child between 1980 and 1996, Werthmann et al. (2010) report that the sex of a deceased child is not significantly associated with parents' mortality risk. Similarly, using data from a 9-year follow-up study of mothers in the U.S., who were aged 20–50 between 1979 and 1981, Espinosa and Evans (2013) report that the mortality risk of mothers who lose a son is not significantly different from that of mothers who lose a daughter. These studies, however, are limited to societies where there is not a pronounced preference for sons. Using data from a cohort of Taiwanese women who had their first child between 1978 and 1987, Chen et al. (2012) report that the risk of maternal suicide increases following the death of a son, but not after the death of a daughter. All three of these studies, however, are limited to younger parents who lost a child; moreover, none of them adjusts for potential confounding variables (e.g., parental health before the death of child).

In East Asian countries, Confucianism strongly emphasizes the importance of family and social order in human relationships, such as in father–son and elder–younger dyads (Ho & Brotherson, 2007). The extended family offers reciprocal support for family members (Son et al., 2008), and it plays an important role in maintaining the wellbeing of the elderly, especially for those who have few public social welfare benefits (Wang, 2011). Traditionally, sons play a central role in the family structure; they not only carry their family's surname to future generations, but they hold the primary responsibility for

providing financial and instrumental assistance to their elderly parents, although daughters are more likely to provide emotional support (Lee et al., 1994).

With rapid social changes owing to industrialization and modernization, gender inequality in education and earnings has declined (Chang & England, 2011); as a result, parents' preference for sons has declined to some extent (Lin, 2009) and it is not uncommon for married daughters to live with and financially support their own parents (Xie & Zhu, 2009). Yet, the recent decline in son preference may be limited to those in younger generations who are well educated. There is some evidence that in order to preserve the "male line," people still prefer to have their firstborn child be male (Chu & Yu, 2009). Therefore, the death of a son is not only an immense emotional loss, but also a financial burden, especially if he is the only or the eldest son.

Sociological perspectives on gender and health inequality suggest that women suffer from poorer health status and higher rates of morbidity than men in part because they have a higher risk of being exposed to social stressors and have fewer material resources to cope with those stressors (Pearlin, 1989; Read & Gorman, 2010; Thoits, 2010). Therefore, a major negative life event, such as the death of a child, may have a stronger adverse effect on women than men. In Taiwan, older women have had particularly few educational and occupational opportunities (Wang, 2011). Women born before World War II were rarely taught to read and were not encouraged to join the labor force; their major responsibilities were domestic (e.g., taking care of their children and elderly parents-in-law) (Hsu, 2005).

In addition, because patrilineality—the passing on of family assets through the male line—is dominant in Confucian societies, women are less likely than men to own property. In Taiwan, parents transfer most of their assets to their sons. If a daughter receives an inheritance, her share is smaller (Chu & Yu, 2009). After the death of a spouse, widows are more likely than widowers to give some or all of their property to their children (Li et al., 1993). Accordingly, a widow's major (and possibly sole) source of financial support in old age may come from her adult sons (Bengtson & Putney, 2000). Such dependencies may render women more vulnerable to the negative effects of a son's death than men. Accordingly, this study proposes two hypotheses.

> *Hypothesis 1:* The negative effect of an adult child's death on parental wellbeing is larger for women than men.
>
> *Hypothesis 2:* The negative effect of a son's death on parental wellbeing is larger for women than men.

Data and methods

Sample

The current study includes participants in the Taiwanese Longitudinal Study of Aging (TLSA), a nationally representative survey designed to assess the health of older people in Taiwan. The first wave of data collection began in 1989 with a nationally-representative random sample of 4,049 persons aged 60 and older; in 1996, an additional sample of 2,462 near-elderly persons (aged 50-66) was added. Follow-up interviews were conducted every 3

or 4 years. By the 2007 survey, 3,041 respondents from the original two cohorts had died (46.7% of the sample), and another 762 were lost to follow up (LFU) for at least one survey wave between 1999 and 2007. Compared with individuals who completed the 1999, 2003, and 2007 surveys (n=2,813), individuals who were LFU for one or more waves were significantly older and less educated at the time of the baseline survey. More detailed information about TLSA, including information about attrition rates across survey waves, is available in supplementary Figure A1 and at www.bhp.doh.gov.tw.

Our analytic sample comprises data collected in the 1996, 1999, 2003, and 2007 surveys. Although data about the death of a child have been gathered since 1989, the sex of deceased children was not recorded until 1999. Thus, data for the sex of deceased children come from the 1999, 2003, and 2007 surveys. We use the 1996 survey to obtain baseline information (e.g., SES and health status). One or more of the variables of interest are missing for respondents who participated in the three inter-survey periods: 1996–1999 (11%), 1999–2003 (10%), and 2003–2007(11%). The vast majority of missing data is attributable to interviews being completed by proxies, who were not asked subjective questions (e.g., depressive symptoms). The analytic sample is restricted to respondents for whom there is complete data for two variables: self-rated health (n=4,390 and observations=10,618) and depressive symptoms (n=4,198 and observations=9,612). The average number of observations per respondent over the three periods is 2.4 for self-rated health and 2.3 for depressive symptoms.

Measures

Death of one's child—Based on retrospective reports, we create a measure of a biological child's death within each of the three periods. Over these periods, 340 parents lost at least one child. Since the number of parents with multiple deceased sons (n=6) or daughters (n=1) within each period is negligible, we do not distinguish between respondents who lost multiple children and those who lost a single child. To test *Hypothesis 1*, death of a child is captured by a single binary variable: whether or not the respondent lost a child between the previous and the current interview. To test *Hypothesis 2*, we include two binary variables: death of a son and death of a daughter during this period.

Parental wellbeing is measured by two self-reported measures, one for overall health status and one for depressive symptoms. *Self-rated health.* Each respondent's overall perception of his or her health was assessed with the question, "Regarding your current state of health, do you feel it is excellent, good, average, not so good, or poor?" The items were coded from 1 to 5, with higher scores indicating better health. Prior research has indicated that self-rated health status is a significant predictor of mortality and disability (Idler & Benyamini, 1997) .

Depressive symptoms are measured with an 8-item subset of the 20-item Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). The CES-D asks respondents how often they have experienced a number of situations or feelings in the past week. Possible responses range from 0 ("rarely or none of the time [less than 1 day]") to 3 ("most or all of the time [5–7 days]"). The eight CES-D items that we analyze include three domains of depressive symptoms: 1) four items to measure somatic symptoms (poor appetite, everything was an effort, poor sleep, and no energy), 2) three items to measure

depressive affect (bad mood, lonely, and sad), and 3) one item to measure interpersonal relations (people were unfriendly). The composite scores of the 8 CES-D items ranged from 0 to 24, with higher scores indicating more frequent symptoms. Average internal consistency (Cronbach's alpha) for these 8 items across the four survey waves is 0.84. Previous studies have demonstrated that short forms of the CES-D yield similar levels of internal consistency and predictive accuracy when compared with the original 20-item CES-D. These findings hold in China (Boey, 1999; Cheng & Chan, 2005) as well as in Western countries (Andresen et al., 1994; Turvey et al., 1999).

Control variables—We include eleven control variables, which fall into five groups: 1) demographic factors, 2) socioeconomic status (SES), 3) sex composition of children, 4) living arrangements, and 5) prior death of a child. There are four *demographic variables*: age, sex of the respondent, marital status (married or cohabiting [reference] or other), and residential area (rural [reference], town, or city). The measures of *SES* comprise two variables: educational attainment (no formal [reference], primary, and secondary or higher) and financial difficulty ranging from 1 (more than enough money) to 4 (great financial difficulty). To measure *sex composition of children*, we include the number of living sons and the number of living daughters. *Living arrangements* are measured with two binary variables: currently living with one or more sons and currently living with one or more daughters. Finally, we include *prior death of a child.* This variable allows us to determine whether the association between the death of a child and parental wellbeing for a given period is driven by a child's death during an earlier period.

Analytic Strategies

In order to fully exploit the longitudinal data, we examine parental wellbeing at each wave (1999, 2003, and 2007). We model each outcome variable as a function of whether a respondent experienced the death of a child between the current (t) and the previous wave (t-1), controlling for covariates that are fixed at the baseline (sex and educational attainment in 1996) as well as time-varying covariates measured at t-1 (age, marital status, residential area, financial difficulty, the number of living sons, the number of living daughters, living with at least one son, living with at least one daughter, and prior child death). In addition, to minimize potential confounding factors that may have led to both a child's death and poor parental health, we control for a lagged measure of the dependent variable (CES-D or self-rated health at the previous wave [t-1]).

We estimate ordinary least squares (OLS) regression models for CES-D scores and ordered logit regression models for self-rated health. Robust standard error estimation is used to account for within-person clustering and to handle multiple observations per respondent. Analyses are carried out in two stages. First, we test the extent to which a child's death (either a son or a daughter) affects parental wellbeing and whether the association varies by parent's sex (*Hypothesis 1*). Next, we test the extent to which the sex of the deceased child affects parental wellbeing and whether the association differs by parent's sex (*Hypothesis 2*). Because there are sex differences in the association between the death of a child, several control variables (e.g. marital status), and outcome variables, we construct sex-stratified models. Nonetheless, we also explicitly test whether the association between a child's death

and parental wellbeing differs by parent's sex by pooling data from both sexes and testing interaction terms.

Results

Descriptive statistics for all variables in the analyses are shown by the period of observation (Table 1). At baseline (1996), the average age of respondents is about 65 years. Men comprise 53% of the sample because of the selective migration of men from mainland China in 1949. The vast majority of the sample has no formal education (38%) or only a primary education (40%); only 22% of respondents received secondary or higher levels of education. About 73% of the respondents are married or cohabiting with a partner. On average, respondents have 2.4 living sons and 2.3 living daughters. About two-thirds of parents are living with their sons while only about one-quarter live with their daughters. Since the 1996 interview, 237 respondents lost at least one son, 99 lost at least one daughter, and 4 lost both a son and a daughter; the average bereaved parent was 72.9 years old at t -1 (SD=8.2) (these data are not shown in Table 1). There is no significant difference between the average age of bereaved mothers (mean=72.9; SD=8.2) and bereaved fathers (mean=73.1; SD=8.3). The frequency of child death varies by analytic period; in the 1999–2003 period, the proportion of respondents who lost a child (4.2%) is higher than in the 1996–1999 (2.4%) and the 2003–2007 (3.7%) periods, but we find no evidence of period effects.

Effects of a child's death on parental wellbeing by parent's sex

In Tables 2 and 3, we observe that the effect of a child's death on parental wellbeing varies by parent's sex, even when controlling for prior health status and other potentially confounding variables. Death of a child has a modest effect on maternal depressive symptoms—that is, women who lost a child scored an average of 2.09 points higher on levels of depressive symptoms than those who did not ($p < .001$); for men, however, there is no significant difference in levels of depressive symptoms between non-bereaved and bereaved fathers (Table 2). A statistical test (not shown) indicates that mothers report significantly higher levels of depressive symptoms after the death of a child than fathers ($p < .001$). For self-rated health, the results suggest that women who lost their child rate their health lower than women who did not, although the relationship is only marginally significant (p=0.098, Table 3). Similar to the findings for depressive symptoms, we have no evidence showing that the loss of a child negatively affects self-rated health for men. Although the coefficients suggest that the death of a child impacts maternal but not paternal reports of health, a statistical test (not shown) indicates that the difference is not significant. Nevertheless, we find support for the first hypothesis: the negative effect of a child's death on parental wellbeing appears to be larger for women than men, most convincingly for depressive symptoms.

Parental wellbeing by the sex of a deceased child

In Tables 4 and 5, we decompose the death of a child into the death of a son and the death of a daughter. Death of a son is associated with an increase in maternal depressive symptoms— that is, women who lost a son scored an average of 2.41 points higher on levels of depressive symptoms than those who did not ($p < .001$); women who lost a daughter scored

1.40 points higher on levels of depressive symptoms than those who did not, but the effect is only marginally significant (p=0.072). For men, however, there is no evidence that either the death of a son or a daughter is associated with an increase in depressive symptoms (Table 4). Statistical tests (not shown) indicate that mothers significantly report higher levels of depressive symptoms than fathers after losing a son ($p < .001$). Similar to results in Table 3, the coefficient in Table 5 suggests that women who lost a son rate their health as lower than women who did not, but again the effect is only marginally significant (p=0.073). There is no evidence that women who lost a daughter report poorer health than women who did not. Men's self-rated health does not appear to be affected by either the death of a son or the death of a daughter. Although the coefficients suggest that a son's death negatively affects maternal but not paternal reports of health, the difference is not significant (not shown). Nonetheless, we find support for the second hypothesis: the negative effect of a son's death on parental health appears to be larger for women than men, most notably for depressive symptoms.

Discussion

This study has several important advantages over previous studies that have examined the link between the death of a child and parental wellbeing. First, previous studies have lacked a control group of non-bereaved parents (e.g., Werthmann et al., 2010), have used community-based or otherwise geographically-limited samples (e.g., Rogers et al., 2008), or have failed to include an extensive set of potentially confounding variables, including the respondent's health condition before their child died or whether they had previously experienced the death of a child (Espinosa & Evans, 2013). Our study overcomes these limitations. Second, while most previous research has focused on the death of *young* children and the wellbeing of *younger* parents, we investigate how the death of an *adult* child threatens the wellbeing of older adults. Finally, based on gender inequality theories in East Asia, our study explores how the sex of a deceased child differentially jeopardizes the wellbeing of men and women at older ages.

Our analyses yield several interesting findings. First, the effect of a child's death on parental wellbeing at older ages varies by parent's sex: bereaved mothers report higher levels of depressive symptoms than non-bereaved mothers. Though bereaved mothers also have lower self-rated health, the relationship is only marginally significant. On the contrary, bereaved fathers are not significantly different from non-bereaved fathers by either measure of wellbeing. Our findings are consistent with those of previous studies of younger parents (Kreicbergs et al., 2004; Li et al., 2005). Differences in how men and women express grief (e.g., problem-focused vs. emotional focused coping) might partially account for why mothers and fathers have different levels of psychological distress after the death of a child (Ptacek et al., 1994). Although our findings could be attributable to higher mortality attrition for men than women (Supplementary Table A1), we cannot assess this bias because we have no information on the number of bereaved fathers that died between t-1 and t. However, a prior study has shown that the mortality risk of bereaved fathers is only 10% greater than non-bereaved fathers 8 years after the death of an adult child (Rostila et al., 2012).Thus, we believe that mortality attrition for bereaved fathers would not significantly change our findings.

Second, we find that a son's death has a modest effect on maternal depressive symptoms but no significant effect on paternal depressive symptoms. In contrast, the effect of a daughter's death on maternal depressive symptoms is much smaller and only marginally significant. We find no evidence that daughter's death negatively affects paternal depressive symptoms or self-rated health. Overall, our findings are in line with recent evidence revealing that the death of a son increases the risk of maternal suicide, whereas the death of a daughter does not (Chen et al., 2012). An important unanswered question is *why* the death of an adult son affects only maternal wellbeing. As previous studies have pointed out, the acute phase of bereavement elicits massive emotional distress and a severe psychophysical burden (Li et al., 2005). Following the death of a child, parents might have difficulty sleeping, drink heavily, eat poorly, or reduce their physical activity (e.g., Vance et al., 1994), any of which can lead to poorer health. One might also argue that the positive association between the death of a child and poor parental health is explained by a shared genetic predisposition to certain diseases or by shared exposure to harmful environments. However, these mechanisms do not account for why the death of a son matters more for mothers than fathers.

The sociological perspectives on gender and health inequality suggest that these differences might be attributed to cultural and socioeconomic contexts (Read and Gorman 2010). Although the negative effect of a child's death on parental wellbeing is seemingly universal, when women occupy marginal social and economic positions they may be more negatively impacted by adverse life events (Pearlin, 1989). For example, in societies with patriarchal family systems, such as China, South Korea, and India, men and women have traditionally held distinct socioeconomic roles. In such systems, having sons increases women's status within their family; having the support of an adult son is a way for women to maintain their wellbeing as they age (Goldman et al., 2006). It is therefore plausible that women may invest more time and energy in their relationship with their sons than with their daughters (Gupta et al., 2003). Accordingly, the loss of a son may not only be a source of emotional distress, but it may also entail financial loss, lead to a change in living arrangements, and ultimately pose a threat to later-life wellbeing.

The literature on son preference and paternal involvement with sons (Lundberg, 2005) suggests that the death of a son would negatively affect both paternal and maternal wellbeing. We find, however, that the death of a son is associated with neither paternal depressive symptoms nor self-related health. We suggest two interpretations regarding this finding. First, strong gender norms regarding appropriate emotional responses to the death of a child might suppress fathers' emotional response to the death of a son (Cook, 1988). Second, in patrilineal systems, men are more likely than women to manage their own finances (Li et al., 1993); because women generally outlive men, a man may benefit from his wife's care after the death of a child. Thus, compared with women, men are less likely to suffer substantial financial strain and their degree of social support is less likely to decrease after the death of an adult son.

Our study has several limitations. First, TLSA does not contain information on various attributes of deceased children, such as their birth order, the nature of their affectional bond with their parents, their age at death, or the cause of their death, all of which may affect the

meaning attributed to their death. For example, the death of older children may affect parental wellbeing more negatively because parents have spent more time bonding with them than with younger children (Rostila et al., 2012). The financial role of the deceased child in his or her parents' life might also affect the intensity and duration of parents' grief. The loss of the eldest son, who is expected to support his parents in old age, may be an especially disruptive and devastating event, entailing major changes in family structure, living arrangements, and wellbeing. In addition, the cause of a child's death is an important predictor of parents' adjustment to bereavement; a sudden death (due to violence, suicide, and accidents) may more negatively affect parental wellbeing than a natural death (e.g., Li et al., 2003). According to a national mortality report in Taiwan (Department of Health, 2012), the risk of extreme or sudden death is greater for men than women. Sex differences in the cause of death may explain, in part, why mothers report more distress following a son's death than a daughter's death. Given data limitations, however, we can only speculate about this possibility. Future studies should explore the extent to which causes of death account for the association.

Second, our findings are based on older parents who survived until, and were interviewed at, time *t*. Therefore, our findings may not be fully generalizable to older people in Taiwan. In addition, surveys administered every 3 to 4 years cannot capture situations in which the death of a child between waves prevents parents from participating in follow-up surveys. For example, bereaved parents may not have participated in the interview due to serious illness following the death of their child. Previous studies have pointed out that a child's death has a pronounced effect on mortality in the years that immediately follow the loss (Chen et al., 2012; Espinosa & Evans, In press). Any parents who lost a child but then died themselves before the next survey wave were not observed in our study; thus, we may have systematically underestimated the effect of a child's death on parental wellbeing.

Third, historical circumstances may uniquely situate individuals in the two cohorts analyzed here. Our study is limited to respondents who were born before 1947; 57% of women from this generation have no formal education. Although these older cohorts are likely to retain a strong preference for sons, recent evidence shows that the preference for sons has decreased considerably in Taiwan as well as some other Asian countries since 1990 (e.g., South Korea) (Chung & Gupta, 2007; Lin, 2009). Women's educational achievement and labor market participation have been increasing, and the gap between men's and women's earnings has declined significantly in these East Asian countries (Chang & England, 2011). We would expect women in younger generations to be more independent financially and thus, may be less negatively affected by the loss of a child in terms of their financial security in old age. For example, a recent study using data from urban China shows that, in the presence of controls for education and income, married daughters, especially those who live with their parents, are more likely to financially support their parents than married sons (Xie & Zhu, 2009). Accordingly, we suggest that future research investigate whether our findings are the same for younger cohorts in Taiwan, as well as in other East Asian societies that have a strong preference for sons, such as China and South Korea.

Our findings show that mothers who lose their adult sons are particularly likely to experience declines in their physical and psychological wellbeing. To mitigate these

negative health impacts, older women need increased support following the death of a son. Such support should entail immediate and effective health care services as well social welfare benefits, especially for those whose son had been a major source of financial support. Much can be done to improve gender equity in income and employment opportunities. Although research indicates that, since 1999, Taiwanese women have attained higher levels of education than Taiwanese men, the female disadvantage with respect to income and job opportunities has persisted (Chang & England, 2011). Social, legal, and market reforms to reduce son preference in East Asian countries (Gupta et al., 2003) would help improve the status of women, allowing them to contribute to their parents' later-life wellbeing.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Highlights

- This study examines how the death of an adult son or daughter affects parental wellbeing in Taiwan.

- Wellbeing is measured by self-reports of overall health status and depressive symptoms.

- A son's death is associated with a decline in wellbeing for mothers but not fathers.

- A daughter's death is not related to the wellbeing of either parent.

- These findings reflect gender inequality and the cultural preference for sons in Taiwan.

Table 1

Descriptive Statistics by Period.

Period, t-1 – t (Total, n=10,168)[a]	1996–1999 (n=3,971)	1999–2003 (n=3,365)	2003–2007 (n=2,832)
Death of a child between t-1 and t			
Death of either a son or a daughter,% (n)	2.4 (94)	4.2 (142)[b]	3.6 (104)[b]
Death of a son,% (n)	1.8 (71)	2.9 (96)	2.6 (74)
Death of a daughter, % (n)	0.6 (23)	1.4 (48)	1.1 (32)
Outcome variables at t			
Depressive symptoms, mean (SD)	3.5 (4.8)	3.3 (4.6)	3.7 (4.8)
Self-rated health, mean (SD)	3.1 (1.1)	3.0 (1.1)	2.9 (1.0)
Fixed baseline characteristics in 1996			
Female, %	47	48	49
Education			
No formal, %	38	36	34
Primary, %	40	40	42
Secondary, %	22	24	25
Time-varying covariates at t-1			
Age, mean (SD)	65.4 (9.0)	67.4 (8.5)	70.8 (8.0)
Married/cohabiting, %	73	72	69
Residential area			
Rural, %	40	33	36
Town, %	23	30	24
City, %	37	37	40
Financial difficulties, mean (SD)	2.2 (0.6)	2.3 (0.7)	2.3(0.7)
Number of living sons, mean (SD)	2.4 (1.6)	2.1 (1.3)	2.0 (1.2)
Number of living daughters, mean (SD)	2.3 (1.8)	2.0 (1.5)	1.9 (1.5)
Living with one or more sons, %	65	58	54
Living with one or more daughters, %	24	19	16
Death of a child prior to t-1, %	19	18	19
Depressive symptoms, mean (SD)	3.5 (4.7)	3.1 (4.5)	3.2 (4.4)
Self-rated health, mean (SD)[c]	3.2 (1.1)	3.2 (1.1)	3.1(1.1)

[a]Note: This number refer to the total number of observations for self-rated health. For depressive symptoms, the total number of observations is 9,612, including 3,811 in 1996-1999, 3,167 in 1999-2003, and 2,634 in 2003-2007.

[b]The number of parents who experienced a son's or daughter's death is not equal to the number of children who died because there are two respondents who lost both a son and a daughter between waves.

[c]Higher scores of self-rated heath indicate better health status.

Table 2

Coefficients (standard errors) from an OLS model of depressive symptoms at t for parents who experienced the death of a child between t-1 and t, by sex of parent.

	Women (observations, n=4,613)	Men (observations, n=4,999)
Death of a child between t-1 and t	2.09*** (0.41)	−0.25 (0.33)
Depressive symptoms at t-1	0.40*** (0.02)	0.38*** (0.02)
(*No formal education*)		
Primary education	−0.33* (0.15)	−0.51** (0.17)
Secondary education	−0.64** (0.22)	−0.68*** (0.18)
Financial difficulty at t-1	0.73*** (0.11)	0.77*** (0.09)
Age at t-1	0.05*** (0.01)	0.04*** (0.01)
Married/cohabiting at t-1	0.15 (0.15)	−0.31+ (0.17)
(*Living in rural area at t-1*)		
Living in city at t-1	0.38* (0.17)	0.06 (0.13)
Living in town at t-1	0.27 (0.18)	0.04 (0.14)
Num. of living sons at t-1	−0.12* (0.06)	−0.003 (0.04)
Num. of living daughters at t-1	−0.06 (0.05)	−0.02 (0.04)
Living with a son at t-1	−0.24** (0.09)	−0.23* (0.12)
Living with a daughter at t-1	−0.18 (0.15)	−0.08 (0.13)
Death of a child prior to t-1	0.14 (0.18)	0.04 (0.18)
Constant	−1.69* (0.72)	−1.90** (0.61)
Overall R^2	0.21	0.19

+ $p < 0.1$,

* $p < 0.5$,

** $p < 0.01$,

*** $p < 0.001$

Table 3

Coefficients (standard errors) from an ordered logit model of self-rated health at t for parents who experienced the death of a child between t-1 and t, by sex of parent.

	Women (observations, n=4,899)	Men (observations, n=5,269)
Death of a child between t-1 and t	−0.23[+] (0.14)	0.02 (0.17)
Self-rated health at t-1	0.64[***] (0.03)	0.65[***] (0.03)
(*No formal education*)		
Primary education	0.18[**] (0.06)	0.16[*] (0.07)
Secondary education	0.36[***] (0.09)	0.30[***] (0.08)
Financial difficulty at t-1	−0.22[***] (0.04)	−0.25[***] (0.04)
Age at t-1	−0.03[***] (0.004)	−0.03[***] (0.003)
Married/cohabiting at t-1	−0.09 (0.06)	0.06 (0.07)
(*Living in rural area at t-1*)		
Living in city at t-1	0.07 (0.06)	0.21[***] (0.06)
Living in town at t-1	0.06 (0.07)	0.08 (0.07)
Num. of living sons at t-1	0.02 (0.02)	0.03[+] (0.02)
Num. of living daughters at t-1	−0.01 (0.02)	0.02 (0.02)
Living with a son at t-1	0.04 (0.06)	−0.004 (0.05)
Living with a daughter at t-1	0.07 (0.08)	0.11[+] (0.07)
Death of a child prior to t-1	−0.10 (0.06)	−0.12 (0.07)
Overall pseudo R^2	0.07	0.08

[+]
$p < 0.1$,

[*]
$p < 0.5$,

[**]
$p < 0.01$,

[***]
$p < 0.001$

Note: Higher scores of self-rated heath indicate better health status.

Table 4

Coefficients (standard errors) from an OLS model of depressive symptoms at *t* for parents who experienced the death of a child between *t*-1 and *t*, by sex of parent and child.

	Women (observations, n=4,613)	Men (observations, n=4,999)
(*No death of a child between t-1 and t*)		
Death of a son between *t*-1 and t	2.41*** (0.47)	−0.30 (0.38)
Death of a daughter between *t*-1 and t	1.40+ (0.77)	−0.19 (0.63)
Depressive symptoms at *t*-1	0.40*** (0.02)	0.38*** (0.02)
(*No formal education*)		
Primary education	−0.33* (0.15)	−0.51** (0.17)
Secondary education	−0.65** (0.23)	−0.68*** (0.18)
Financial difficulty at *t*-1	0.73*** (0.11)	0.77*** (0.09)
Age at *t*-1	0.05*** (0.01)	0.04*** (0.01)
Married/cohabiting at *t*-1	0.15 (0.15)	−0.31+ (0.17)
(*Living in rural area at t-1*)		
Living in city at *t*-1	0.39* (0.17)	0.05 (0.13)
Living in town at *t*-1	0.27 (0.18)	0.04 (0.14)
Num. of living sons at *t*-1	−0.12* (0.06)	−0.03 (0.04)
Num. of living daughters at *t*-1	−0.06 (0.05)	−0.02 (0.04)
Living with a son at *t*-1	−0.18 (0.15)	−0.23+ (0.12)
Living with a daughter at *t*-1	−0.04 (0.18)	−0.08 (0.13)
Death of a child prior to *t*-1	0.14 (0.18)	0.04 (0.18)
Constant	2.41*** (0.47)	−0.30 (0.38)
Overall R^2	0.21	0.19

+ p < 0.1,

* p < 0.5,

** p < 0.01,

*** p < 0.001

Table 5

Coefficients (standard errors) from an ordered logit model of self-rated health at t for parents who experienced the death of a child between t-1 and t, by sex of parent and child.

	Women (observations, n=4,899)	Men (observations, n=5,269)
(*No death of a child between t-1 and t*)		
Death of a son between t-1 and t	−0.29[+] (0.16)	0.08 (0.23)
Death of a daughter between t-1 and t	−0.14 (0.28)	−0.01 (0.23)
Self-rated health at t-1	0.64[***] (0.03)	0.65[***] (0.03)
(*No formal education*)		
Primary education	0.18[**] (0.06)	0.16[*] (0.07)
Secondary education	0.36[***] (0.09)	0.30[***] (0.08)
Financial difficulty at t-1	−0.22[***] (0.04)	−0.25[***] (0.04)
Age at t-1	−0.03[***] (0.004)	−0.03[***] (0.003)
Married/cohabiting at t-1	−0.09 (0.06)	0.06 (0.07)
(*Living in rural area at t-1*)		
Living in city at t-1	0.07 (0.06)	0.21[***] (0.06)
Living in town at t-1	0.06 (0.07)	0.08 (0.07)
Num. of living sons at t-1	0.02 (0.02)	0.03[+] (0.02)
Num. of living daughters at t-1	−0.001 (0.02)	0.02 (0.02)
Living with a son at t-1	0.04 (0.06)	−0.005 (0.05)
Living with a daughter at t-1	0.07 (0.08)	0.11[+] (0.07)
Death of a child prior to t-1	−0.10 (0.06)	−0.12 (0.07)
Overall pseudo R^2	0.07	0.08

[+] $p < 0.1$,

[*] $p < 0.5$,

[**] $p < 0.01$,

[***] $p < 0.001$

Note: Higher scores of self-rated heath indicate better health status.