

Hearing Impairment and Mental Health
Among Married Couples

Jessica S. West, MPH, is a PhD candidate in the Department of Sociology at Duke University, Durham, NC, USA.

Correspondence should be sent to Jessica S. West, MPH, Department of Sociology, Duke University, 417 Chapel Drive, Durham, North Carolina 27708 (email: jessie.west@duke.edu)

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Conflict of Interest

The author has no conflicts of interest to disclose.

Author Contributions

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J.S. West planned the study, performed all statistical analyses, wrote, and revised the article.

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Abstract

Objectives: Disablement is a significant health problem and chronic stressor for older adults and is associated with negative mental health outcomes. Although some research has explored how disability extends beyond individuals to influence the mental health of their support networks, less population-based research has assessed the consequences of hearing impairment, a growing public health concern that affects 72.4% of people aged 65 and older. Moreover, although much research has examined the negative individual impact of hearing impairment, less population-based research has assessed its consequences on spouses. To fill this gap, the current study builds on gender, marriage, and stress proliferation research to examine 1) the association between own hearing impairment and spouses' depressive symptoms, and 2) whether this association varies by the gender of the spouse.

Methods: Fixed-effects regression models were conducted using data from 5,485 couples (10,970 individuals) from 10 waves of the Health and Retirement Study (1998-2016).

Results: Wives' fair or poor hearing is significantly associated with an increase in husbands' depressive symptoms, net of controls. However, husbands' fair or poor hearing is not associated with an increase in wives' depressive symptoms.

Discussion: These findings suggest that hearing impairment can proliferate from one spouse to the other, but that this proliferation depends on gender. Health care providers need to be aware of the implications for husbands when treating women with hearing impairment.

Keywords: Disability; Stress proliferation; Spouses

As the global population of people aged 60 and older is predicted to rise (Bloom et al., 2015), the mental and physical functioning of these aging adults will pose increasing challenges. One of the most common age-related stressors is the emergence or worsening of physical and mental decline for one or both spouses (Muramatsu, Yin, & Hedeker, 2010). Although providing physical and emotional support or care for a spouse is an integral part of marriage, it can have consequences for the caregiver (Thomeer, Reczek, & Umberson, 2015). Spouses experience disability through their partner's impairment, which is called third-party disability (Scarinci, Worrall, & Hickson, 2012). This concept is similar to stress proliferation, which describes how stressors in one area of life can lead to the accumulation of stressors in other aspects of life (Pearlin, 1989). Stress proliferation has since been extended to describe the collateral consequences when one person's stress spills over to others (Thoits, 2010). In other words, since people exist in social networks, the development of health problems can impact not only the individual but also those close to them (Elder Jr, Shanahan, & Jennings, 2015).

Hearing impairment is one physical health condition that may be particularly salient in the marital context. Hearing connects an individual to the social and physical environments (Verbrugge & Jette, 1994). Thus, hearing impairment has social implications because it affects one's ability to communicate with others (Dalton et al., 2003). Prior research has explored the relationship between hearing impairment and negative health outcomes, revealing associations with depression (West, 2017), cognitive impairment (Lin et al., 2011), and poorer physical functioning (Dalton et al., 2003). In contrast, research on the spouses of those with hearing impairment is currently limited to qualitative studies or small, cross-sectional studies, as few nationally

representative datasets include comprehensive data on spouses. Therefore, they offer limited knowledge on population-level causal processes. Given population aging and the fact that hearing impairment is one of the most common health problems in later life (Whitson et al., 2018), it will become increasingly important to understand how it spills over from focal individuals to partners.

The current study draws on research in marriage, gender, and stress to examine how stressors within the marital context can have consequences for partners. The primary objectives are to explore the relationship between hearing impairment in one spouse and mental health outcomes in the other spouse, and how gender shapes this relationship. To this end, the study uses the Health and Retirement Study (HRS), a nationally representative, longitudinal survey with detailed data on the focal participants' spouses to estimate the relationship between hearing impairment and spouse's mental health.

Background

Stress Proliferation and Linked Lives

Research over the past 70 years has demonstrated that stress undermines physical and mental health (Institute of Medicine, 2001). One type of stressor, chronic strains, are ongoing, long-term difficulties that negatively affect well-being, such as living in poverty or having a chronic illness (Pearlin, 1989). Chronic stressors can be a source of stress proliferation, which has traditionally explained how stressors associated with one event or role (e.g., incarceration, chronic illness) can lead to the accumulation

of stressors in other aspects of life (e.g., divorce, financial strain due to the inability to find work) (Pearlin, 1989; Turney, 2014). According to stress proliferation theory, experiencing poor health (e.g., hearing impairment) throughout adulthood can have spillover effects, especially regarding social and economic attainment.

Stress proliferation has been extended to explain the consequences of one person's stressors on others in their social environment (Thoits, 2010). For example, adolescent children of mothers with severe hearing impairment have worse mental health than adolescent children of mothers without hearing impairment (Borren et al., 2015), suggesting that the stress associated with disability can proliferate to family members. The cross-person spillover effects of stressors illustrate the life course principle of linked lives, indicating that social changes not only have a direct impact on individuals, but can also affect individuals indirectly through other people (Elder, Johnson, & Crosnoe, 2003). For example, a person's well-being may be influenced by their family member's illness. Family members (particularly spouses) are interdependent and serve as important sources of both social influence and connection across the life course (Thomas, Liu, & Umberson, 2017).

Gender and Health Contingencies within Marriage

The marital relationship has received a great deal of research attention and is considered one of the most important relationships for health (Umberson, 1987). For decades, research has reported the health benefits of marriage: compared to unmarried people, married people have less psychological distress, are less often depressed, report fewer physical health problems, and have better overall physical health (Waite &

Gallagher, 2000). More recently, studies show that individuals who were never married or who experienced a marital dissolution were significantly more likely than continuously married individuals to die following a heart attack (Dupre & Nelson, 2016).

Additionally, gendered expectations of spouses result in men and women experiencing marriage differently (Thomeer et al., 2015). From a stress process perspective, the effect a chronic stressor has on health may depend on core social status characteristics (Pearlin & Bierman, 2013). Gender is a core social status characteristic that may influence the relationship between disability and spousal mental health and lead to different experiences of depressive symptoms for men and women. For example, gendered expectations contribute to asymmetric caregiving in which men are more likely to rely exclusively on a spouse for companionship, emotional support, and caregiving (Umberson, Chen, House, Hopkins, & Slaten, 1996) while women are expected to provide emotional and instrumental support to their husbands (Behler, Donnelly, & Umberson, 2019). This asymmetry leads men to be less effective caregivers when called upon to perform care-related tasks (Thomeer et al., 2015).

Some research on caregiving within marriages has explored those in which one partner is health impaired. Stress proliferation may be particularly important in such relationships because of third-party disability, which occurs when a significant other does not have a health condition but experiences disability through the partner's impairment (Scarinci et al., 2012). Evidence suggests that wives are more likely to experience stress when caring for a health-impaired spouse because of additional tasks they must perform for their spouses' emotional

well-being (Thomeer et al., 2015). Other research shows that wives providing only personal care (i.e., care related to activities of daily living) to health-impaired spouses report more depressive symptoms than wives providing only instrumental care (i.e., care related to instrumental activities of daily living), while the mental health of husbands providing only personal or only instrumental care does not differ (Kim et al., 2017). Although not a study on caregiving, per se, Margolis (2013) found that while both men and women are more likely to quit smoking after reporting a new chronic condition, only women were more likely to quit smoking (to reduce negative effects of secondhand smoke the partner's health) or to start smoking (as a coping strategy) after their partners became ill. Such research suggests that when one spouse has health limitations, the other may take on more responsibilities and that this process may be gendered since wives perform more emotion and care work than husbands (Thomeer et al., 2015). These patterns reveal the gendered experience of caregiving for health-impaired spouses.

Hearing Impairment Within Marriage

Despite a large body of literature on the marital relationship, comparatively less research has conceptualized hearing impairment as a physical health stressor that is linked to health outcomes in spouses. Hearing impairment may be particularly important to study in marital contexts since it affects communication. When poor hearing affects communication, interactions become impaired, which can reduce quality of life (Dalton et al., 2003).

Qualitative research studies and studies using larger, clinical samples provide important insights regarding the experience of hearing impairment within marital relationships. For example, one study of ten non-impaired spouses of hearing-impaired partners (five females, five males) revealed that the effects of hearing impairment on spouses include avoiding social situations, frustration with communication, and altered home environments (due to increased television volume) (Scarinci, Worrall, & Hickson, 2008). Subsequent research using the Significant Other Scale for Hearing Disability (SOS-HEAR) in a sample of 100 normally-hearing spouses in Australia reveals that spouses experience third-party disability in areas related to communication changes, use of communication strategies, and emotional problems (e.g. feeling frustrated or angry) (Scarinci et al., 2012). In a randomized control trial of 36 couples in which one partner was a hearing aid or cochlear implant user, Preminger and Meeks (2010) randomly assigned couples to an audiological rehabilitation program for the hearing-impaired spouses only, or to a program that included a treatment designed for the spouses. All couples reported that the hearing impairment caused difficulties with communication, activities of daily living, and social participation, but quality of life improved up to six months post-intervention. One important caveat is that to be included in the study, couples had to report that hearing impairment created quality of life disruptions in their lives. This research contributes to knowledge about the experiences of spouses whose partners are hearing-impaired.

Although there have been numerous qualitative and clinical samples examining hearing impairment within marriages, research using population-based, longitudinal data is limited. A recent review found only two studies that used large epidemiologic datasets to study the effect of hearing impairment on spouses (Lehane, Dammeyer, &

Elsass, 2017). Using the Alameda County Study, Wallhagen, Strawbridge, Shema, and Kaplan (2004) found that the spouse of a person with hearing loss is more likely to report poor physical functioning, not feeling happy, symptoms of depression, and having less energy five years after baseline measurement. Importantly, the analyses revealed a gender-moderated effect: while a husband's hearing impairment negatively affected his wife, a wife's impairment did not impact her husband. In contrast, a cross-sectional study in Norway found that spouses of people with hearing loss do *not* exhibit greater symptoms of decreased subjective well-being, depression, or anxiety compared to spouses of people without hearing loss (Ask, Krog, & Tambs, 2010). More recently, a cross-sectional study in Ireland found that partners of people with sensory losses (hearing, vision, or dual loss) had higher levels of depression (but not anxiety) than spouses of people without sensory loss (Lehane, Hofsöe, Wittich, & Dammeyer, 2017). Further analysis showed no significant differences according to whether the spouse had hearing, vision, or dual-sensory loss, suggesting that individuals tend to report similar levels of distress, regardless of loss type. Given the limited population-based, longitudinal analysis and conflicting findings among them, the association between hearing impairment and spousal mental health remains uncertain. Moreover, there is limited evidence on how this relationship differs by gender.

Current Study

The current study aims to contribute to existing research on marriage, gender, and disability by addressing some of the limitations and contradictory findings in previous studies on the relationship between hearing impairment and spousal mental health. Drawing on the stress proliferation framework, hearing impairment is

conceptualized as a physical health stressor and its impact on depressive symptoms in spouses is examined. Specifically, the study uses the HRS to assess: 1) to what extent does an individual's hearing impairment influence his/her spouse's depressive symptoms?; and 2) does the relationship between an individual's hearing impairment and the spouse's depressive symptoms depend on the gender of the non-hearing-impaired spouse?

Methods

Sample

The data for this study come from the Health and Retirement Study (HRS) Waves 4-13 (1998-2016), a nationally representative survey of U.S. adults aged 50 and older. Respondents' spouses are also recruited and surveyed, regardless of their age. Respondents and their spouses are interviewed for the HRS Core files every two years. The HRS Core starting sample is 42,053 individuals. The current sample is restricted to people who were present and had a spouse in the 1998 wave (n=13,820). The sample is further restricted by eliminating individuals who report more than one spouse (n=486), live in a single-occupant household (n=820), or report a same-sex partner (n=1). From these 12,512 individuals, couples were matched on household identification number, resulting in 6,256 couples. Proxy responses are omitted because most proxies were used for focal respondents with cognitive impairment, which is linked to both hearing impairment and depressive symptoms (Djernes, 2006; Lin et al., 2011). Proxy respondents indicated that 37.44% of focal husbands and 14.61% of focal wives had

hearing impairment. Exclusion of surveys completed by proxies (12.73% of husbands, 3.77% of wives) resulted in a sample of 5,658 couples. After listwise deletion of missing items and death, the final dataset is comprised of 5,485 couples, or 10,970 individuals. A sensitivity analysis using multiple imputation (not shown) revealed a similar pattern of results to listwise deletion.

Depressive Symptoms

Depressive symptomology is based on a summed score of responses to an eight-item version of the Center for Epidemiologic Studies Depression Scale (CES-D), a screening test for depression and depressive disorder (Radloff, 1977). Items in the scale ask about having restless sleep, not being able to get going, enjoying life, and feeling lonely, sad, depressed, that everything was an effort, or happy. Participants reported whether the statements were true much of the time during the past week (no/yes). Responses are summed and range from zero to eight. Higher scores indicate more depressive symptoms.

Hearing

All participants were asked to rate their hearing (while wearing a hearing aid as usual, if relevant) on a five-point scale (excellent, very good, good, fair, poor). While pure-tone audiometry is the gold standard for assessing hearing impairment, it has a limited relationship with the lived experience of disability, especially self-reported comprehension in noise (Kramer, Kapteyn, Festen, & Tobi, 1996) or group conversations

(Gatehouse & Noble, 2004). Moreover, self-report measures are reliable indicators of hearing impairment (Chou, Dana, Bougatsos, Fleming, & Beil, 2011).

Control Variables

The HRS collects detailed information on both main participants and their spouses, which is organized into two groups for this study: household-level variables (one variable collected per household) and individual-level variables (separate variables collected for both participants and spouses). The time-varying household-level variables include marriage length (continuous, in years) and wealth (logged continuous variable), which measures total household assets while subtracting out debt (Bugliari et al., 2016). A dummy variable for currently living in the South (reference) compared to other U.S. regions is included because research suggests that risk factors for hearing loss, including acute otitis media, are spatially distributed (Ren, Sethi, & Stankovic, 2018). Time-varying individual-level control variables include age (continuous) and a dichotomous measure of hearing aid use (1=use hearing aids), as using hearing aids can reduce depression (Mener, Betz, Genter, Chen, & Lin, 2013). Time-invariant individual-level control variables include race/ethnicity (non-Hispanic White, non-Hispanic Black, non-Hispanic other race, Hispanic White, Hispanic Black, and Hispanic other race) and educational attainment (continuous).

Two health behaviors that are both gendered expressions of mental health and associated with hearing loss are included: smoking status (never smoker; ever smoker) and number of drinks per week (zero versus five or more) (McKee, Stransky, & Reichard, 2018; Read, Porter, & Gorman, 2016). Activities of daily living (ADLs: difficulty bathing,

eating, dressing, walking across a room, or getting in or out of bed) and instrumental activities of daily living (IADLs: difficulty using a telephone, taking medication, or handling money) are included because functional limitation is a predictor of depressive symptoms (Djernes, 2006). The indices range from 0-5 and 0-3, respectively. Since own hearing impairment is associated with own depressive symptoms (West, 2017), own depressive symptoms are also included in the models.

Analysis

Fixed-effects models are used to examine how one spouse's hearing impairment impacts the other spouse's depressive symptoms. Fixed-effects models are longitudinal models that treat unobserved, time-invariant variables that differ across individuals as a set of fixed parameters (Allison, 2009). Such models control for variables that either have not or cannot be measured and allows those variables to have an association with the variables that have been measured. Fixed effects models only capture within-individual differences or change, which makes them less subject to unobserved confounding than other models, but also reduces their efficiency. For fixed effects models, the dependent variable must be measured on at least two time points for each individual and the predictor variable's values must change across those time points for a large portion of the sample (Allison, 2009). The fixed effects model is written as follows:

$$y_{it} = \mu_i + \beta hearing_{it} + \gamma x_{it} + \alpha_t + \varepsilon_{it}$$

where y_{it} is the number of depressive symptoms for an individual i at time t , and

$\beta hearing_{it}$ represents the effect of the focal analysis measure, or the change in self-

rated hearing from 1998 to 2016. The parameter x_{it} is the vector of control variables. The μ_i term accounts for both observed and unobserved stable traits between individuals while α_t accounts for year fixed effects, therefore capturing trends that are constant across individuals over time.

Since models in the current study are estimated separately by gender, the model above can be re-written:

$$Wife\ CESD_{it} = \mu_i + \beta Husband\ Hearing_{it} + \gamma x_{it} + \alpha_t + \varepsilon_{it} \quad (1)$$

$$Husband\ CESD_{it} = \mu_i + \beta Wife\ Hearing_{it} + \gamma x_{it} + \alpha_t + \varepsilon_{it} \quad (2)$$

where (1) indicates the effect of a husband's hearing impairment on his wife's depressive symptoms, while (2) indicates the effect of a wife's hearing impairment on her husband's depressive symptoms. All analyses were conducted in Stata version 16.

Results

Table 1 presents descriptive statistics for the sample pooled across the ten waves and separated by husbands and wives. Women report a higher mean level of depressive symptoms than men (1.28 versus 0.99) and around 29% of men reported fair or poor hearing compared to 13% of women.

[Table 1]

Table 2 presents the fixed effects results showing the effect of wives' hearing impairment on their husbands' depressive symptoms. Control variables were

sequentially added into the models in blocks: demographic, health behaviors, and other health variables. With only wives' hearing in the model (Model 1), wives' fair ($p=0.006$) or poor hearing ($p=0.006$) is associated with an increase in husbands' depressive symptoms. Specifically, compared to having a wife with excellent hearing, having a wife with fair self-rated hearing results in a 0.14-point-increase in the number of depressive symptoms reported by the husband while having a wife with poor self-hearing is associated with a 0.22-point-increase in a husband's depressive symptoms.

[Table 2]

The significant relationship between wives' fair (coefficient=0.14, $p=0.006$) or poor (coefficient=0.22, $p=0.005$) hearing and husbands' depressive symptoms persisted after adding demographic variables in Model 2. Longer marriages are also significantly associated with an increase in husbands' depressive symptoms (coefficient=0.04, $p<0.001$). After adding time-varying health behaviors in Model 3, wives' fair (coefficient=0.14, $p=0.006$) and poor (coefficient=0.22, $p=0.005$) hearing is still associated with an increase in husbands' depressive symptoms. Other significant variables in the model are marriage length and husbands' own smoking behavior, with longer marriages ($p<0.001$) and ever having smoked associated with an increase in husbands' own depressive symptoms ($p=0.02$).

In Model 4, other time-varying health variables are added. The significant relationship between wives' fair or poor hearing and husbands' depressive symptoms persists but is slightly attenuated ($p=0.03$ and $p=0.046$, respectively). Longer marriages and husbands' own smoking behavior are still associated with an increase in own

depressive symptoms ($p < 0.001$ and $p = 0.02$, respectively). Husbands' own fair ($p = 0.05$) or poor ($p < 0.001$) hearing and use of hearing aids ($p = 0.001$) are associated with an increase in his own depressive symptoms. A husband's own increase in ADLs or in IADLs are both associated with an increase in his own depressive symptoms (p -values < 0.001). Having a wife with more depressive symptoms is also associated with an increase in a husband's own depressive symptoms ($p < 0.001$).

Overall effect sizes for wives' self-rated hearing appear modest. Nonetheless, it is important to note first, that these coefficients capture the effect of change in hearing on change in depressive symptoms at a time in the life course for spouses when depressive symptoms tend to remain stable. Second, research generally finds that women report more depressive symptoms than men. Here, the difference in number of depressive symptoms is small: only 0.29 more symptoms reported by wives. The coefficients for men with wives with fair/poor hearing are relatively close to that difference in symptoms. Finally, the effect sizes of husbands' own hearing impairment on husbands' own depressive symptoms are of similar magnitude (0.27 for poor hearing and 0.09 for fair hearing).

Table 3 replicates Table 2 but shows the effect of husbands' hearing impairment on their wives' depressive symptoms. In Model 1, no level of husbands' self-reported hearing ability is significantly associated with an increase in wives' depressive symptoms. In Models 2 and 3, the relationship remains insignificant and the only significant relationship is that an increase in marriage length reduces a wife's depressive symptoms ($p = 0.004$ in both models). In contrast, in Model 4, wives' own good, fair, or poor hearing ($p < 0.001$ for each), an increase in own ADLs ($p < 0.001$), and an increase in

own IADLs ($p=0.01$) increase wives' own depressive symptoms. Additionally, having a husband with more depressive symptoms is associated with an increase in a wife's depressive symptoms ($p<0.001$).

[Table 3]

Supplementary Analyses

Several sensitivity analyses were performed (results available on request). First, logging CES-D resulted in a similar pattern of results. Second, alternative measures of hearing impairment did not change the results. For example, self-rated hearing was dichotomized into no hearing impairment (excellent, very good, or good hearing) versus hearing impairment (fair or poor hearing) with individuals reporting use of a hearing aid also classified as hearing impaired. Third, since couples in longer marriages may be better able to cope with stressors, the moderating effect of length of marriage was tested by including an interaction term between self-rated hearing and marriage length. The interaction term was never significant, either when marriage length was a continuous or categorical variable.

Discussion

Hearing impairment is an important and growing disability with numerous implications for individuals at all stages of the life course (Stucky, Wolf, & Kuo, 2010). It also matters in the marital context because it impacts communication (Dalton et al., 2003). However, current research on hearing impairment among married couples is

limited to small, unrepresentative qualitative studies and three population-level studies which yielded mixed results and were mostly cross-sectional. The goal of the current study was to examine the effect of hearing on spousal mental health outcomes in an effort to highlight the stress and mental health implications for an aging society at increasing risk of hearing impairment. Given the gendered dynamics of both hearing impairment and the marital context, the current study also examined whether the relationship between hearing impairment and spousal depressive symptoms was gendered.

From a stress process perspective, results from this study indicate that the stress associated with one person's fair or poor hearing can spill over to the spouse, depending on gender. For male spouses, having a wife with fair or poor hearing has a direct effect on their depressive symptoms, and this relationship persists even after adding variables associated with mental health, including his wife's depressive symptoms. In contrast, husbands' fair/poor hearing is never significantly associated with wives' depressive symptoms. Previous qualitative research has revealed that third-party disability is a common experience for spouses but given small sample sizes that are not drawn randomly, these studies are limited in their ability to assess the impact of gender (Scarinci et al., 2008, 2012).

Of the three population-based studies on this topic, two found that the spouses of hearing-impaired individuals *do* report worse health outcomes (Lehane, Hofsöe, et al., 2017; Wallhagen et al., 2004), while one found that spouses do *not* exhibit worse health outcomes (Ask et al., 2010). The studies by Ask et al. (2010) and Lehane, Hofsöe, et al. (2017) are both cross-sectional and based on international samples, which may

contribute to the mixed findings regarding this relationship. In contrast, the current study follows a large (n=5,485 couples), nationally representative sample over ten waves (1998-2016), which provides sufficient power to lend a causal interpretation to the association and to overcome some of the methodological obstacles that might have contributed to previous mixed results.

The main finding of the current study, that husbands' fair or poor hearing (hereafter, hearing impairment) does not impact wives' depressive symptoms, strays from past research that underscores the importance of husbands' impairment on wives' mental health (Wallhagen et al., 2004). There are several reasons to suspect why spousal hearing impairment matters more for husbands than for wives. First, structural systems of gender explain that within heterosexual marriages, women are more attuned to and responsive to their spouse's health, and also more likely than men to monitor and regulate their spouse's health behaviors in order to promote the health of their spouse (Umberson, Donnelly, & Pollitt, 2018). In other words, there are known gender differences in who takes responsibility for the health of other family members. According to the social control perspective on marriage, spouses will regulate one another's behaviors (e.g., encourage the partner to eat healthier food, reduce alcoholic beverage intake, exercise, quit smoking, etc.) (Umberson, 1992), and that the use of social control to influence spousal behavior has gendered differences. For example, women are more likely to encourage healthy eating and compliance with a medical regime as well as to discourage unhealthy behaviors such as binge drinking or smoking (Umberson, 1987, 1992; Waite & Gallagher, 2000). In the case of hearing, since wives have traditionally been expected to serve as caregivers in marital relationships, their husbands' hearing impairment may not appear like an additional burden. Since women

are already socialized to monitor health within the marital context, encouraging their husbands to get their hearing tested or helping their husbands find accommodations for hearing impairment may simply be another task they perform. In contrast, men are less accustomed to monitoring and regulating their spouses' health within the marital relationship, and therefore may find accommodating their wives' hearing impairment unduly distressing.

Second, heterosexual marital relationships are often subject to asymmetric caregiving, in which men rely almost exclusively upon their wives for companionship, emotional support, and caregiving (Umberson et al., 1996). Marital role expectations vary for women and men, which often leads to women acting as their husbands' exclusive confidant or source of emotional and instrumental support (Behler et al., 2019). Moreover, women receive beneficial social support from a variety of sources – a recent study by Glauber and Day (2018) found that part-time employment (compared to full-time employment) reduced psychological distress among women serving as caregivers for their spouse, perhaps because these women could benefit from having social ties and coping resources outside of the home. As such, wives usually find sources of social support outside of the marital relationship, while husbands do not, which provides wives, but not husbands, with resources to cope with their spouses' hearing impairment.

Finally, the prevalence of hearing impairment is lower among women than men (Hoffman, Dobie, Losonczy, Themann, & Flamme, 2017), which may make hearing-impaired wives more stigmatizing for their husbands. Mechanisms used to explain the gendered difference in prevalence usually include that men are more likely to work in

occupations that entail excessive noise exposure, including construction or manufacturing. Additionally, men are more likely to engage in recreational activities that expose them to loud noises, including riding motorcycles, using power tools, and shooting firearms (Lie et al., 2016). Given societal awareness that men engage in behaviors that are harmful to their hearing, wives may feel it is socially acceptable to have a hearing-impaired husband and may even be able to receive social support or other resources from other wives whose husbands are similarly impaired. In contrast, since fewer women are hearing impaired, their husbands may lack access to social support or resources.

It is also important to note that regardless of gender, individuals' own fair or poor hearing is significantly associated with an increase in their depressive symptoms. This is consistent with previous research which finds that self-rated hearing is associated with a significant increase in depressive symptoms among individuals (West, 2017). In the current study, one's own fair or poor hearing remains a significant predictor of one's own depressive symptoms over and above other covariates.

Limitations

One limitation is that analysis is restricted to heterosexual couples due to the small, unrepresentative number of same-sex partners in the sample. Research by Kelly and Atcherson (2011) finds that significant others in same-sex relationships (n=10) with a partner with hearing impairment have both similar and different experiences to significant others in heterosexual relationships (n=10). Therefore, future research

should explore the impact of hearing impairment on mental health outcomes among same-sex couples.

Second, measures of positive or negative marital quality were not included. Marital quality has been shown to play an important role for health outcomes among married couples (e.g., Carr, Cornman, & Freedman, 2017). The HRS does include measures of marital quality, but these measures are only asked in self-administered questionnaires (SAQ). In each wave of the HRS, a randomly selected half of the sample is eligible for the SAQ such that individuals eligible in 2008 were eligible again in 2012, while those eligible in 2006 were eligible again in 2010 and 2014. Including the marital quality measures would preclude inclusion of the 1998 through 2004 waves, thus limiting the longitudinal nature of the study. Future research could focus specifically on examining whether marital quality moderates the relationship between hearing impairment and spousal mental health.

Third, the study assumes that hearing impairment will impact mental health but does not consider strategies that individuals may have for coping, including marital dissolution. It is plausible that the onset of hearing impairment may lead certain spouses to seek divorce or separation. Such a hypothesis is empirically testable, and future research should examine how hearing impairment influences marital status.

Finally, the study relies on self-reported hearing impairment, while pure-tone audiometry is the gold standard for evaluation. However, Chou et al. (2011) report that a single item about hearing impairment yields results almost as accurate as those provided by portable audiometric devices or more extensive questionnaires.

Conclusion

As the older population in the U.S. increases, hearing impairment will affect a larger proportion of the population (Whitson et al., 2018), underscoring the importance of examining health and marital relationships in the context of aging. This population is vulnerable to hearing impairment, which can negatively impact communication (Dalton et al., 2003). According to the stress proliferation model, wives' hearing impairment spills over to husbands in the form of increased depressive symptoms. In contrast, husbands' hearing impairment does not result in an increase in wives' depressive symptoms. Thus, findings from this study suggest the need for increased vigilance regarding hearing impairment among both older adults *and* their spouses.

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Table 1

Sample characteristics for wives and husbands: HRS, 1998-2016 (n=5,485 couples, 10,970 individuals).

	Husbands	Wives	
Individual characteristics			
CES-D, mean (sd)	0.99 (1.53)	1.28 (1.80)	***
Self-rated hearing			
Excellent	11.11	23.18	*
Very good	22.2	32.47	**
Good	37.31	31.72	
Fair	22.29	10.10	
Poor	7.10	2.53	
Wear hearing aid	16.32	6.00	***
Age, mean (sd)			
	70.65 (8.82)	67.26 (9.36)	***
Range	30.92-99.83	25.5-102.25	
Race			
NH White	83.29	83.11	***
NH Black	8.15	8.09	***
NH Other	1.72	1.72	***
Hispanic White	5.40	5.63	***
Hispanic Black	0.12	0.13	***
Hispanic Other	1.33	1.32	***
Education, mean (sd)	12.79 (3.29)	12.65 (2.82)	***
Ever a smoker	70.74	46.66	***

Drinks per week, mean (sd)	3.29 (6.81)	1.59 (3.86)	***
ADL	0.21 (0.68)	0.22 (0.71)	
IADL	0.09 (0.37)	0.06 (0.32)	***

Couple characteristics

Wealth (median)	\$257,000
Live in South	39.94
Marriage length, mean (sd)	41.20 (13.66)
Range (years)	0.10-76.2

Note: sd=standard deviation. NH=Non-Hispanic.

*p < 0.05, **p < 0.01, ***p < 0.001.

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Table 2

Fixed effects regression coefficients for husbands' depressive symptoms, HRS 1998-2016.

Variable	Model 1 Coef (SE)	Model 2 Coef (SE)	Model 3 Coef (SE)	Model 4 Coef (SE)
Wife hearing [excellent]				
Very good	0.03 (0.03)	0.03 (0.03)	0.04 (0.03)	0.04 (0.032)
Good	0.05 (0.04)	0.05 (0.04)	0.05 (0.04)	0.04 (0.04)
Fair	0.14 (0.05)**	0.14 (0.05)***	0.14 (0.05)**	0.11 (0.05)*
Poor	0.22 (0.08)**	0.22 (0.08)***	0.22 (0.08)**	0.16 (0.08)*
Husband age		-0.16 (0.10)	-0.17 (0.10)	-0.15 (0.10)
Wife age		0.13 (0.10)	0.13 (0.10)	0.10 (0.10)
Wealth (log)		-0.01 (0.005)	-0.01 (0.005)	-0.01 (0.005)
Live in south		-0.08 (0.07)	-0.09 (0.07)	-0.06 (0.06)
Marriage length		0.04 (0.01)***	0.04 (0.01)***	0.03 (0.01)***
Husband ever smoke			0.70 (0.30)*	0.77 (0.32)*
Wife ever smoke			-0.31 (0.231)	-0.25 (0.20)
Husband 5+ drinks			-0.02 (0.08)	-0.01 (0.08)
Wife 5+ drinks			-0.29 (0.18)	-0.29 (0.17)
Wife wears HA				-0.12 (0.07)
Husband hearing [excellent]				
Very good				-0.06 (0.04)
Good				0.01 (0.04)
Fair				0.09 (0.05)*
Poor				0.27 (0.06)***
Husband wears HA				0.15 (0.04)**
Husband ADL				0.34 (0.03)***
Husband IADL				0.25 (0.05)***
Wife CES-D				0.08 (0.01)***
Constant	0.93 (0.02)***	2.60 (0.39)***	2.27 (0.46)***	2.34 (0.48)***

Note: Race and education not included because they are time-invariant. HA=hearing aid.

*p < 0.05, **p < 0.01, ***p < 0.001.

Table 3

Fixed effects regression coefficients for wives' depressive symptoms, HRS 1998-2016.

Variable	Model 1 Coef (SE)	Model 2 Coef (SE)	Model 3 Coef (SE)	Model 4 Coef (SE)
Husband hearing [excellent]				
Very good	-0.01 (0.04)	-0.01 (0.04)	-0.01 (0.04)	0.002 (0.04)
Good	-0.003 (0.05)	0.01 (0.05)	0.01 (0.05)	0.01 (0.05)
Fair	0.01 (0.07)	0.02 (0.06)	0.02 (0.06)	0.01 (0.06)
Poor	0.10 (0.07)	0.12 (0.07)	0.11 (0.07)	0.06 (0.07)
Wife age		0.14 (0.14)	0.14 (0.14)	0.10 (0.13)
Husband age		-0.11 (0.14)	-0.11 (0.14)	-0.07 (0.13)
Wealth (log)		-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.005)
Live in south		-0.03 (0.12)	-0.03 (0.12)	0.02 (0.12)
Marriage length		-0.03 (0.01)**	-0.03 (0.01)**	-0.04 (0.01)***
Wife ever smoke			-0.09 (0.31)	0.01 (0.31)
Husband ever smoke			-0.68 (0.62)	-0.71 (0.62)
Wife 5+ drinks			0.004 (0.10)	0.01 (0.09)
Husband 5+ drinks			0.07 (0.23)	0.12 (0.22)
Husband wears HA				-0.001 (0.05)
Wife hearing [excellent]				
Very good				0.03 (0.03)

Good				0.15 (0.04)***
Fair				0.30 (0.06)***
Poor				0.46 (0.10)***
Wife wears HA				0.11 (0.09)
Wife ADL				0.35 (0.03)***
Wife ADL				0.13 (0.05)*
Husband CES-D				0.11 (0.01)***
Constant	1.24 (0.04)***	1.05 (0.56)	1.56 (0.74)*	1.33 (0.70)

Note: Race and education not included because they are time-invariant.

HA=hearing aid.

*p < 0.05, **p < 0.01, ***p < 0.001.

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