Relationships Between Perceived Social Support, Depressive Symptoms, and Suicidal Ideation in Older Adulthood: Variations Based on Biological Sex and Partnership Type

by

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DISSERTATION ABSTRACT

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Doctor of Philosophy in Counseling Psychology

Title: Relationships Between Perceived Social Support, Depressive Symptoms, and Suicidal Ideation in Older Adulthood: Variations Based on Biological Sex and Partnership Type

Perceived social support is consistently associated with better physical and mental health outcomes in older adulthood. In this dissertation I examined the associations between the number and combination of sources of perceived social support (i.e., spouse/partner, child, family, and friend support) and depressive symptoms and suicidal ideation, in a nationally-representative sample of older adults living in the United States. Further, I examined if the association between perceived spousal/partner support and depressive symptoms and suicidal ideation differ by partnership type (i.e., same-sex or different -sex) or participant sex. I examined these relationships with data from the 2020 wave of the Health and Retirement Study (HRS) utilizing a novel multilevel modeling approach termed multilevel analysis of individual heterogeneity and discriminatory accuracy (MAIHDA) that allowed the effects of each unique combination of sources of perceived social support to be examined in a single, parsimonious model. In general, the effects of different sources of perceived social support on both depressive symptoms and suicidal ideation were additive, indicating that more sources of perceived social support were associated with fewer depressive symptoms and a lower likelihood of suicidal ideation, for both males and females. For depressive symptoms in particular, perceived spousal/partner support was associated with the lowest predicted depressive symptom scores for both males and females, regardless of other individual sources or combinations of sources of perceived support. Further, the association between perceived spousal/partner support and depressive symptoms was significant regardless of relationship type (same- or different-sex/sex unknown). Consistent with

prior evidence, female participants reported significantly more depressive symptoms and suicidal ideation compared to male participants. However, I found females who reported perceiving significant support from their partner/spouse, child(ren), and friends had similar predicted depressive symptoms and likelihood of endorsing suicidal ideation compared to the average male participant. Indicating that significant perceived social support from enough sources may buffer older females' increased risk of depression and suicidal ideation. Findings related to the moderating effect based on relationship type are limited by same-sex partners sample size, but supplement extant evidence that perceived partner/spousal support can be a significant protective factor for same-sex older adults, who are at increased risk of depression and suicidal ideation as compared to heterosexual older adults. Overall, findings indicate that strengthening perceived social support from as many sources as possible (e.g., partner, friends, children, other family) may be a useful focus of interventions aimed at reducing risk of depressive symptoms and suicidal ideation for all older adults, and such an intervention is particularly important for older females. Further research is needed to test causality of the relationship between perceived social support and mental health and explore how cultural understandings of perceived social support affect this relationship.

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DEDICATION

To my mother, thank you for everything.

To my father, rest in peace.

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KEY TERMS AND DEFINITIONS

Older adulthood. Older adulthood is typically defined by chronological age. In the United States, the Centers for Disease Control define older adults as individuals aged 65 years and older (Kaniewski et al., 2015). However, the Health and Retirement Study (HRS) recruited adults 50 years and older and therefore most studies that use HRS data employ a more expansive definition of the term older adult to include adults 50 year and older. In the literature, chronological age is not consistently defined across studies, but the majority of literature reviewed for this dissertation defined older adults as individuals 65 years and older.

Perceived social support. Definitions of social support vary, but social support is typically conceptualized as the perception or experience that an individual is cared about and valued by others and is a part of a social network that provides tangible and psychological assistance to its members (Taylor, 2012). Perceived social support is a specific measure of how an individual perceives they are being supported by individuals and groups in their social network (Asante & Karikari, 2022). Of note, some prior studies have used social support to describe *acts* of support from social connections (e.g., expressing emotional support, providing aid, giving advice), but this dissertation and the literature reviewed here uses the more expansive definition of social support described above (Ashida & Heaney, 2008).

Depressive symptoms. Depression is a common psychiatric disorder characterized by symptoms such as persistently low mood, markedly diminished interest in most activities, fatigue, sleep difficulties, feeling worthless, difficulty concentrating, and recurrent thoughts of death or suicide (Kok & Reynolds, 2017). For this dissertation, I will focus on depressive symptoms, assessed using the Center for Epidemiological Studies Depression 8 Item (CES-D8) Scale and not as a

disorder diagnosed using the Diagnostic Statistical Manual (DSM) criteria (Maier et al., 2021; Radloff, 1977).

Suicidal ideation. Suicidal ideation is a term for having thoughts related to considering, planning, or wanting to kill oneself (Jobes & Joiner, 2019). Constraints in epidemiological measures have resulted in a broader definition of suicidal ideation that includes having persistent thoughts of death also as a form of suicidal ideation (Klonsky et al., 2016). Suicidal ideation is distinct from suicidal *behavior*, which is related to preparing or attempting to kill oneself.

Biological sex vs. gender. The American Psychological Association (APA) defines gender as "the psychological, behavioral, social, and cultural aspects of being male or female (i.e., masculinity or femininity) ("Gender," 2023)." However, scholars contest this definition as overly simplistic and an inaccurate dichotomy that is not reflective of the diverse array of gender identities and expressions that exist across cultures (Lindqvist et al., 2021). Most social scientific literature and data, including the data in this dissertation, conflate biological sex (i.e., biological aspects of being male or female) with gender and thereby limit generalizability of findings related to gender to individuals who identify as cisgender. The HRS uses biological sex and gender interchangeably, but most often refers to "participant sex" and offers "Male" and "Female" as potential responses to the assessment of sex and gender. However, since gender is socially constructed and experienced, research on differences in mental health outcomes in relation to social experiences evaluates differences by gender. Therefore, the present literature review focuses on gender differences between men and women, but data descriptions and analyses use biological sex and HRS terminology of "Male" and "Female." I use "sex" to refer to participant's reported biological sex in the *Results* and *Discussion* sections. Current best

practices recommend asking two demographic questions, one that assesses sex at birth and one that assesses present gender identity (Hanes & Clouston, 2021).

Sexual orientation vs. type of partnership. The APA defines sexual orientation as "one's enduring sexual attraction to male partners, female partners, or both. Sexual orientation may be heterosexual (attracted to the opposite sex), same sex (gay or lesbian), or bisexual ("Sexual Orientation," 2023)." However, scholars maintain a similar critique to the APA's definition of sexual orientation as the critique of APA's definition of gender, proposing that sexual orientation consists of a wider range of sexual preferences that may be fluid and evolve across the lifespan (Moser, 2016). The HRS began assessing sexual orientation with the newest cohort of older adults surveyed in 2016. But given that the majority of participants (the other 6 cohorts) in the present sample were not asked about their sexual orientation, I used data from household surveys (i.e., data is gathered on all members of the participant's household) that provides information about partners of participants and identified couples with same-sex partners and couples with different-sex and sex unknown partners in the HRS. Similar to previous research with HRS data (Liu et al, 2021), I used this approach to define the *Type of partnership.* The literature review for this dissertation includes studies examining the relationship between sexual orientation, perceived social support, and mental health outcomes. Given limitations of the HRS data, I explored these associations using type of partnership instead of sexual orientation.

CHAPTER 1

INTRODUCTION

Depressive symptoms and suicidal ideation are common and significant problems in older adulthood (Conejero et al., 2018). Approximately 14% of adults over the age of 55 have clinically significant depressive symptoms (Kok & Reynolds, 2017). Major depressive episodes and other depressive disorders are less common in older adulthood compared to earlier stages of life, but symptoms of depression (e.g. feeling sad, hopeless, loss of interest in things) remain frequent experiences for older adults that significantly affect quality of life (Hybels & Blazer, 2003). Notably, older women, transgender and gender nonconforming (TGNC) and lesbian, gay, or bisexual (LGB) older adults are all significantly more likely to report symptoms of depression or meet criteria for a depressive disorder compared to older heterosexual men (Crimmins et al., 2011; Hoy-Ellis & Fredriksen-Goldsen, 2017). Social support, both tangible and perceived, is closely associated with a decreased risk of experiencing depressive symptoms in older adulthood (Ahn et al., 2017). Suicidal ideation is also less common among older adults compared to younger adults and adolescents (Duberstein et al., 1999; Fässberg et al., 2012), but between 10.9% and 13.3% of adults 50 years or older are estimated to experience suicidal ideation in a given year and adults over the age of 85 are more likely to die by suicide than any other age group (Suicide Data and Statistics, 2023). The protective role of social support against suicidal ideation and behavior is also well recognized. The French sociologist Emile Durkheim is often credited with the first contemporary theory of suicidal behavior, proposing that individuals with greater social integration and more social support are less likely to die by suicide (Durkheim, 1951 [1897]; Wray et al., 2011). How researchers and clinicians study and treat suicidality has changed significantly over the past century, but social connection and social support remain

steadfast components of all dominant theories of suicidal behavior (Klonsky et al., 2016). Higher levels of perceived social support have been found to reduce the risk of suicidal ideation for individuals across different sociodemographic backgrounds (Kleiman & Riskind, 2013; Panagioti et al., 2014; Thompson et al., 2002). The more supported an older adult feels by their close relationships, and the less of a perceived burden this support confers, the lower the risk of suicidal ideation and suicidal behavior even when accounting for depression and other risk factors (Cukrowicz et al., 2011).

Perceived social support, an individual's belief that a social contact or relationship currently provides or will provide emotional and tangible support, is a particularly powerful predictor of emotional wellbeing for older adults (Asante & Karikari, 2022; Roohafza et al., 2014; Wang et al., 2018). The perception of having individuals that may provide social support appears to confer the greatest protective effect against depression for older adults (Bruce, 2002). In fact, explicitly accessing or being provided social support may have the opposite effect by increasing distress or feelings of worthlessness and shame, suggesting that the perception of social support is the critical component of social support that confers mental health benefits (Kim et al., 2008; Taylor, 2012). Different sources of perceived social support (e.g., spouse/partner, child, friends) can have differing effects on mental health outcomes (Ryan et al., 2014), but these differing effects have not been systematically examined in a large longitudinal sample of older adults, while also assessing variations based on gender and sexual orientation (Gariépy et al., 2016). Generally, a greater number of sources of perceived social support is associated with a decreased risk of depression and suicidal ideation, but what combination of sources of perceived social support provides the greatest mental health benefit is uncertain (Chen & Feeley, 2014). Further, the potential mental health benefits of different combinations of sources of perceived

social support can vary based on individual's gender and sexual orientation. For instance, the mental health benefits of perceived spousal support for heterosexual men are well-established, but heterosexual women are less likely to report positive mental health benefits from spousal support (Sikorski et al., 2014). Similarly, while perceived spousal support is found to be protective against depression for LGB couples, the effects of perceived family support on mental health differ for heterosexual and LGB older adults. LGB older adults are less likely compared to heterosexual older adults to report perceived family support that confers positive mental health benefits (Grossman et al., 2000). Nevertheless, when perceived family support is present, the support is associated with a reduced risk of depression for both heterosexual and LGB adults (Graham & Barnow, 2013). Given that, compared to heterosexual men, women and LGB older adults experience higher rates of depression and suicidal ideation it is imperative to identify what sources of perceived social support are uniquely associated with improved mental health outcomes for these sub-groups.

Perceived Social Support and Mental Health Outcomes in Older Adults

Social support is associated with reduced risk of mortality, physical illness, and mental health disorders (Cohen, 1988). Researchers across disciplines agree that connection to community, feelings of belongingness, and experiencing close relationships confer a wide range of psychological and physical health benefits (Berkman et al., 2000; Taylor, 2012). In fact, quality and frequency of contact with social relationships has been found to have a similar magnitude of protective effect on mortality risk as well-established risk factors such as smoking and alcohol consumption (Holt-Lunstad et al., 2010). While social support confers mental health benefits across the lifespan, there is some evidence that older adults are particularly affected by social support and satisfaction with relationships (Kafetsios & Sideridis, 2006). Older adults, on

average, tend to have fewer social contacts that confer greater meaning and support as compared to the social contacts of younger adults. Carstensen's (1993) theory of Socioemotional Selectivity posits that older adults engage in social interactions, broadly construed, less frequently while simultaneously deepening meaningful social relationships (e.g., partner, close friend). One study found that social network size typically remains stable in older adulthood, but the shifts towards increased connections and contact with family and close friends coincide with decreased contact with other friends and acquaintances (van Tilburg, 1998). However, a more recent longitudinal examination of changes in social support across adulthood revealed that, on average, an individual's social network peaks in middle adulthood and decreases significantly after age 65 (English & Carstensen, 2014). The same longitudinal study found that "inner circle" social contacts remained relatively stable into and throughout older adulthood, and that as older adults age they report greater positive emotional experiences and fewer negative emotional experiences from social relationships. Overall, refining sources of social support based on life experience and preferences appears to buffer the risks of experiencing depressive symptoms and suicidal ideation in older adulthood (Ashida & Heaney, 2008; Rowe et al., 2006).

Contemporary theories linking perceived social support to improved mental health outcomes posit that perceived social support operates as a direct and indirect protective factor against depression and emotional distress (Berkman et al., 2000; Cohen & Wills, 1985; Lin et al., 1979; Lin & Ensel, 1984). For example, higher rates of perceived social support are correlated with higher rates of physical and leisure activity in older adulthood, which in turn are associated with better physical and mental health outcomes (Everard et al., 2000). Being able to draw on various sources of social support (e.g., spouse, family) following an acute crisis has been associated with a significantly decreased risk of subsequent depression (G. W. Brown et al.,

1986). Increased social support is also associated with increased adherence to medical recommendations and engagement in healthy behaviors (Lett et al., 2007) as well as fewer and shorter hospital stays (Valtorta et al., 2018). Having more sources of perceived social support is also associated with better cognitive functioning in older adulthood, although the directionality of these associations is unclear (Kelly et al., 2017). Broader definitions of social support that include neighborhood support (e.g., transportation to healthcare services) and societal support (e.g., community outreach programs, universal healthcare) are all associated with improved mental and physical health treatment and outcomes (Mueller et al., 1998; Shou-Hsia & Tung-Liang, 1997; Williams et al., 2003). Regardless of the pathway to wellness, perceived social support is, on average, beneficial for most older adults.

Increases in most sources of perceived social support are associated with better mental health outcomes, but specific sources can have a greater protective effect on depression compared to others. For instance, in a study of 1,174 adults over the age of 50, higher rates of perceived support from spouse, friends, and adult children were all associated with lower rates of depression, but perceived support from 'other' family members (besides spouse and adult children) was not associated with a lower rate of depression (Dean et al., 1990). Other studies with older adults have found similar patterns of spousal/partner support being associated with the greatest reduction in depression and the lowest likelihood of suicidal ideation compared to other sources of perceived support (Rowe et al., 2006; Tucker & Bishop, 2020).The Dean et al. study, which used data gathered from in-depth interviews and psychometric testing, also showed that social support had a direct effect on depression, but it did not buffer the effects of experiencing a negative life event (e.g., death of a family member) on the associated increased rate of depression among older adults.

Effects of Perceived Social Support: Variations Based on Gender and Sexual Orientation

While women tend to have larger and more diverse social connections compared to men, especially in older adulthood, the protective effects of perceived social support for older women tend to be muted compared to older men (Thomeer et al., 2013). For instance, older men have been shown to benefit more (e.g., lower risk of heart disease and depression) from spousal/partner support compared to older women in heterosexual relationships (Broadwell & Light, 1999; Girgus et al., 2017). This finding is thought to be a result of gender socialization norms that lead women to be more likely to engage in caregiving activities and provide emotional support than men, which in turn is associated with a higher likelihood of relationships causing distress or strain and lower likelihood of the same relationship conferring support and comfort (Umberson & Karas Montez, 2010). Additional explanations propose that due to socialization patterns imposed on men and women beginning in childhood, men are more affected by lower levels of spousal/partner support compared to women. In other words, men are not socialized to be as emotionally resilient in relationships as women, and when relationships are not perceived to provide adequate social support they are more likely to engage in unhealthy behaviors (e.g., drinking excessive amounts of alcohol) and experience more psychological distress compared to women who may have been socialized from an early age to navigate varying levels of perceived support from a range of sources (Umberson et al., 2014). However, the finding that men suffer more than women from lack of perceived social support is contested, with other survey data suggesting men and women suffer equally without certain sources of perceived support (e.g., spousal support) (Umberson et al., 1996) or that men with low levels of perceived social support may be at higher risk of depression compared to women with low levels of perceived social support (Sonnenberg et al., 2013). Further exploration of the disparate effects

of perceived social support by gender is particularly important due to the consistently higher rates of depression older women experience compared to older men (Yang & Lee, 2009).

In the United States, older adults typically experience significant changes in their social lives. Retirement, for example, often leads to a reduction in social interactions and may result in feelings of loneliness and isolation as an individual adjusts to post-employment life (Carter & Cook, 1995). In the 20th century the changes in social experiences associated with retirement mostly affected men, but as baby boomer women enter retirement age we are beginning to understand how this transition affects women who may have shouldered additional caregiving and other unpaid work throughout adulthood. While this uneven burden has deleterious effects on when and how women can retire, the household and caregiving work they engaged in over their lifetime may serve as a protective factor post-retirement, in terms of the relationships they developed in their personal social networks in addition to the social connections related to formal employment (Price, 2002; Sawyer & James, 2018). Limited research suggests that older women, in particular, may benefit from perceived support from friends (Harvey & Alexander, 2012), but extant literature does not identify what combinations of perceived social support are associated with decreased depression and suicidality among older women.

Most research on the effects of social support, and particularly partner support, has been conducted with heterosexual couples. However extant literature on same-sex, or Lesbian Gay and Bisexual (LGB) couples, suggests that perceived social support is associated with similar health and mental health benefits for LGB couples (Graham & Barnow, 2013; Kurdek, 2006). LGB older adults are less likely to disclose their identity due to discrimination they may face in care settings, from family members, and others in their community. This may limit their ability to draw on adequate social supports as they age (Choi & Meyer, 2016). However, LGB older

adults often report a more expansive understanding of the term "family" that includes close relationships and friends that share an LGB identity (Gabrielson et al., 2014). Perceived family, friend, and partner supports are beneficial for LGB couples, but the importance of perceived friend and partner support has been shown to be particularly important for LGB couples as they are at increased risk of less or no family support due to homophobia (Graham & Barnow, 2013).

Effects of Perceived Social Support: Variations Based on Source

While all sources of perceived social support are associated with a decreased risk of depression, there is evidence that the protective effects of spousal/partner and family support are stronger than friend support (Roohafza et al., 2014), particularly in older adulthood (de Jong Gierveld et al., 2009). For older adults, the effects of perceived spousal/partner support is consistently protective against depression and other health problems, but the protective effects of perceived social support from children, other family, and friends is typically weaker compared to younger adults (Ahn et al., 2017). Older adults are at higher risk of experiencing the death of a spouse/partner, which is associated with a significant increase in depressive symptoms. However, social support from other relationships (e.g., children, friends) has been found to moderate the risk of depression for older adults who lose spousal/partner support when their partner dies (Tucker & Bishop, 2020). A recent meta-analysis of interventions aimed at treating depression in older adulthood revealed that spousal support was associated with a higher likelihood of decreasing depressive symptoms, but other family member support was not associated with a significant change in treatment outcomes (Martire et al., 2004). Although, the meta-analysis was unable to assess the effects of other family member support among older adults without a spouse or partner. Overall, there remains a dearth in literature examining the

differing effects various sources of perceived social support can have on depressive symptoms and suicidal ideation in older adulthood (Fiori & Jager, 2012).

Caretaking literature consistently demonstrates that one family member is typically responsible for most social support for older adults with chronic illnesses. When an older adult is partnered, their partner provides the bulk of support (Choi et al., 2007), but without a partner, a child or other family member may contribute support that confers similar protective benefits (Schulz et al., 2020). Thus, different sources of social support may provide unique protective effects, and their effect may increase in relevance in the absence of spousal support. Of note, women are more likely to engage or be expected to engage in these caretaking responsibilities, whether as a partner or other family member (e.g., daughter, sister) (Feld et al., 2010). Gendered patterns of care and support among older LGB adults is less studied, but extant literature suggests that lesbian women are more likely to engage in caregiving tasks compared to gay men and that LGB adults are more likely to be single or living alone and less likely to have children to care for them (Choi et al., 2007; Savage & Barringer, 2023). Given the lower likelihood of receiving partner or child support compared to heterosexual older adults, LGB older adults are more likely to perceive and draw social support from friends and community ties (Choi & Meyer, 2016).

The impact of different sources of social support on health outcomes can also vary by gender. In a sample of 45 heterosexual married couples, Broadwell & Light (1999) found that regardless of racial and ethnic identity, men's perceived support from their family and their spouse was significantly associated with better vascular resistance indexes (measure of cardiac function) and blood pressure, while women's perceived social support (from same sources) was only associated with their vascular resistance index. Other studies corroborate the beneficial

effects of marital support for both men and women, but extant research suggest that within heterosexual couples, men tend to benefit more from spousal and family support than women (Donoho et al., 2013; Gallo et al., 2003). Much of this work has focused on physical health outcomes, less is known about gender-based variations in the effects of different sources of perceived social support on mental health outcomes of older adults. Research with adolescents suggests that close friends are the most protective source of perceived social support against suicidal ideation for girls, but not boys (Fredrick et al., 2018), but similar studies have not been conducted with older adults to determine if there continue to be gender differences in the protective effects of different sources of perceived social support on mental health outcomes.

The impact of COVID-19 on social support, depression, and suicidal ideation among older adults in 2020 and 2021

The COVID-19 pandemic may have affected the results of this dissertation and limit generalizability of the findings because outcome data were gathered during the first year of the pandemic, between March 2020 and May 2021. Throughout the 2020-21 HRS data collection period significant and heterogeneous changes in social isolation measures and SARS-CoV-2 infection occurred across the United States (Webster, 2021). Within household isolation precautions that occurred throughout 2020 may have increased the effect of perceived social support from a partner/spouse (or other live-in family member) on depressive symptoms and suicidal ideation and decreased the effect of perceived social support from friends on the same outcomes. Conversely, isolating alone (i.e., no spouse/partner, other family) was associated with a significant increase in depression among older adults (Grey et al., 2020) and therefore the effect of having no sources of perceived social support on depression and suicidal ideation may have been greater. Additionally, the rapid vaccine rollout beginning in January 2021 led to increased social contact compared to March through December 2020 and may have impacted

how individuals perceive social support from various sources throughout the 2020-21 data gathering period. On average, increased social isolation measures in response to the pandemic were associated with an increase in self-reported mental health problems (e.g., low mood, loneliness, and anxiety) throughout 2020 and 2021. However, population-level rates of depression, self-harm, and suicide did not significantly increase (Bailey et al., 2021; Penninx et al., 2022) and in fact older adults reported an overall reduction in depression and anxiety during the first year of the pandemic (Vahia et al., 2020). Depressive symptoms and suicidal ideation rates collected for HRS in 2018 and 2020 will be compared to evaluate how much the COVID-19 pandemic affected generalizability of 2020 data.

Summary

Depression and suicidal ideation in older adulthood are consistently associated with greater life dissatisfaction and an increased risk for a wide range of physical and psychological illnesses (Arora et al., 2019). The risk of depression and suicidal ideation is significantly higher for older women and LGB adults (Girgus et al., 2017; Hoy-Ellis & Fredriksen-Goldsen, 2017). Current evidence suggests that improving social relationships is the most effective treatment for depression in older adulthood and that doing so is an important aspect of reducing the frequency and intensity of suicidal ideation (Guideline Development Panel for the Treatment of Depressive Disorders, 2022). Perceived spousal support appears to be particularly beneficial for older adults, but mostly older heterosexual men (Ryan et al., 2014; Sorensen & Wang, 2009). It is imperative to understand what sources of perceived social support are associated with the lowest risk of depression and suicidal ideation in older adulthood for men and women, as well as if the effects differ for different- or same-sex couples. Extant literature suggests perceived spousal, child, friend, and family support all confer some mental health and health benefits for older adults

(Asante & Karikari, 2022; Dean et al., 1990). However, previous research studies have not examined the differing effects of all combinations of sources of social support on future depressive symptoms and thoughts of death concurrently. This dissertation will leverage data from a large, nationally representative, longitudinal study of older adults to identify who benefits from what combination of perceived social supports.

Study Aims & Hypotheses

The primary objective of this dissertation is to identify how different sources of perceived social support (i.e., spousal/partner, child(ren), friend(s), and other immediate family) are related to depressive symptoms and suicidal ideation in older adulthood. Additionally, this dissertation will explore how these associations differ by participant gender and partnership type (same- or different-sex/sex unknown partners). The analyses will focus on describing associations between number and combination of different sources of perceived social support and mental health outcomes of depressive symptoms and suicidal ideation, without attempting to identify causal pathway between the key variables. Prior research suggests that, on average, greater perceived social support from all four sources is associated with lower rates of depressive symptoms and a lower likelihood of suicidal ideation (Asante & Karikari, 2022; Tucker & Bishop, 2020). Heterosexual men, LGB men and LGB women with high levels of spousal/partner support are expected to have lower rates of depressive symptoms and suicidal ideation compared to heterosexual women with similar levels of spousal/partner support (Girgus et al., 2017; Sorensen & Wang, 2009). Support from "other" family members besides spouse/partner and child is predicted to have the least pronounced relationship with changes in depressive symptoms or suicidal ideation (Dean et al., 1990). Specific research questions and associated hypotheses are as follows:

RQ1: Compared to the absence of a significant source of perceived social support, is having significant perceived social support from at least one source (i.e., spouse/partner, child(ren), other family, and/or friends) associated with fewer depressive symptoms and a lower likelihood of suicidal ideation?

Hypothesis 1: Participants who reported significant perceived social support from at least one source (i.e., spouse/partner, child(ren), other family, or friend(s)) are expected to have lower depressive symptoms and a lower likelihood of reporting suicidal ideation compared to participants who reported an absence of any significant source of perceived social support.

RQ2: Is having a greater number of sources of perceived social support associated with fewer depressive symptoms and a lower likelihood of suicidal ideation?

Hypothesis 2: Participants who reported a greater number of sources of perceived social support are expected to have fewer depressive symptoms and a lower likelihood of suicidal ideation compared to participants who reported fewer sources of perceived social support.

RQ3: Does the association between perceived spousal/partner support and depressive symptoms and suicidal ideation differ by partnership type (i.e., same-sex or different -sex) or participant sex?

Hypothesis 3: The association between perceived spousal/partner support and depressive symptoms and suicidal ideation is not predicted to differ by partnership type (i.e., same-sex or different -sex), but is predicted to be greater for males compared to females. Specifically, the potential protective association between perceived spousal/partner support and lower depressive symptoms and suicidal ideation is expected to be significantly higher among male participants than female participants.

RQ4: Does the association between perceived social support and depressive symptoms or suicidal ideation differ by specific combination of sources of perceived social support (e.g., significant perceived support from children and other family vs. from spouse/partner, children, and friends)? Further, do these associations differ for males compared to females?

Hypothesis 4: The association between perceived social support and depressive symptoms or suicidal ideation is expected to differ based on unique combination of sources of perceived social support. Further, these associations of unique combination of sources of perceived social support and depressive symptoms and suicidal ideation are expected to differ by participant sex. These associations will be explored in current analyses. No a priori hypotheses are being specified (beyond the prediction specified in Hypothesis 3) due to lack of prior evidence.

CHAPTER II

METHODS

Data

This analysis will use final public-release data from the 2020 wave of the Health and Retirement Study (HRS), with the 2018 wave data being used to compare differences in depressive symptoms and suicidal ideation pre and post-COVID 19 (i.e. 2018 compared to 2020 wave data). The HRS is a nationally representative longitudinal panel study following approximately 20,000 U.S. adults over the age of 50 sponsored by the National Institute on Aging (grant number NIA U01AG009740) and is conducted by the University of Michigan (HRS 2018 Core Data Description and Usage, 2022). Given that HRS data are anonymized and made publicly available, this dissertation is not considered research involving human subjects by Research Compliance Services at the University of Oregon. Written documentation of this determination is available upon request. Data for the 2018 wave were collected between April 2018 and June 2019. Data for the 2020 wave were collected between March 2020 and May 2021. Samples are selected at the household financial unit level using a national area-clustered probability sample frame. Baseline interviews were typically conducted face-to-face by survey interviewers employed by the Survey Research Center at the Institute for Social Research at the University of Michigan, while follow up interviews were typically conducted over the phone or computer (Fisher & Ryan, 2018). Due to COVID-19 isolation precautions, all 2020 wave data were collected via phone or computer (Health and Retirement Study: 2020 Core, Final Version 2.0, Data Description and Usage, 2023). Final release data from the 2022 wave were not available at the time of analysis and therefore data from the last two available waves, i.e., 2018 and 2020, were used. Both datasets consist of seven sub-samples (cohorts) that are interviewed

every 2 years. The original HRS sub-sample consists of people who were born from 1931 through 1941 and were household residents of the U.S. in the spring 1992, and their spouses or partners at the time of the initial interview in 1992 or at the time of any subsequent interview. A steady-state sampling design has been used continuously since 1992, meaning that a new cohort of individuals aged 51-56 years-old has been added every 6 years. The most recent cohort, the Late Baby Boomer (LBB) sub-sample consists of people who were born from 1960 to 1965 and who, at that time, did not have a spouse or partner who was born before 1959 was first interviewed in 2016.

This dissertation only uses participants who were assessed in the 2020 data collection efforts, who were among the 50% of randomly selected participants asked to complete the Leave Behind (LB) Psychosocial questionnaire in 2020, and who returned the completed questionnaire (n = 4,451). This is because the LB Psychosocial questionnaire is what captures perceived social support data from HRS participants. The LB Psychosocial questionnaire was first introduced in 2004 as a self-administered questionnaire that collects data on participants' perception of their social lives and their psychological wellbeing. The LB Psychosocial questionnaire is administered to approximately 50% of participants, who are randomly selected, every 4 years (e.g., half of participants are asked to complete the questionnaire in 2018 and the other half are asked to complete the questionnaire in 2020). Selected participants are asked to complete the questionnaire and return it via mail to HRS staff. In 2020, approximately 65.47% of participants who were selected to complete the LB Psychosocial questionnaire completed and returned the questionnaire. These participants had, on average, fewer depressive symptoms and were more likely to be non-Hispanic White, older, wealthier, and have a high school degree, compared to participants who did not return the questionnaire. Descriptive statistics for individuals who did

and did not complete the LB Psychosocial questionnaire are documented in Table 1 in the Appendix. For additional details related to HRS study design and participant recruitment refer to the HRS Survey Design and Methodology website (https://hrs.isr.umich.edu/documentation/survey-design).

Weights

HRS staff provide respondent and household level weights (Sampling Weights Revised for Tracker 2.0 and Beyond, 2022). The weights are constructed using a two-step process with data from the March Current Population Survey (CPS) of the year data are gathered. The first step was to create post-stratified household weights using initial sampling probabilities, the birth years, race/ethnicity, and biological sex of household members. The second step was to then use the household weights to create post-stratified respondent-level weights. The primary analyses will not use respondent or household level weights as the multilevel analytic strategy will not support accounting for weights. However, descriptive analyses for each source of perceived social support, accounting for individual respondent weights are available in Table 2A in the appendix.

Measures

All data described below and used in the final analyses are from the 2020 HRS data collection period, excluding the 2018 CES-D8 scores and suicidal ideation prevalence statistics used to evaluate the possible effects of COVID-19 on depressive symptoms and suicidal ideation. Descriptive statistics for all the study measures including variations based on (1) whether participants completed the 2020 LB Psychosocial Questionnaire, (2) biological sex, and (3) type of partnership are available in Tables 1A, 3 and 4, respectively in the Appendix and Results section. The final analytic sample consists of individuals who completed the 2020 LB

Psychosocial Questionnaire (n = 4,451) and descriptive statistics for this sample are noted in the first column of Table 1. A description of the study measures follows.

Depressive Symptoms. HRS utilizes an abridged 8-item version of the 20-item Center for Epidemiological Studies Depression (CES-D) Scale. The CES-D scale is a brief self-report scale designed to measure depressive symptoms in the general population (Radloff, 1977). The 8-item version of the scale has been found to provide comparable data to the 20-item scale and is considered a valid and reliable measure of depressive symptoms among older adults (Briggs et al., 2018). The CES-D8 scale consists of 8 items that prompt respondents to "think about the past week and the feelings [they] experienced" and respond to the interviewer with Yes or No for if "each of the following [8 statements were] true for [them] much of the time during the past week." Statements included "you felt depressed" and "you felt that everything you did was an effort." While scales that measure depressive symptoms are not directly capturing whether a participant meets criteria for a diagnosis of a depressive disorder, the elevated CES-D scores are associated with increased risk for current and future psychopathology (Karim et al., 2015). For reference, cutoff scores of 3, 4, or 5 are typically used as proxies for "depression," but a recent analysis of the CES -D8 showed that attempting to dichotomize the scale resulted in low sensitivity (ranging from 56.2% to 70.2% depending on the threshold) of depression compared to the Short Form Composite International Diagnostic Interview (CIDI-SF) (Dang et al., 2020). There were no missing values for the CES-D8 score in the final analytic sample. Scores on the CES-D8 ranged from 0-8 (M = 1.23; SD = 1.83). The continuous score from the CES-D8 was used as an indicator of depressive symptoms.

Suicidal Ideation. Suicidal ideation is not asked about directly in HRS data collection. Instead, respondents are asked a series of questions from the Short Form Composite International

Diagnostic Interview (CIDI-SF) beginning with “During the last 12 months, was there ever a time when you felt sad, blue, or depressed for two weeks or more in a row?” If respondents answer yes then they are asked to think of the two-week period when symptoms were worse and asked how long symptoms lasted during the day. If respondents answer “All Day Long” or “Most of the Day” they are then asked how often they felt these symptoms. If respondents answer “Every Day” or “Almost Every Day” then they are asked if they lost interest in more things than usual during the two-week period. If respondents answer affirmatively, they are asked a series of additional yes/no questions capturing additional symptoms of major depressive episodes, including “Did you think a lot about death -- either your own, someone else's, or death in general -- during those two weeks?” Similar to past research on suicidal ideation using HRS data, I used this final variable as an imperfect proxy for suicidal ideation in the current analysis (Mezuk et al., 2022). A study comparing a large sample of community dwelling older adults that directly assessed suicidal ideation for all participants with HRS’s method of nesting the suicidal ideation question within a series of forced choice depression symptom questionnaires showed that the HRS methodology results in an underestimate of older adults endorsing suicidal ideation of between 5.4% and 9.2% . 116 participants (2.61% of analytic sample) were missing data for the initial CIDI-SF depression screening question. 4.34% of the analytic sample responded yes to the variable used to approximate suicidal ideation.

Perceived Social Support Variables. Perceived social support was measured using three items of a social support scale developed by Walen & Lachman (2000), which asked about a respondents’ spouse/partner, child(ren), friends, and other family. The three items included: ‘‘How much do they really understand the way you feel about things?’’, ‘‘How much can you rely on them if you have a serious problem?’’, and ‘‘How much can you open up to them if you

need to talk about your worries?'' The response options ranged from 1 (a lot), 2 (some), 3 (a little), to 4 (not at all). Items were reverse coded so that a higher value indicates a higher level of social support (1 = not at all, 2 = a little, 3 = some, 4 = a lot). The three items for each source of perceived support were averaged (summed and divided by 3), and an average score of 3.33 was used as the cutoff point to identify whether the participant perceived a significant amount of support from a given source. Among participants who had a partner or spouse (n = 2,817), 76.85% reported perceiving significant (i.e., at or above the cutoff of 3.33) support from their partner or spouse. Among participants who had a child(ren) (n = 3,751), 66.26% reported perceiving significant support from their child(ren). Among participants who had other family members (n = 4,052), 46.92% reported perceiving significant support from their other family members. Among participants who had friend(s) (n = 3,091), 50.37% reported perceiving significant support from their friend(s). Variables for perceived social support from all four sources were created where significant (i.e., at or above the cutoff of 3.33) perceived support was coded as 2, and a perceived social support score below 3.33 or the absence of the source of perceived social support (e.g., does not have children) was coded as 1. Participants in the final analytic sample who did not have a spouse/partner, child(ren), other family members, or friends were coded as 1 to indicate the absence of support. There was no missingness for the perceived social support variables because the final sample size consisted only of participants who completed and returned the LB psychosocial questionnaire, all of whom answered all perceived social support questions.

Sex. HRS biological sex is captured as a dichotomous variable: male or female. Male is coded as 1 and female is coded as 2. There were no missing values for participant sex in the final

analytic sample. See *Key Terms and Definition Section* for discussion on the limitations and inaccuracy of HRS conflating gender and biological sex.

Partnership Type. The HRS did not assess respondent sexual orientation until 2016 with the Late Baby Boomer cohort and has not assessed previous cohorts' respondents' sexual orientation leaving sex composition of the couple (for those in a partnership) as the only cross-cohort measure of type of partnership (same-sex vs different-sex/sex unknown). Therefore, respondent and partner sex were used to create a variable for the sex composition of the couple (partnership type). See *Key Terms and Definition Section* for discussion on the limitations of using a participant's current partner's biological sex to compare with previous literature on the relationship between sexual orientation, social support, and mental health.

In the final analytic sample, 2,817 participants (63.29%) were partnered and 1,634 participants (36.71%) were not partnered. Of the partnered participants, there were 2,494 participants for whom their partner's sex was known (88.53% of partnered participants), 2,457 were in different-sex relationships (87.22% of partnered participants), 37 were in same-sex relationships (1.31% of partnered participants), and 323 participants had partners who were not assessed and therefore the sex of the partner was unknown (11.47% of partnered participants). Even though there was low representation in the same-sex partnership type category, the analyses could still be conducted as there were at least 10 cases in each of the strata being tested. Stratum construction and MAIHDA analytic strategy are explained below in *Level 2 Strata* and *Analytic Plan.* The unpartnered participants (n = 1,634) were categorized as absent/low amount of spousal/partner support. Unfortunately, the partnership type measure had two key limitations in that it did not capture all sexual orientations and it only captured partnership type for participants whose partners were assessed in 2020. I categorized the 323 partnered participants

whose partners were not assessed, and therefore the sex of their partner was not known, within the different-sex/sex unknown partnership category (n = 2,780; 98.69%) of partnered participants). Assuming the percentage of same sex-partnerships observed among partnered participants for whom their partner's sex was known (1.31% of partnered participants had same-sex partners) also applied to the 323 partnered participants with no partner sex data, this decision resulted in the potential miscategorization of approximately 4 participants who might have been in same-sex partnerships (0.09% of the final analytic sample). However, this assumption may be flawed in that there may be an over representation of participants in same-sex partnership whose partners were not assessed in the HRS data collection process due to concerns of stigma or homophobia. It is unlikely that partnership sex data is missing at random and therefore multiple imputation to attempt to predict missing partnership sex data is contraindicated (Sterne et al., 2009). I recognize that this categorization process reifies heteronormativity, a harmful concept that presumes and privileges heterosexuality (Pollitt et al., 2021). I concluded that including all participants' reported perceived spousal support and not biasing data on same-sex partnered participants by attempting to impute partnership type data was the most effective way to examine the experience of same-sex partnered participants using data that privileges the experience of heterosexual participants.

Level 2 Strata. In this dissertation, level 2 will be constructed using HRS's dichotomous measures of sex (male = 1 & female =2) and of perceived social support from four unique sources: (1) spouse/partner, (2) child(ren), (3) friend(s), and (4) other family. Each study respondent will be categorized within a stratum that identifies who they perceive to receive social support from as described in the *Perceived Social Support Variables* section. For example: a female with a spouse who they perceive to provide support, with no children (i.e. child support

is absent), with friends who they perceive to provide support, and with other family members who they do not perceive to provide support, will have the following level 2 stratum: 22121 (see Tables A-3 in the Appendix for complete list of all Strata IDs with the number of participants in each stratum). All possible combinations of strata had participants (range from 15 participants in the smallest stratum to 315 in the largest stratum). All strata were included in final analyses.

Of note, participants in different-sex/sex unknown partnerships are categorized as described above (1 = low or absent perceived social support and 2 = high perceived social support). However, participants who endorsed perceiving significant same-sex spouse/partner support (n = 32) were only classified into two strata, defined based on sex: 13333 for same sex-partnered males and 23333 for same sex-partnered females, with 3 being a constant to represent that variations in sources of perceived social support were not included as part of this categorization. Given the low numbers of same-sex partnered participants, there was no further classification done based on their sources of perceived support. This was done to prevent participants with same-sex spouse/partner support from being dropped in the final analyses due to insufficient numbers of participants in a given stratum. For example: only one male participant had same-sex spouse/partner support, no child(ren) support, other family support, and no friend support; this participant would have been dropped from the final analyses if they were not included in the same-sex spouse/partner support stratum, given the recommended cutoff of having at least 10 participants per stratum (Mahendran et al., 2022a). In the *Results* and *Discussion* sections perceived spouse/partner support refers to different-sex/sex unknown partnerships unless otherwise specified as same-sex spouse/partner support.

Covariates

Race-Ethnicity. Recent Medicare data show that older adults who identified as Mexican, Puerto Rican, Cuban, multiple Hispanic ethnicities, Black/African American, Southeast Asian/Indian, Filipino, Native Hawaiian, or multiracial all had higher odds of screening positively for depression compared to White older adults, after controlling for sex, age, income, education, and self-reported health status (Hooker et al., 2019). The same analysis of Medicare data did not find a significant difference in odds of screening positively for depression among older adults who identified as Chinese, Japanese, Korean, Vietnamese, American Indian, or Alaska Native compared to older White adults, when controlling for the aforementioned sociodemographic variables. Other research suggests that depression prevalence is significantly higher for White and Hispanic Americans compared to Black/African American older adults (Steffens et al., 2009) or significantly higher for white older adults alone (Riolo et al., 2005). Notably, disparities in rates of depression by race diminish as adults age, but on average Black and Hispanic older adults remain at higher risk of experiencing depression compared to White older adults (Fiske et al., 2009; Xu et al., 2010). Also, there is evidence that the effects of different sources of perceived social support vary by race and ethnicity. For example, perceived family support is associated with better health outcomes for Latino immigrants compared to White non-immigrants (Almeida et al., 2009).

Given these variations in depressive symptoms and effects of perceived social support, race-ethnicity was included as a covariate, and coded by combining two items developed by HRS staff for the 2020 cross-wave tracker file: “Hispanicity” (“Hispanic” or “non-Hispanic”) and “Race/Ethnicity” (“White/Caucasian,” “Black or African American,” or “Other”). To protect confidentiality of participants HRS staff collapsed Asian/Asian-American, Native American/American Indian, Alaska Native, Pacific Islander, and all other racial ethnic categories

into “Other.” The “Hispanicity” and “Race/Ethnicity” are combined into a single “Race/Ethnicity” categorical variable: Hispanic (reference), non-Hispanic White, non-Hispanic Black/African American, and non-Hispanic Other. Importantly, race and ethnicity are two distinct constructs and that describe heterogenous social, political, and cultural experiences. APA defines race as a “social construction and categorization of people based on perceived shared physical traits that result in the maintenance of a sociopolitical hierarchy” with significant within group heterogeneity and variability over time (“Race,” 2023). APA defines ethnicity as a “characterization of people based on having a shared culture (e.g., language, food, music, dress, values, and beliefs) related to common ancestry and shared history” (“Ethnicity,” 2023). Bhopal (2002) warned that combining race with ethnicity and focusing exclusively on a limited set racial categories (as I do in this dissertation) is likely to be “inconsequential or harmful” because this strategy does not account for significant ethnic heterogeneity within racial categories. Other scholars maintain that abandoning the inclusion of race and/or ethnicity presents a different potential for harm by failing to account for the structural and persistent effects racism has on non-White individuals (Smith et al., 2023). Therefore, I included the HRS’s measure of race/ethnicity as a covariate in my analysis and recognize that this measure provides a limited measure of the effects of race/ethnicity and racism on depressive symptoms and suicidal ideation. 5 participants were missing race/ethnicity data in the final analytic sample (0.11%).

Education. Increased educational attainment is consistently associated with lower rates of depression and suicidal ideation (Chang-Quan et al., 2010). Hence, educational attainment was included as a covariate in current analyses. It was coded as an ordinal variable by HRS staff: no degree (reference), high school/GED, some college/two-year college degree, four-year

college degree, and master's or professional degree. There were no missing values for participant education in the final analytic sample.

Wealth. Older adults with more wealth are consistently found to be at lower risk of endorsing depressive symptoms compared to older adults with less wealth (Xue et al., 2021). Therefore, household wealth was included as a covariate in current analyses. Total household wealth was drawn from the RAND HRS Detailed Imputations File 2020 (V1) produced by the RAND Center for the Study of Aging, with funding from the National Institute on Aging and the Social Security Administration (*RAND HRS Detailed Imputations File 2020 (V1)*, 2023). RAND researchers calculated total household wealth by subtracting all debts (mortgages, credit card debt, and loans) from all assets (property value, business(es) value, stocks, Individual Retirement Accounts, bonds, checking accounts, and saving accounts). Certain assets and debts were imputed by RAND researchers when missing and determined to be integral to calculating total wealth. Further documentation on the RAND HRS Public Use Datafiles is available at: https://www.rand.org/well-being/social-and-behavioral-policy/centers/aging/dataprod.html.

Age. Adults over 85 years-old are more likely to die by suicide than any other age group (Disparities in Suicide, 2023). Participant age was included as a model covariate. It was measured in years and constructed by HRS staff using date of birth and interview date. There were no missing values for participant age in the final analytic sample.

Analytic Plan

Dataset merging and descriptive statistics were conducted using R 3.3.0 through RStudio 2023.06.01 Statistical Software. All analyses were conducted using STATA 18.0 Statistical Software. Analytic strategy and STATA code were guided by Evans et al.'s (2024) tutorial outlining how to conduct multilevel analyses of heterogeneity and discriminatory accuracy

(MAIHDA). All models (linear and binary) were fit using maximum likelihood estimation (MLE). Missingness was handled with listwise deletion given that no predictor variables or covariates have more than 0.17% missingness in the final analytic sample. Listwise deletion is appropriate to use when there is less than 3% missingness across the variables (Buhi et al., 2008). For the models predicting depressive symptoms, the original sample size is 4,451 and the final sample size following listwise deletion will be 4,446 (0.11% total attrition). For the models predicting suicidal ideation (2.61% missingness for initial screener question), the final analytic sample size will be 4,330 individuals following listwise deletion (2.72% total attrition).

This dissertation's hypotheses will be tested using a recently developed method of multilevel modelling coined multilevel analysis of individual heterogeneity and discriminatory accuracy (MAIHDA) by Merlo (2018). MAIDHA was developed to allow social epidemiologists to explore the intersectional effects of multiple identities on health outcomes more fully than traditional regression models permitted. Multilevel models divide the residual variance in a model into within-group (level 1 – typically an individual) and between-group (level 2 – typically an observable context such as a school or neighborhood) variance (Raudenbush & Bryk, 2002). Multilevel models are often used to account for data collection processes that result in clustering of respondents that would violate the regression assumption of independence without considering between-group effects (Peugh, 2010). While clustering within a similar context typically assumes a concrete and observable context (e.g., school), more abstract similarities may be shared by individuals that result in a theoretical shared context, or social strata (e.g., intersectional identities such as race, sex, immigration status). MAIHDA creates hierarchical models by nesting individual respondents (level 1) within social strata (level 2) composed by the researcher (Evans et al., 2018).

In simulation studies where MAIHDA was compared systematically to six other leading quantitative intersectional approaches (e.g., regression with interactions, decision-tree methods), it was recommended as "the preferred unbiased method for accurate estimation of high-dimensional intersections at smaller sample sizes" in both linear and logistic models, including under conditions when sample sizes were very small (average N=10.4 per stratum) and when the prevalence of characteristics defining the strata ranged from rare to common in the sample (Mahendran et al., 2022a).

MAIHDA, like other multilevel and mixed-effects models, will produce two variance terms: (1) level-1 within strata variance (i.e., individual variance within each strata) and (2) between strata variance in intercepts (Bliese et al., 2018). The following models are informed by Evans et al. (2023) documentation on MAIHDA modeling. Of note, given that one outcome variable in the current analyses is continuous (i.e., CES-D8 score/depressive symptoms) and one outcome variable is binary (i.e., suicidal ideation) separate sets of models for each outcome are described below. Multilevel modeling, and MAIHDA specifically, has been shown to be an appropriate analytical methodology for both continuous and binary outcomes (Guo & Zhao, 2000; Mahendran et al., 2022b)

Linear Models

Model 1A: In a null MAIHDA model with no additive main effects, the between-stratum variance is interpreted as the total variation between strata around the global mean. Between-stratum variance is best understood as between-stratum difference in predicted means and will be described by μ_{0j}. The total degree of variation in depressive symptoms explained by level 2 strata (i.e., combination of perceived social support) without exploring differences by sex will be

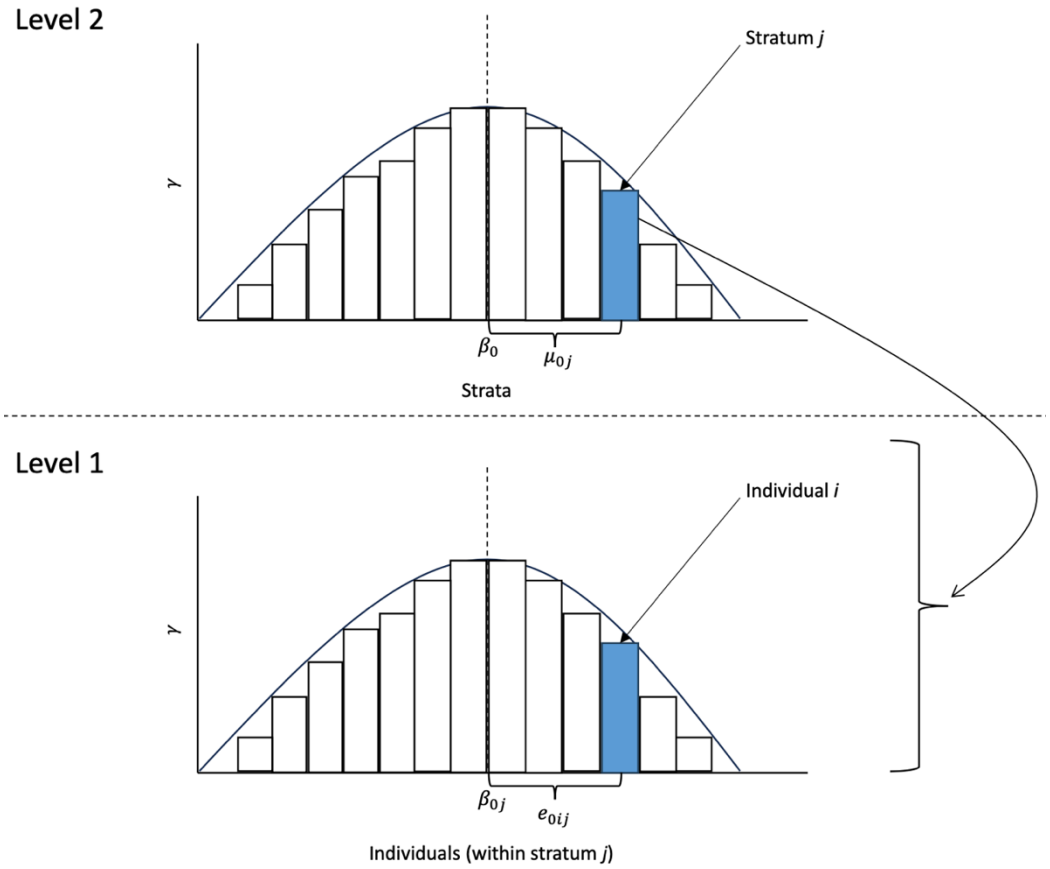
explained by $\sigma^2_{\mu 0}$. This model addresses RQ1 and RQ2 and is written out below and represented in Figure 1.

$$\gamma_{ij} = \beta_0 + \mu_{0j} + e_{0ij}$$

Level 2: $[\mu_{0i}] \sim N(0, \sigma^2_{\mu 0})$
Level 1: $[e_{0ij}] \sim N(0, \sigma^2_{e0})$

Figure 1

Visual representation of Model 1A.



Note. β_0, the intercept, is the grand mean of CES-D8 scores for all strata, while μ_{0j} is the distance from the intercept to a given stratum ($\beta_0 + \mu_{0j}$), and finally e_{0ij} is the distance from the mean of stratum j to individual i's CES-D8 score.

The null model has an intercept, β_0 and the random effects $\mu_{0j}(stratum)$ & $e_{0ij}(individual)$. Where β_0+μ_{0j} is equal to the predicted mean CES-D8 value for stratum j, also referred to as the precision-weighted mean for a given stratum. The precision-weighted mean for each stratum is essentially a weighted average of the observed stratum means towards intercept (the precision-weighted grand mean, i.e. the average of the predicted average CES-D8 scores for each stratum). This provides a more accurate estimate of the predicted CES-D8 score for each stratum by adjusting observed stratum means based on their reliability (e.g., relative number of participants in a given stratum, distance from the precision-weighted grand mean). Estimated CES-D8 scores for each stratum will be calculated using Model 1B (to allow for separate precision-weighted grand means for males and females), described below. The predicted mean values and 95% confidence intervals will be calculated for each stratum (i.e., unique combination sources of perceived social supports) and grouped by sex. Model 1C (all additive effects model) will not be used to calculate predicted CES-D8 and stratum residuals because of how the same-sex partner/spouse support strata were constructed; including the additive effects of all four sources of perceived social support would split the same-sex partner/spouse support strata into small (1 to 6 participants) strata and become uninterpretable.

Additionally, the Variance Partition Coefficient (VPC), calculated as the between-stratum variance divided by the total variance, will provide a measure of difference for each unique combination of perceived social support compared to the average variance explained by all level 2 strata:

VPC = $(\sigma^2_{\mu 0}/(\sigma^2_{\mu 0} + \sigma^2_{e0})) \times 100\%$

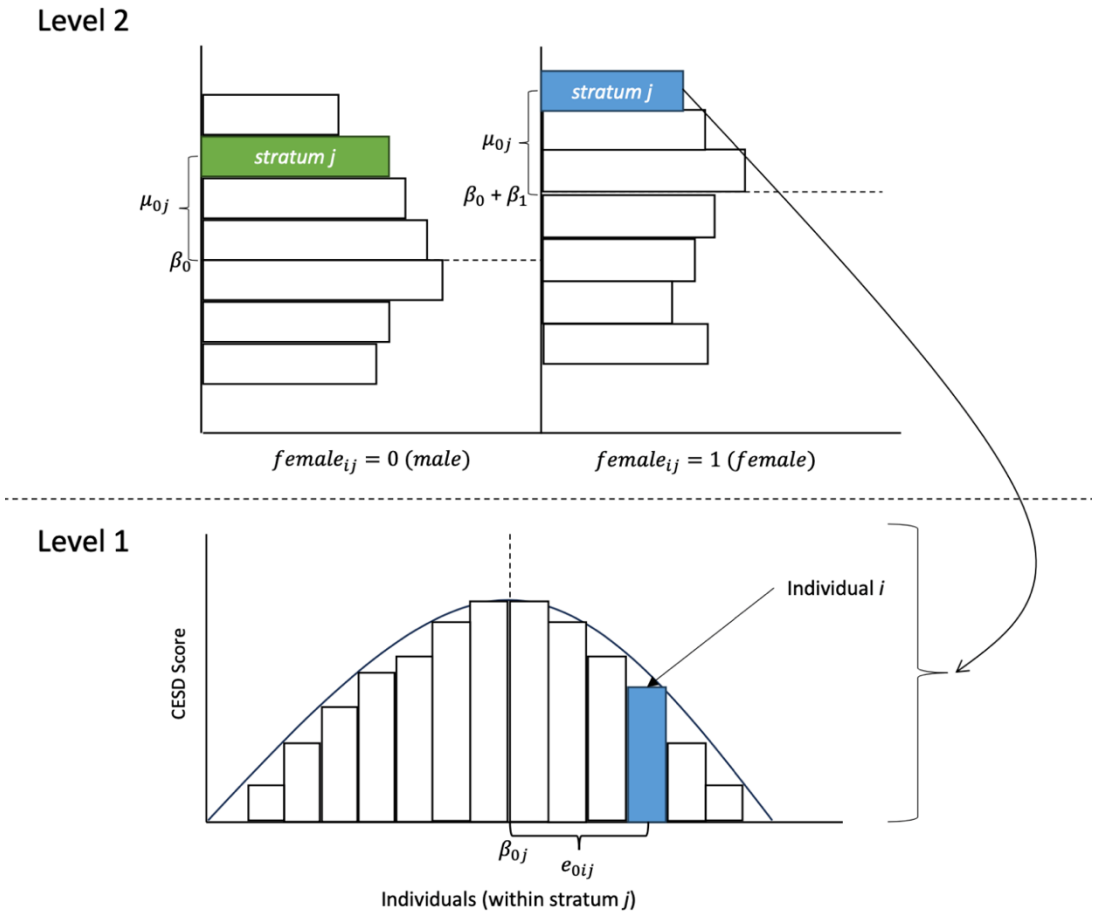
Model 1B: The general structure of the model testing the overall difference in depressive symptoms between men and women (i.e., sex as a fixed effect) with perceived social support combinations as Level 2 is:

$$\gamma_{ij} = \beta_0 + \beta_1(female_{ij}) + \mu_{0j} + e_{0ij}$$

Level 2: $[\mu_{0i}] \sim N(0, \sigma^2_{\mu 0})$
Level 1: $[e_{0ij}] \sim N(0, \sigma^2_{e0})$

Figure 2

Visual representation of Model 2.



Note. β_0, the intercept, is the grand mean of CES-D8 scores for all strata among males (reference group), while $\beta_0 + \beta_1$ is the grand mean of CES-D8 scores for all strata among females. For both males and females μ_{0j} is the distance from the intercept to a given stratum ($\beta_0 + \mu_{0j}$ *or* $\beta_0 +$

$\beta_1+\mu_{0j}$), and finally e_{0ij} is the distance from the mean of stratum j to individual i's CES-D8 score.

Where γ_{ij} is depressive symptoms in 2020 of individual *i* in social stratum *j* (i.e., unique combination of sources of perceived social supports), β_0 is the predicted depressive symptoms for the reference group of males and β_1 is the predicted difference between males and females. μ_{0j} is the residual difference in depressive symptoms between the value predicted for stratum *j* based on the fixed (beta) parameters and the total predicted value for stratum *j*. Stratum-level residuals (μ_{0j}) are normally distributed with mean 0 and variance σ^2_{u0}. The individual-level residual (e_{0ij}), which accounts for the difference predicted for individual *i* in social stratum *j*, is normally distributed with mean 0 and variance σ^2_{e0}. This model addresses RQ3.

Model 1C: This model will be identical to Model 1B but analyses will control for all additive effects of sex and perceived social support (different-sex/sex unknown and same-sex spousal support, child support, other family support, and friend support). Analyzing the change in VPC from the null model to this model will provide insight into how much the effects of sex and each source of perceived social support on depressive symptoms are additive and how much is explained by the combined effects of sex and perceived social support (between stratum variance). This change will be measured by calculating the Proportional Change in Variance (PCV). The PCV is calculated by subtracting the between stratum-variance parameter ($\sigma^2_{\mu 0}$) from model 1A (null) and model 1C, then dividing by the between stratum-variance of model 1A and converting to a percentage.

Model 1D: This model will be identical to Model 1C but analyses will control for the effects of respondent age, race/ethnicity, education, and wealth given the strong association

between these covariates and depressive symptoms. This model continues to explore RQ3 and RQ4.

Binary Outcome (Logistic Regression) Models

Fitting logistic regression MAIHDA models is similar to the linear models described above except that the outcome variable is binary (i.e. endorsed suicidal ideation or did not). Therefore, rather than estimating the mean CES-D8 score the models will estimate the probability of endorsing suicidal ideation in each stratum. Originally, similar to the CES-D8 outcome models, Model 3 would treat sex as a random coefficient, wherein the likelihood of suicidal ideation difference between males and females is allowed to be different in every stratum *j*, however the high number of stratum, subsected by sex, with no participants who endorsed suicidal ideation led to STATA being unable to run such a model.

Model 2A: The null model had an intercept, β_0 and the random effect μ_{0j} and addresses RQ1 and RQ2:

γ_{ij}~$Bernoulli\ (\pi_{ij})\ logit\ (\pi_{ij}) = \log\ (\pi_{ij}/(1-\pi_{ij})) = \ \beta_0$+$\mu_{0j}$

Level 2:$[\mu_{0i}]$~$N(0, \sigma^2_{\mu 0})$
Level 1: Var $(\gamma_{ij}|\pi_{ij}) = \pi_{ij}(1-\pi_{ij})$

This model is similar to the linear Model 1A, with key differences due to binomial nature of the outcome variable suicidal ideation. Binomial model descriptions and rationale are guided by Leyland & Groenewegen (2020) and Evans et al. (2024) recommendations regarding variance partitioning in binomial multilevel models. In Model 2A γ_{ij}~$Bernoulli\ (\pi_{ij})logit\ (\pi_{ij})$ means that the predicted outcome γ_{ij} follows the Bernoulli binomial distribution with probability π_{ij} on the logit scale, so $logit\ (\pi_{ij})$ is the logit of the probability of endorsing suicidal ideation. γ_{ij} is the logit probability of individual *i* in social stratum *j* (i.e., unique combination of sources of

perceived social supports) endorsing suicidal ideation, β_0 is the constant logit probability of endorsing suicidal. μ_{0j} is the residual difference in probability of endorsing suicidal ideation between the value predicted for stratum *j* based on the fixed (beta) parameter and the total predicted value for stratum *j*. Stratum-level residuals (μ_{0j}) are normally distributed with mean 0 and variance $\sigma^2{}_{u0}$. The total degree of variation in odds of suicidal ideation explained by level 2 strata (i.e., combination of perceived social support) will be explained by $\sigma^2_{\mu 0}$.

The Variance Partition Coefficient (VPC), calculated as the between-stratum variance divided by the total variance, will provide a measure of difference for each unique combination of perceived social support compared to the average variance explained by all level 2 strata:

VPC = $(\sigma^2_{\mu 0}/(\sigma^2_{\mu 0} + \sigma^2_{e0})) \times 100\%$

Model 2B: The general structure of the model testing the overall difference in odds of suicidal ideation between men and women (i.e., sex as a fixed effect) with perceived social support combinations as Level 2 is:

γ_{ij}~$Bernoulli\ (\pi_{ij})\ logit\ (\pi_{ij}) = \beta_0 + \beta_1(female_{ij}) + \mu_{0j}$

Level 2:$[\mu_{0i}] \sim N(0, \sigma^2_{\mu 0})$
Level 1: Var $(\gamma_{ij}|\pi_{ij}) = \pi_{ij}(1 - \pi_{ij})$

Where γ_{ij} is the logit probability of individual *i* in social stratum *j* (i.e., unique combination of sources of perceived social supports) endorsing suicidal ideation, β_0 is the logit probability of endorsing suicidal ideation for the reference group of males and β_1 is the predicted difference between males and females. μ_{0j} is the residual difference in probability of endorsing suicidal ideation between the value predicted for stratum *j* based on the fixed (beta) parameters and the total predicted value for stratum *j*. Stratum-level residuals (μ_{0j}) are normally distributed with mean 0 and variance $\sigma^2{}_{u0}$. This model addresses RQ3.

Model 2C: This model will be identical to Model 2B but analyses will control for all additive effects of sex and perceived social support (different-sex/sex unknown and same-sex spousal support, child support, other family support, and friend support). Analyzing the change in VPC from the null model to this model will provide insight into how much the effects of sex and each source of perceived social support on likelihood of endorsing suicidal ideation are additive and how much is explained by the combined effects of sex and perceived social support (between stratum variance). This change will be measured by calculating the Proportional Change in Variance (PCV), similarly to the PCV calculated for linear Model 1B and 1C.

Model 2D: This model will be identical to Model 2C, but analyses will control for the effects of respondent age, race/ethnicity, education, and wealth given the strong association between these covariates and suicidal ideation. This model explores RQ3 and RQ4.

Similar to the linear model, the predicted percentage of participants who endorse suicidal ideation and 95% confidence intervals will be calculated for each stratum (i.e., unique combination sources of perceived social supports) and grouped by sex using Model 2B. This will be calculated using the inverse of the logit function described in Model 2B. Stratum residuals from Model 2B will also be calculated to describe the remaining difference between predicted values for each stratum and stratum-level predictions based on the additive effect of sex. Model 2C was not used to calculate predicted suicidal ideation and stratum residuals because of how the same-sex partner/spouse support strata were constructed; including the additive effects of all four sources of perceived social support would split the same-sex partner/spouse support strata into small (1 to 6 participants) strata and become uninterpretable.

CHAPTER III

RESULTS

Descriptive Statistics

Differences Between 2018 and 2020 – The Effects of COVID-19

While the mean CES-D8 scores for all participants increased from 2018 to 2020, the change from 2018 to 2020 was not statistically significant for males or females. See Table 1 for details.

Table 1

Difference in average CES-D8 score from 2018 to 2020 for the final analytic sample (n=4,451).

	CES-D8 Score in 2018 (Mean (SD))	CES-D8 Score in 2020 (Mean (SD))	Mean Difference [95% CI]	Mean Difference t-test (p-value)
Males (*n* = 1,756)	1.00 (1.58)	1.02 (1.67)	0.02 [-0.12 – 0.10]	-0.22 (0.83)
Females (*n* = 2,695)	1.38 (1.95)	1.47 (1.99)	0.09 [-0.20 – 0.01]	-1.71 (0.09)
Total (*n* = 4,451)	1.23 (1.83)	1.29 (1.88)	0.06 [-0.14 – 0.02]	-1.54 (0.12)

The percentage of participants, both male and female, who endorsed thoughts of death increased from 2018 to 2020. This increase was statistically significant for both males and females (see Table 2 for details). Implications and the limitations of HRS's measure of suicidal ideation: "thoughts of death" during the COVID-19 pandemic are discussed under *Limitations & Future Directions*.

Table 2

Difference in percentage of participants who endorsed thoughts of death from 2018 to 2020 for the final analytic sample (n=4,451). Pearson's Chi-squared test to test whether frequencies are significantly different between 2018 and 2020.

	Suicidal Ideation in 2018 (%)	Suicidal Ideation in 2020 (%)	Pearson's Chi-squared test (p-value)
Males (*n* = 1,713)	2.69%	2.72%	195.59 (<0.01)*
Females (*n* = 2,656)	4.63%	5.37%	219.51 (<0.01)*
Total (*n* = 4,369)	3.87%	4.34%	407.81 (<0.01)*

Note. * Significance level of $p < 0.05$.

Differences by Sex

Among participants who completed the LB questionnaire (i.e., the final analytic sample; n = 4,451), females were, on average, significantly more likely than males to endorse the HRS's measure of suicidal ideation: thinking about death in the past year (5.37% compared to 2.72%, $p < 0.01$). Females also had on average, significantly higher CES-D8 scores compared to males (1.47 compared to 1.02, $p < 0.01$). Sex differences in the percentage of participants who reported living with a spouse or partner (females: 51.44% and males: 76.37%) and the differences in level of perceived social support by source were also statistically significant. Males reported more perceived social support from their spouses compared to females (3.58 compared to 3.39, $p < 0.01$), while females reported significantly more perceived social support from all other sources compared to males ($p < 0.01$). Sex differences in study variables and associated significance tests are documented in Table 3.

Table 3

Non-weighted descriptive statistics by sex among participants who completed the LB Questionnaire in 2020 and will be included in the final sample and analyses.

	Total (% or Mean (SD)) (n = 4,451)	Males (% or Mean (SD)) (n = 1,756)	Females (% or Mean (SD)) (n = 2,695)	Mean Difference t-test (p-value) or Chi2 (p-value)
8-item CES-D (2018 Depressive Symptoms)	1.23 (1.83)	1.00 (1.58)	1.38 (1.95)	-7.09 (<0.01)*
8-item CES-D (2020 Depressive Symptoms)	1.29 (1.88)	1.02 (1.67)	1.47 (1.99)	-8.29 (<0.01)*
Change in 8-item CES-D (2018 to 2020)	0.06 (1.68)	0.02 (1.49)	0.09 (1.80)	-1.61 (0.11)
Endorsed being depressed for 2 weeks in last year (2020)	15.15%	10.46%	18.16%	46.97 (<0.01)*
If yes above: Depressed all day/almost all day (2020)	45.62%	40.11%	47.68%	2.68 (0.10)
If yes above: Depressed every day or almost every day (2020)	87.84%	83.10%	89.33%	1.42 (0.23)
If yes above: Loss of interest in more things than usual (2020)	84.94%	83.05%	85.50%	0.07 (0.80)
If yes above: Suicidal Ideation (2020)	72.31%	77.97%	70.65%	0.88 (0.35)
Suicidal Ideation (Percentage of total participants)	4.34%	2.72%	5.37%	16.88 (<0.01)*
Lives with Spouse/Partner	61.14%	76.37%	51.44%	247.16 (<0.01)*
Perceived Spousal/Partner Support (if partnered – all partner types)	3.48 (0.65)	3.58 (0.57)	3.39 (0.71)	7.72 (<0.01)*
Has Child(ren)	87.91%	85.86%	89.25%	10.74 (<0.01)*
If yes above: Perceived Support from Child (ren)	3.29 (0.74)	3.17 (0.78)	3.36 (0.70)	-7.49 (<0.01)*

Table 3 (continued).

Has Other Family	93.21%	92.80%	93.49%	0.67 (0.41)
If yes above: Perceived Other Family Support	2.95 (0.87)	2.82 (0.87)	3.04 (0.86)	-7.70 (<0.01)*
Has Friend(s)	88.46%	87.35%	89.19%	3.27 (0.07)
If yes above: Perceived Support from Friend(s)	3.13 (0.73)	2.96 (0.73)	3.23 (0.71)	-11.54 (<0.01)*
Age (years)	69.10 (10.44)	69.31 (9.97)	68.96 (10.73)	1.11 (0.27)
Type of Partnership	-	-	-	1.34 (0.25)
Same-Sex	1.48%	1.54%	1.42%	-
Different-sex/sex unknown	98.52%	98.46%	98.58%	-
Race/Ethnicity	-	-	-	14.08 (<0.01)*
Non-Hispanic Black	18.62%	16.02%	20.32%	-
Hispanic	14.35%	14.14%	14.49%	-
Non-Hispanic White	62.87%	65.56%	61.11%	-
Non-Hispanic Other	4.16%	4.28%	4.09%	-
Educational Attainment	-	-	-	15.77 (<0.01)*
No High School Degree/GED	12.24%	11.39%	12.80%	-
High School Degree/GED	46.98%	45.84%	47.72%	-
Some College/2-year degree	11.53%	10.36%	12.28%	-
4-year degree or higher	29.25%	32.40%	27.20%	-
Total Wealth ($100,000)	6.34 (24.07)	7.06 (18.84)	5.87 (26.94)	1.73 (0.08)
Total	100%	39.45%	60.55%	-

Table 3 (continued).

Note. * Significance level of p < 0.05. Variables assessed during 2018 data collection are noted in table above, all other variables were assessed during 2020 data collection. Perceived support scales range from 1 to 4, with 4 indicating the highest level of perceived support. The first column, "Total" are the descriptive statistics for the final analytic sample.

Differences by Partnership Type

The differences between same-sex and different-sex/sex unknown partnered participants are reported in Table 4. Notably, same-sex partners reported higher levels of spousal/partner support compared to different-sex/sex unknown partners (3.72 compared to 3.48, p <0.01), participants with different-sex/sex unknown partners were more likely to have children compared to participants with same-sex partners (91.32% compared to 29.73%, $p < 0.01$), and same-sex partnered participants reported higher levels of friend support compared to different-sex/sex unknown partnered participants (3.35 compared to 3.09, $p = 0.04$). There were no statistically significant differences in outcome variables (CES-D8 score and reporting suicidal ideation) between same-sex and different-sex/sex unknown partnered participants.

Table 4

Non-weighted descriptive statistics by type of partnerships among participants who completed the LB Questionnaire in 2020 and for whom the sex of their spouse/partner is known. (N = 2,494). Note that only participants with a reported partner are included in this table.

	Total (% or Mean (SD)) (n =2,817)	Same-Sex Partner/Spouse (% or Mean (SD)) (n = 37)	Different-sex/sex unknown Partner/Spouse (% or Mean (SD)) (n = 2,780)	Mean Difference t-test (p-value) or Chi2 (p-value)
8-item CES-D (2018 Depressive Symptoms)	1.04 (1.*65*)	0.97 (1.55)	1.04 (1.65)	0.26 (0.79)
8-item CES-D (2020 Depressive Symptoms)	1.09 (1.71)	1.22 (1.69)	1.08 (1.71)	-0.48 (0.64)

Table 4 (continued).

Change in 8-item CES-D (2018 to 2020)	0.05(1.58)	0.24 (1.09)	0.04 (1.58)	-1.10 (0.28)
Endorsed being depressed for 2 weeks in last year (2020)	13.15%	27.03%	12.96%	5.15 (0.02)*
If yes above: Depressed all day/almost all day (2020)	43.14%	20.00%	43.80%	1.38 (0.24)
If yes above: Depressed every day or almost every day (2020)	86.92%	100%	86.75%	<0.01 (1.00)
If yes above: Loss of interest in more things than usual (2020)	83.33%	100%	83.08%	<0.01 (1.00)
If yes above: Suicidal Ideation (2020)	66.92%	50.00%	67.18%	<0.01 (1.00)
Suicidal Ideation (Percentage of total participants)	3.25%	2.70%	3.26%	0.20 (0.84)
Lives with Spouse/Partner	98.41%	100%	98.38%	<0.01 (1.00)
Perceived Spousal/Partner Support (if partnered)	3.48 (0.65)	3.72 (0.43)	3.48 (0.66)	-3.41 (<0.01)*
Has Child(ren)	90.48%	29.73%	91.32%	153.62 (<0.01)*
Perceived Support from Child (ren)	3.24 (0.74)	2.79 (0.82)	3.25 (0.74)	1.85 (0.09)
Has Other Family	93.88%	86.49%	93.98%	2.38 (0.12)
Perceived Other Family Support	2.90 (0.86)	2.74 (0.82)	2.90 (0.86)	1.10 (0.28)
Has Friend(s)	88.85%	86.49%	88.88%	0.04 (0.84)
Perceived Support from Friend(s)	3.09 (0.73)	3.35 (0.68)	3.09 (0.73)	-2.18 (0.04)*

Table 4 (continued).

Age (years)	67.58 (9.86)	61.84 (10.74)	67.67 (9.82)	3.28 (<0.01)*
Sex	-	-	-	0.05 (0.82)
Female	51.90%	48.65%	51.94%	-
Male	48.10%	51.35%	49.06%	-
Race/Ethnicity	-	-	-	7.88 (0.049)*
Non-Hispanic Black	15.39%	13.51%	15.41%	-
Hispanic	15.10%	2.70%	15.27%	-
Non-Hispanic White	65.17%	72.97%	65.07%	-
Non-Hispanic Other	4.34%	10.81%	4.25%	-
Educational Attainment	-	-	-	23.39 (<0.01)*
No High School Degree/GED	11.18%	0%	11.33%	-
High School Degree/GED	45.08%	18.92%	45.43%	-
Some College/2-year degree	11.40%	27.03%	11.19%	-
4-year degree or higher	32.34%	54.05%	32.05%	-
Total Wealth ($100,000)	740.68 (1,869.91)	857. (1,191.47)	739.13 (1,877.37)	-0.59 (0.56)
Total	100%	1.31%	98.69%	-

Note. * Significance level of $p < 0.05$. Variables assessed during 2018 data collection are noted in table above, all other variables were assessed during 2020 data collection. Perceived support scales range from 1 to 4, with 4 indicating the highest level of perceived support.

Depressive Symptoms

Results for the MAIHDA models with CES-D8 score as the outcome of interest are presented below in Table 3. The null model (Model 1A), where CES-D8 is predicted without any covariates and the perceived social support strata are included as the level 2 variable had a VPC of 5.51%, meaning that approximately 5.51% of the total variation in CES-D8 scores can be attributed to between-stratum differences, before accounting for additional variables. The VPC for Model 1B (accounting for sex) was 4.60% with a PCV from Model 1A of 17.37%. Meaning that 17.37% of the VPC in the Null Model (1A) is explained by the additive effect of sex. The VPC for Model 1C (accounting for all additive effects: sex and perceived sources of social support) was 0.11%. Meaning that only 0.11% of the total variation in CES-D8 scores can be attributed to between-stratum differences when accounting for additive effects of what constitutes the social strata. In Model 1D, which included all covariates and additive effects, being female was associated with a CES-D8 score 0.33 units [95%CI: 0.20-0.45, $p<0.01$] higher compared to male participants. Attaining a high school degree, attending some college, and graduating from college were all associated with lower CES-D8 scores compared to not graduating high school or obtaining a GED, with graduating college being associated with the lowest predicted CES-D8 score at 0.88 units [95% CI: -1.08 to -0.69, $p<0.01$] lower than participants without a high school degree or GED. Age and wealth were also associated with marginal decreases in CES-D8 scores. A one-year increase in age was associated with a 0.01 unit lower CES-D8 score [95%CI: -0.01 to -0.00, $p<0.01$]. A $100,000 increase in wealth was associated with a 0.002 unit lower CES-D8 score [95%CI: -0.00 to -0.00, $p=0.03$]. The relationships between race and ethnicity and CES-D8 score were not statistically significant.

Table 5

Linear MAIHDA Model Results Predicting CES-D8.

	Model 1A		Model 1B		Model 1C		Model 1D	
	Est. [95% CI]	*p*	Est. [95% CI]	*p*	Est. [95% CI]	*p*	Est. [95% CI]	*p*
Intercept	1.24 [1.08-1.40]*	<0.01	1.05 [0.83-1.26]*	<0.01	1.79 [1.65-1.92]*	<0.01	3.02 [2.59-3.45]*	<0.01
Sex (female)			0.37 [0.07-0.67]*	0.02	0.36 [0.23-0.48]*	<0.01	0.33 [0.20-0.45]*	<0.01
Perceived Support from partner/spouse (reference: no significant perceived support)					-	-	-	-
Perceived Support from partner/spouse (Same-Sex)					-0.86 [-1.50 to -0.22]*	<0.01	-0.73 [-1.36 to -0.09]*	0.03
Perceived Support from partner/spouse (Different-sex/sex unknown)					-0.73 [-0.85 to -0.61]*	<0.01	-0.69 [-0.81 to -0.57]*	<0.01
Perceived Support from Child(ren)					-0.33 [-0.45 to -0.20]*	<0.01	-0.31 [-0.43 to -0.18]*	<0.01
Perceived Support from Other Family					-0.20 [-0.32 to -0.08]*	<0.01	-0.22 [-0.35 to -0.10]*	<0.01
Perceived Support from Friend(s)					-0.18 [-0.30 to -0.06]*	<0.01	-0.14 [-0.26 to -0.1]*	0.03
Age (years)							-0.01 [-0.01 to -0.00]*	<0.01
Race/Ethnicity (reference: Hispanic)							-	-

Table 5 (continued).

Non-Hispanic Black				-0.01 [-0.20 - 0.18]	0.91
Non-Hispanic White				-0.09 [-0.25 - 0.08]	0.32
Non-Hispanic Other				0.02 [-0.28 to 0.32]	0.90
Educational Attainment (reference: No High School Degree/GED)				-	-
High School Degree/GED				-0.61 [-0.78 to -0.43]*	<0.01
Some College/2-year degree				-0.52 [-0.74 to -0.29]*	<0.01
4-year degree or higher				-0.88 [-1.08 to -0.69]*	<0.01
Total Wealth ($100,000)				-0.00 [-0.00 to –0.00]*	<0.01
Random Effects					
Stratum-Level Variance – Reference ($\sigma^2_{\mu 0}$)	0.19	0.16	0.00	0.00	
Individual-Level Variance (σ^2_{e0})	3.29	3.29	3.29	3.19	
Variance Partition Coefficient (%)	5.51%	4.60%	0.11%	0.14%	
Proportional Change in Variance (%) – compared to Null Model (1A)	-	17.37%	97.99%	97.70%	

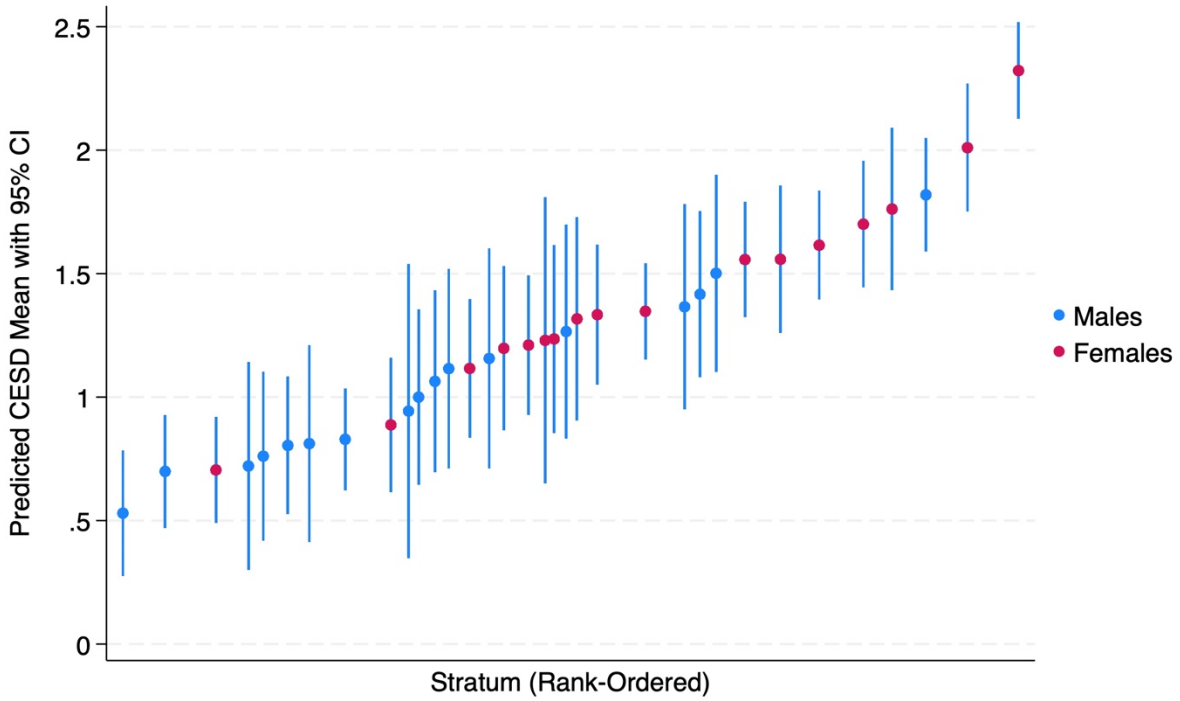
Table 5 (continued).

Note. * Significance level of $p < 0.05$.

Across all models, being female was associated with a significantly higher CES-D8 score compared to being male. This disparity is evidenced in Figure 3, which plots predicted CES-D8 scores by stratum, and shows most male strata (blue dots) are in the bottom half of predicted CES-D8 scores while most female strata (red dots) are in the top half of predicted CES-D8 scores. Figure 3 provides a visual representation of the variation in predicted CES-D8 scores across strata and Table 4A in the Appendix documents each stratum's predicted CES-D8 score with 95% confidence intervals, the number of participants in each stratum, and the observed CES-D8 score in each stratum.

Figure 3

Predicted CES-D8 score with 95% confidence intervals by stratum.



Notably, the predicted CES-D8 scores for females in strata 22222 (farthest red dot on the left - high level of perceived support from all four sources) and 22212 (second farthest red dot on

the left - high level of perceived support from spouse/partner, children, and friends), were markedly lower than the predicted CES-D8 scores for all female participants and comparable to the male strata with the same combinations of perceived social support. The predicted CES-D8 score for females in strata 21111 (farthest red dot on the right - no high levels of perceived social support from any source) and strata 21112 (second farthest red dot on the right - only reported a high level of perceived support from friends) had the highest predicted CES-D8 score among all social strata. For further visibility of each stratum's location, female participants' predicted CES-D8 scores with 95% confidence intervals by stratum are displayed in Figure 4 and male participants' predicted CES-D8 scores with 95% confidence intervals by stratum are displayed in Figure 5. Of note, having only high levels of perceived spousal/partner support (without any other sources of perceived significant support) is associated with fewer depressive symptoms than having low or no perceived spousal/partner support even with high levels of perceived support from children, other family, and friends for both males and females. The bottom half of predicted CES-D8 scores is constituted exclusively of strata that included high levels of perceived spousal/partner support in combination with other sources of support. The top half are strata without high levels of perceived spousal/partner support in combination with other sources of support.

Figure 4

Predicted CES-D8 scores for females with 95% confidence intervals by stratum.

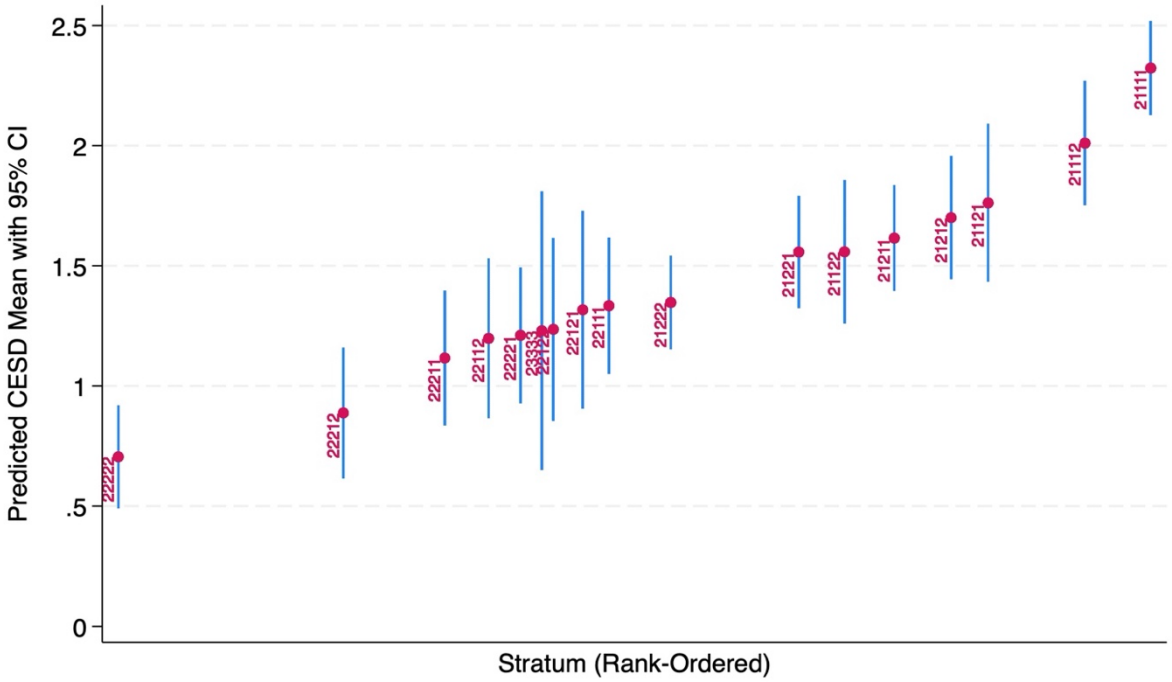
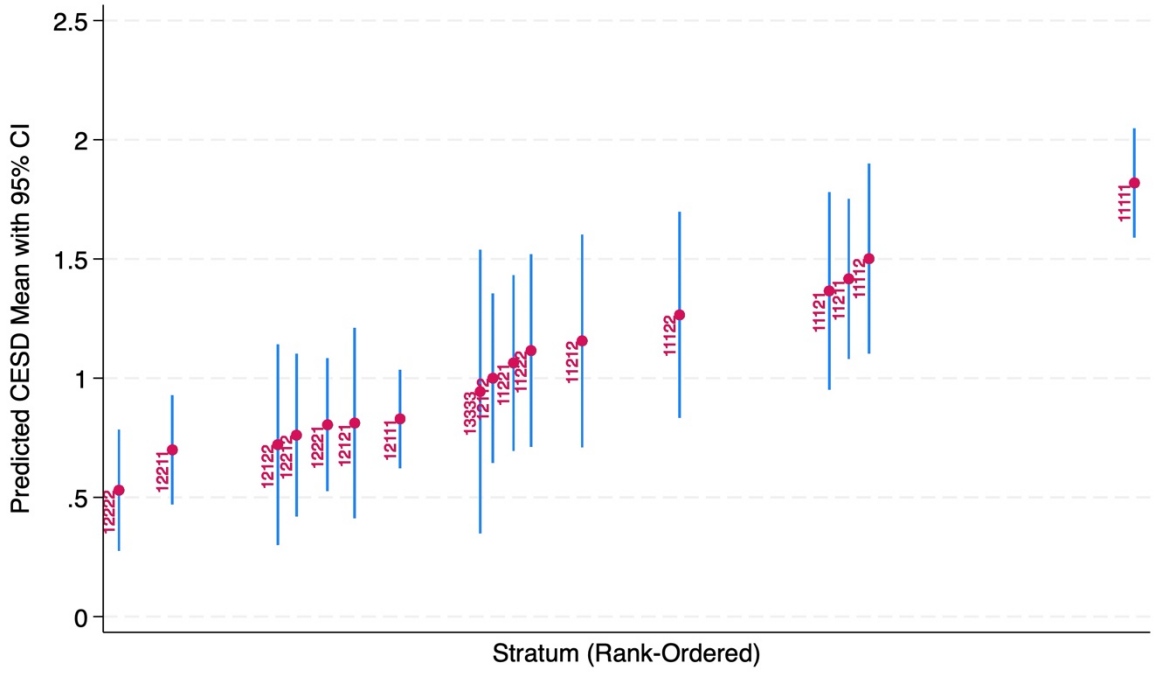


Figure 5

Predicted CES-D8 score for males with 95% confidence intervals by stratum.



The 5 highest predicted CES-D8 scores by stratum, for males and females are displayed in Table 6. The 5 lowest CES-D8 scored by stratum for males and females are displayed in Table 7. A complete list of each stratum's predicted CES-D8 score with a 95% confidence interval, observed mean CES-D8 score, and number of participants are displayed in the Appendix in Table 4A.

Table 6

5 highest predicted CES-D8 score by stratum and sex.

	Stratum ID	Significant Source of Perceived Support						
		Spouse/ Partner	Child(ren)	Other Family Member(s)	Friend(s)	Estimate	95% CI	
Males	11111	No	No	No	No	1.82	1.59	2.05
	11112	No	No	No	Yes	1.50	1.10	1.90
	11211	No	Yes	No	No	1.42	1.08	1.75
	11121	No	No	Yes	No	1.37	0.95	1.78
	11122	No	No	Yes	Yes	1.27	0.83	1.70
Females	21111	No	No	No	No	2.32	2.13	2.52
	21112	No	No	No	Yes	2.01	1.75	2.27
	21121	No	No	Yes	No	1.76	1.43	2.09
	21212	No	Yes	No	Yes	1.70	1.44	1.96
	21211	No	Yes	No	No	1.62	1.40	1.83

Table 7

5 lowest predicted CES-D8 score by stratum and sex.

	Stratum ID	Significant Source of Perceived Support						
		Spouse/ Partner	Child(ren)	Other Family Member(s)	Friend(s)	Estimate	95% CI	
Males	12221	Yes	Yes	Yes	No	0.80	0.53	1.08
	12212	Yes	Yes	No	Yes	0.76	0.42	1.10

Table 7 (continued).

Males	12122	Yes	No	Yes	Yes	0.72	0.30	1.14
	12211	Yes	Yes	No	No	0.70	0.47	0.93
	12222	Yes	Yes	Yes	Yes	0.53	0.28	0.78
Females	22221	Yes	Yes	Yes	No	1.21	0.93	1.49
	22112	Yes	No	No	Yes	1.20	0.87	1.53
	22211	Yes	Yes	No	No	1.12	0.84	1.40
	22212	Yes	Yes	No	Yes	0.89	0.62	1.16
	22222	Yes	Yes	Yes	Yes	0.71	0.49	0.92

Random Effects

A graph of all stratum random effects, adjusted for sex, is depicted in Figure 6. The predicted stratum random effects, or stratum-level residuals, represent μ_{0j} (males) and $\mu_{0j}+\mu_{1j}$ (females) for each stratum. A $\mu_{0j}= 0$ represents a stratum with a predicted CES-D8 score completely explained by the additive effects (sex) of Model 1B (i.e., the intercept β_0 *or* $\beta_0 + \beta_1$ would fully predict the mean CES-D8 score for stratum *j* if $\mu_{0j}= 0$). The stratum-level residuals with a confidence interval above or below 0 indicate a stratum with a higher or lower predicted CES-D8 score than would be predicted based on sex. These significant stratum random effects, adjusted for sex, are depicted in Figure 7. Examining stratum-level residuals for Model 1B provides insight into which relationships between combinations of perceived social support are associated with significantly high or low levels of depressive symptoms for both males and females. Plotting random effects for Model 1C or 1D would not reveal any strata with a confidence interval that does not include $\mu_{0j}= 0$ because the additive effects of perceived social support explained almost all stratum-level variation in these models.

For males and females, strata with no sources of significant perceived social support (11111 and 21111) and strata with only significant perceived support from friends (11112 and 21112) were associated with the two highest predicted CES-D8 scores (i.e., most depressive symptoms). The male stratum with only significant perceived support from children (11211) was also associated with significantly higher predicted CES-D8 scores compared to the predicted grand mean for males. For females, the stratum with only significant perceived support from children and other family (21212) and the stratum with only significant perceived support from friends (21112) were also associated with significantly higher predicted CES-D8 scores compared to the predicted grand mean for females.

For males, the following strata had lower-than-expected predicted mean CES-D8 scores (compared to the predicted grand mean CES-D8 score for males): 12222, 12211, 12111. For females, the following strata had lower-than-expected predicted mean CES-D8 scores (compared to the predicted grand mean CES-D8 score for males): 22222, 22212, 22211. Significant perceived spousal support is present in all strata with significantly lower predicted mean CES-D8 scores for both males and females. For females, the presence of significant perceived support from children and friends has the second lowest predicted mean CES-D8 score. Of note, for males the mean predicted CES-D8 score for the stratum with significant perceived spousal support alone (i.e., no other sources of significant perceived support) was significantly lower than the predicted mean CES-D8 score for males.

Figure 6

Stratum random effects from Model 1B.

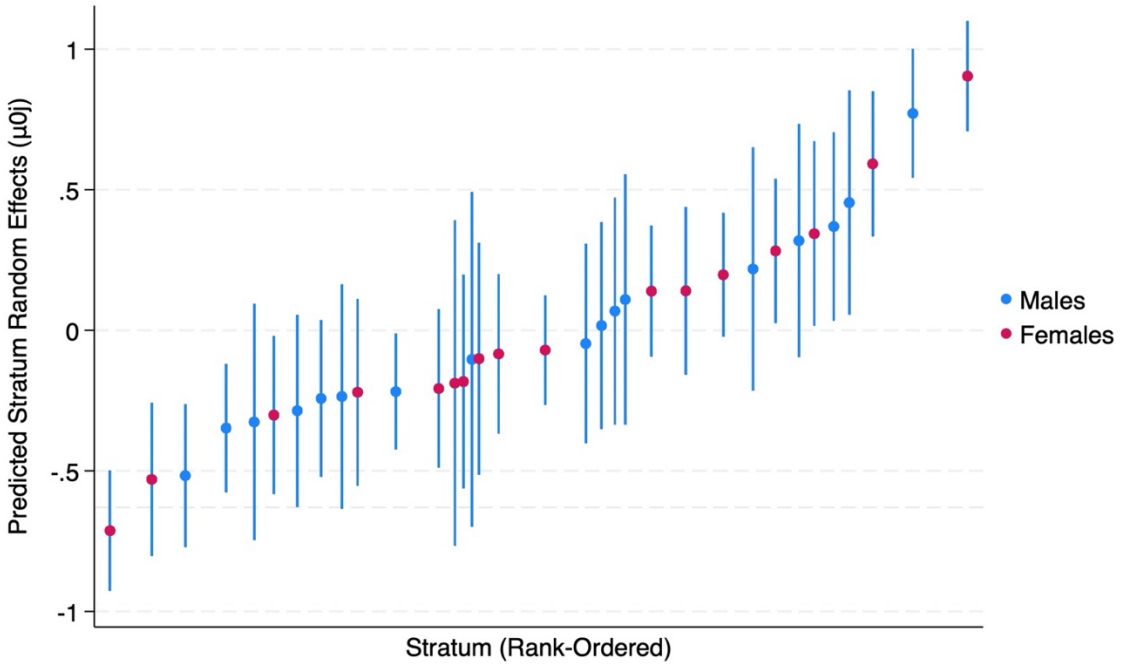
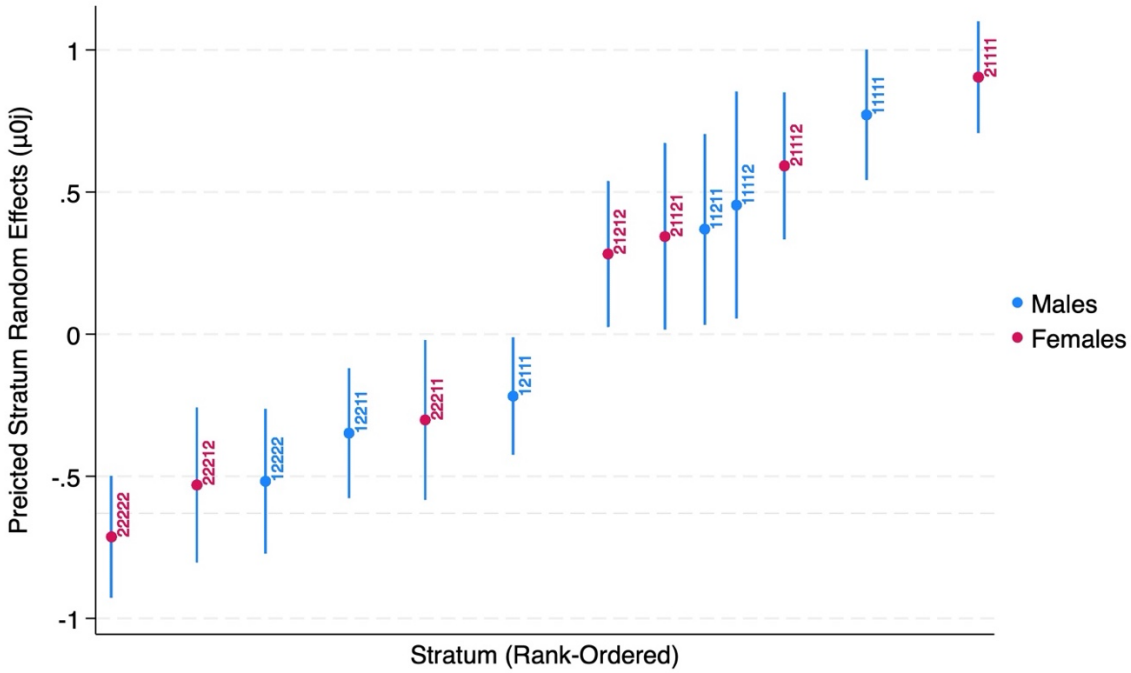


Figure 7

Significant (i.e., 95% CI < or > 0) stratum random effects from Model 1B.



Suicidal Ideation

Results for the MAIHDA models predicting suicidal ideation are presented in Table 8. The null model (Model 2A), where odds of expressing suicidal ideation is predicted without any covariates and the perceived social support strata are included as the level 2 variable had a VPC of 8.25%, meaning that approximately 8.25% of the total variation in odds of expressing suicidal ideation can be attributed to between-stratum differences, before accounting for additional variables. The VPC for Model 2C (adjusting for all additive effects) was less than 0.00% suggesting that holding sex and all sources of perceived social support constant, none of the total odds of expressing suicidal ideation variance could still be attributed to between-stratum differences. In Model 2D, which included all additive effects and covariates, being female was associated with being 1.79 times more likely to report suicidal ideation [95%CI: 1.26-2.55, $p<0.01$] compared to male participants. Perceiving significant spousal support was associated with being 0.56 times less likely to report suicidal ideation [95%CI: 0.69-0.38, $p<0.01$] and perceiving significant support from other family was associated with being 0.33 times less likely to report suicidal ideation [95%CI:0.52-0.07, $p=0.02$]. Neither significant perceived support from children or friends was associated with statistically significant difference in odds of reporting suicidal ideation. Age was the only other covariate associated with a slightly lower odds of reporting suicidal ideation. A one-year increase in age was associated being 0.96 times less likely to report suicidal ideation [95%CI: 0.94-0.97, $p<0.01$]. Race/ethnicity, education, and wealth were not associated with significantly different odds of reporting suicidal ideation.

Table 8

MAIHDA logistic model results with odds ratios of Suicidal Ideation in 2020.

	Model 2A		Model 2B		Model 2C		Model 2D	
	OR [95% CI]	*p*	OR [95% CI]	*p*	OR [95% CI]	*p*	OR [95% CI]	*p*
Intercept	0.04 [0.03-0.05]*	*<0.01*	0.03 [0.02-0.04]*	*<0.01*	0.06 [0.04-0.08]*	*<0.01*	0.98 [0.30-3.22]	0.98
Sex (female)			2.04 [1.27-3.28]*	*<0.01*	1.87 [1.32-2.66]*	*<0.01*	1.79 [1.26-2.55]*	<0.01
Perceived Support from partner/spouse (Different-sex/sex unknown)					0.48 [0.34-0.67]*	<0.01	0.44 [0.31-0.62]*	<0.01
Perceived Support from Child(ren)					0.79 [0.58-1.07]	0.12	0.91 [0.66-1.25]	0.55
Perceived Support from Other Family					0.67 [0.49-0.93]*	0.02	0.67 [0.48-0.93]*	0.02
Perceived Support from Friend(s)					0.86 [0.63-1.17]	0.33	0.85 [0.62-1.16]	0.31
Age (years)							0.96 [0.94 - 0.97]*	<0.01
Race/Ethnicity (reference: Hispanic)							-	-
Non-Hispanic Black							0.99 [0.59-1.67]	0.97
Non-Hispanic White							1.35 [0.85-2.14]	0.20

Table 8 (continued).

Non-Hispanic Other				1.51 [0.72-3.16]	0.28
Educational Attainment (reference: No High School Degree/GED)				-	-
High School Degree/GED				0.84 [0.53 - 1.34]	0.47
Some College/2-year degree				0.75 [0.41-1.34]	0.33
4-year degree or higher				0.74 [0.43-1.72]	0.27
Total Wealth ($100,000)				0.98 [0.96-1.10]	0.16
Random Effects					
Stratum-Level Variance – Reference ($\sigma^2_{\mu 0}$)	0.30	0.19	0.00	0.00	
Area Under Receiver Operating Characteristic curve (AUC) – fixed portion only (intercept)	0.50	0.58	0.66	0.69	
Area Under Receiver Operating Characteristic curve (AUC) – intercept and stratum random effects	0.68	0.67	0.66	0.69	
Variance Partition Coefficient (%)	8.25%	5.42%	<0.00%	<0.00%	
Proportional Change in Variance (%) compared to the Null Model (2A)	-	36.29%	~100%	~100%	

Note. * Significance level of $p < 0.05$. No participants in same-sex partnerships reported suicidal ideation in 2020, therefore perceived same-sex partner/spousal support could not be included in Models 2B, 2C, and 2D.

Figure 8 shows that, among males the average predicted percentage of participants who reported suicidal ideation did not differ widely by strata. Females had a wider spread of average

predicted percentage of participants who reported suicidal ideation, but this pattern must be interpreted with caution due to the large confidence intervals across strata averages. Similar to the average predicted CES-D8 (by strata) scores depicted in Figure 3, both males and females had two strata that "flipped" the pattern of a purely additive effects model where being male was associated with lower likelihood of endorsing suicidal ideation compared to being female. Strata 22222 (female with high level of perceived support from all sources) and 22221 (female with high level of perceived support from spouse/partner, children, and friends) had similar average predicted percentages of participants who reported suicidal ideation compared to most male strata while 11111 (male with no high level of perceived support from any source) and 11121 (male with high level of perceived support from friends) had average predicted percentages of participants who reported suicidal ideation that were comparable to many female strata (albeit still on the lower end of average predicted percentages of participants who reported suicidal ideation for females).

For further visibility of each stratum's location, female participants' percentages of participants who reported suicidal ideation with 95% confidence intervals by stratum are displayed for in Figure 9 and male participants' predicted percentages of participants who reported suicidal ideation with 95% confidence intervals by stratum are displayed in Figure 10.

Figure 8

Predicted percentage of participants who reported suicidal ideation with 95% confidence intervals by stratum.

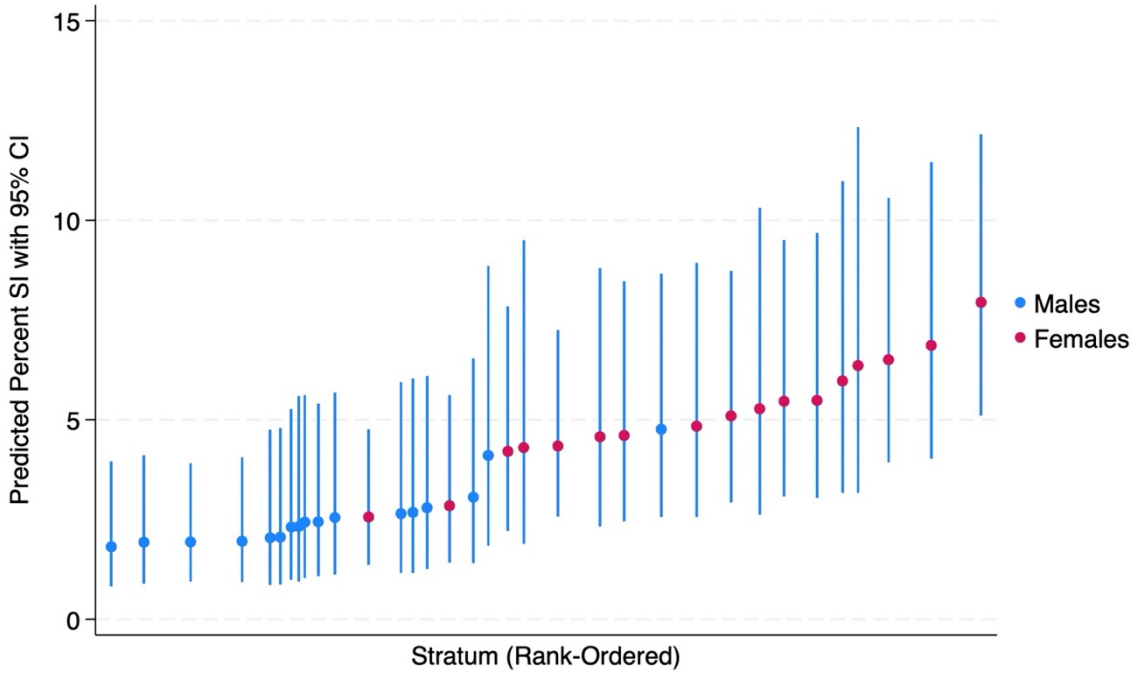


Figure 9

Predicted percentage of females who reported suicidal ideation with 95% confidence intervals by stratum.

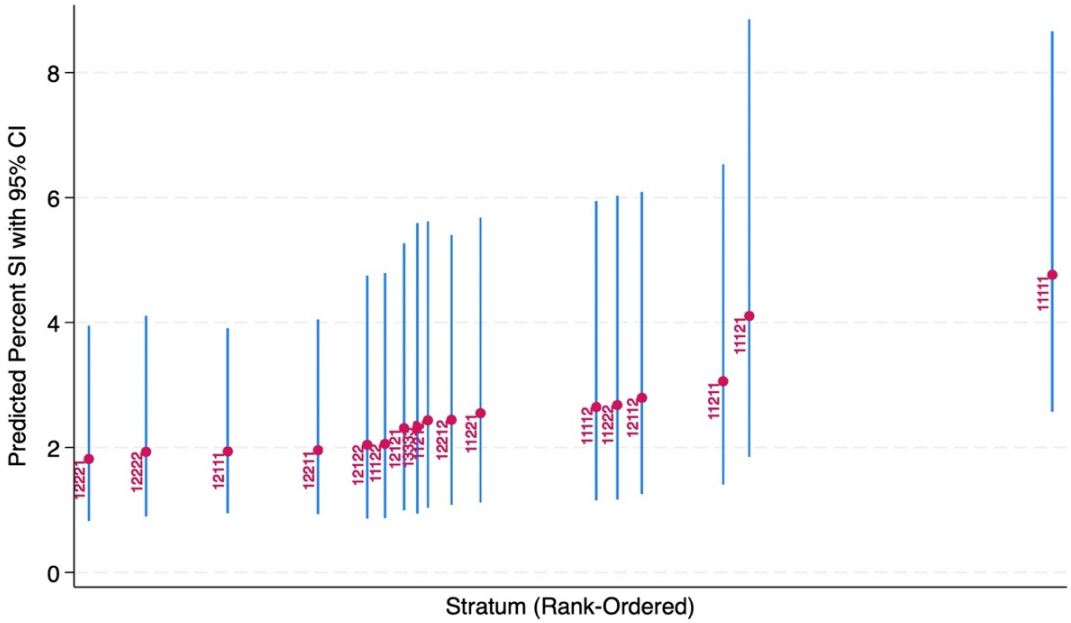
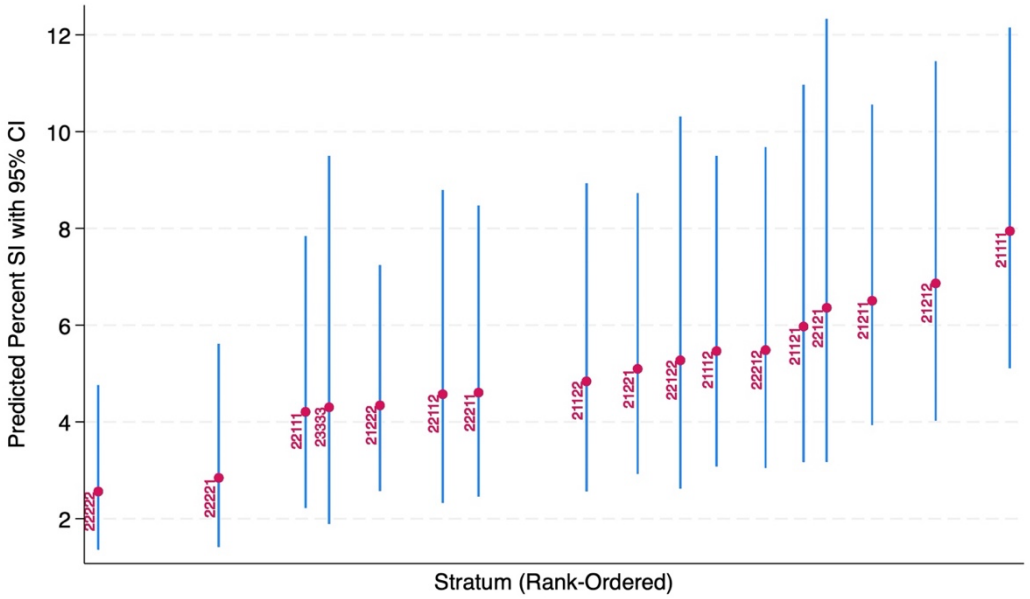


Figure 10

Predicted percentage of males who reported suicidal ideation with 95% confidence intervals by stratum.



The 5 highest predicted percentage of participants who report suicidal ideation by stratum, for males and females are displayed in Table 9. The 5 lowest predicted percentage of participants who report suicidal ideation by stratum for males and females are displayed in Table 10. Notably, no strata were significantly above or below (i.e., no overlap in 95% confidence intervals) from the intercepts for males (β_0) or females ($\beta_0 + \beta_1$). A complete list of each stratum's predicted CES-D8 score with a 95% confidence interval, observed mean CES-D8 score, and number of participants are displayed in the Appendix in table 5A.

Table 9

5 highest predicted percent of participants who reported suicidal ideation by stratum.

	Stratum ID	Significant Source of Perceived Support				Estimate	95% CI	
		Spouse/ Partner	Child(ren)	Other Family Member(s)	Friend(s)			
Males	11111	No	No	No	No	4.76	2.57	8.66

Table 9 (continued).

Males	11121	No	No	Yes	No	4.10	1.85	8.85
	11211	No	Yes	No	No	3.06	1.41	6.53
	12112	Yes	No	No	Yes	2.79	1.26	6.09
	11222	No	Yes	Yes	Yes	2.68	1.17	6.03
Females	21111	No	No	No	No	7.94	5.11	12.15
	21212	No	Yes	No	Yes	6.86	4.03	11.45
	21211	No	Yes	No	No	6.50	3.94	10.55
	22121	Yes	No	Yes	No	6.36	3.18	12.33
	21121	No	No	Yes	No	5.97	3.17	10.97

Table 10

5 lowest predicted percent of participants who reported suicidal ideation by stratum.

		Significant Source of Perceived Support						
	Stratum ID	Spouse/ Partner	Child(ren)	Other Family Member(s)	Friend(s)	Estimate	95% CI	
Males	12122	Yes	No	Yes	Yes	2.04	0.86	4.75
	12211	Yes	Yes	No	No	1.96	0.93	4.05
	12111	Yes	No	No	No	1.94	0.95	3.91
	12222	Yes	Yes	Yes	Yes	1.93	0.90	4.10
	12221	Yes	Yes	Yes	No	1.82	0.82	3.95
Females	21222	No	Yes	Yes	Yes	4.34	2.57	7.23
	23333	Yes	-	-	-	4.30	1.89	9.49
	22111	Yes	No	No	No	4.21	2.22	7.84
	22221	Yes	Yes	Yes	No	2.84	1.42	5.61
	22222	Yes	Yes	Yes	Yes	2.56	1.36	4.76

Random effects

Stratum random effects, adjusted for sex, are depicted in Figure 11 and significant stratum random effects, adjusted for sex, are depicted in Figure 12. For both males and females, only strata with no significant perceived social support from any source (11111 and 21111) were associated with a significantly higher predicted percentage of participants reporting suicidal ideation compared to the expected percentage of male and female participants who reported suicidal ideation. For males, there were no strata with significantly lower predicted percentages of participants reporting suicidal ideation. For females, only the stratum with significant perceived support from all four sources (22222) had a significantly lower predicted percentage of participants reporting suicidal ideation. Based on these MAIHDA models, most combinations of perceived social support do not appear to be associated with significant differences in predicted suicidal ideation beyond the differences associated with sex. Only the complete absence of significant perceived social support was associated with significantly higher predicted rates of endorsing suicidal ideation for males and females.

Figure 11

Stratum random effects for Model 2B.

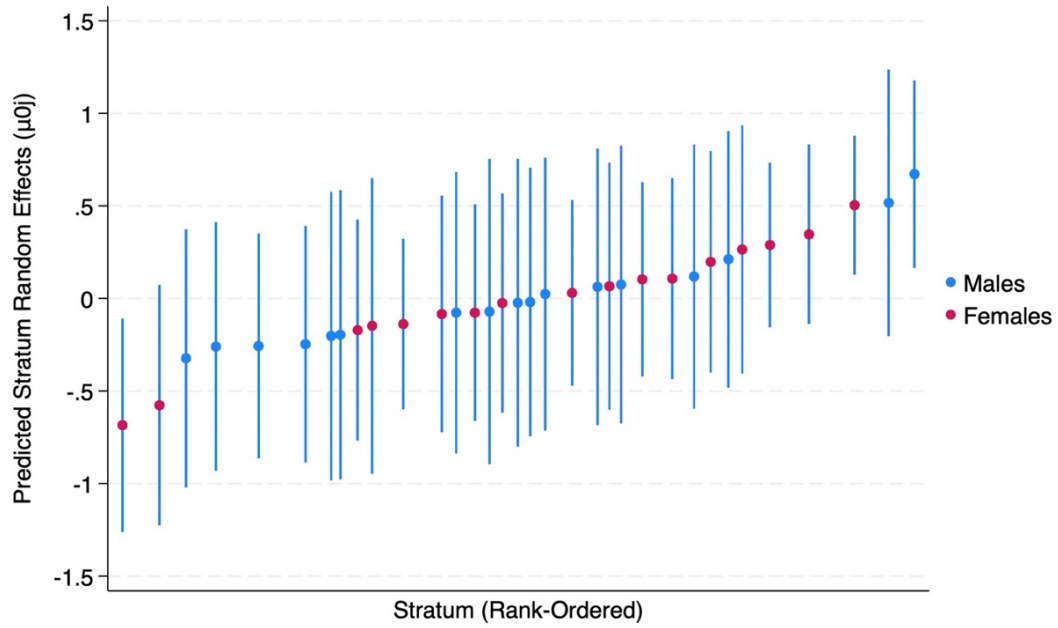
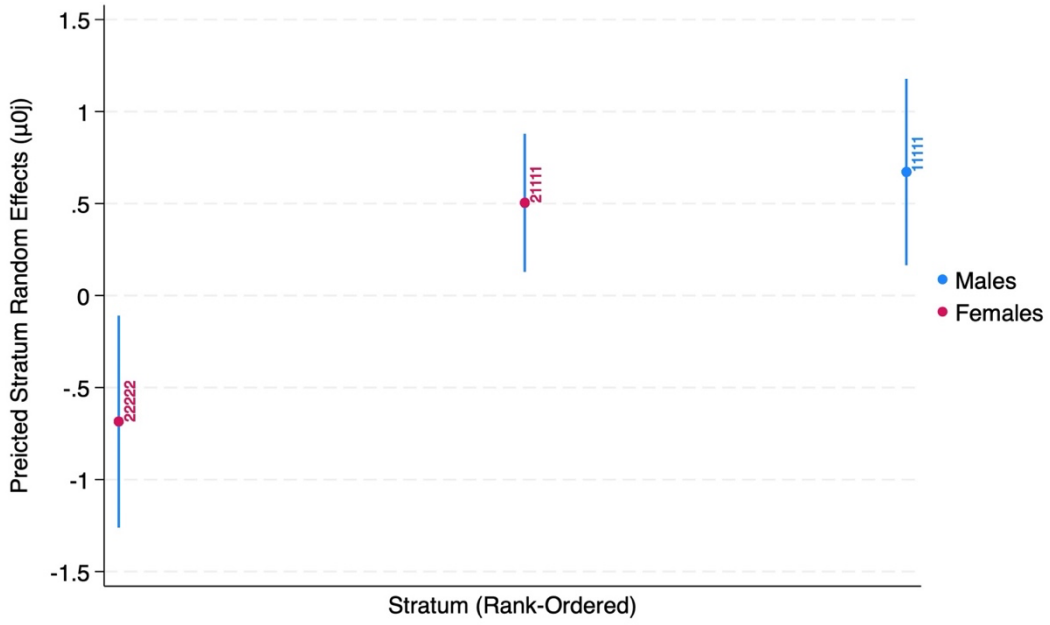


Figure 12

Significant stratum random effects for Model 2B



CHAPTER IV

DISCUSSION

In this dissertation, I examined the associations between sources of perceived social support and outcomes of depressive symptoms and suicidal ideation using data from a nationally representative survey of older adults in the United States. I also assessed if these associations varied based on participant's sex or partnership type. Findings help improve our understanding of how different combinations of sources of perceived social support are related to depressive symptoms and suicidal ideation among older males and females and add to the limited literature on the relationships between same-sex partner support, depressive symptoms, and suicidal ideation in older adulthood. This dissertation also represents the first time perceived social support was examined as a "level 2" context (i.e., the social strata within which individuals are nested) using a novel analytic strategy (i.e., MAIHDA).

Consistent with my first hypothesis, for both male and female participants, those without a single source of significant perceived social support were found to have the most depressive symptoms and the highest likelihood of endorsing suicidal ideation, as compared to participants who reported significant perceived social support from at least one source (i.e., spouse/partner, child(ren), other family, or friend(s)). This finding is consistent with prior work that found low levels of perceived social support in older adulthood to be associated with more depressive symptoms and a higher likelihood of endorsing suicidal ideation (Asante & Karikari, 2022; Fiori & Jager, 2012).

As predicted by my second hypothesis, for both male and female participants, those who perceived significant support from all four sources (spouse/partner, child(ren), other family, and friend(s)) had the fewest predicted depressive symptoms and lowest predicted percentage of

participants endorsing suicidal ideation. The effects of each source of perceived social support on predicted depressive symptoms were additive, meaning that each additional source of significant perceived support was associated with fewer predicted depressive symptoms. These findings are consistent with prior research that found more sources of perceived social support to be associated with fewer depressive symptoms (Adams & Blieszner, 1995; Turner et al., 2022) and a lower likelihood of reporting suicidal ideation (Fässberg et al., 2012). To my knowledge, this dissertation is the first time that depressive symptoms and likelihood of reporting suicidal ideation were predicted for older adults who reported a combination of significant perceived support from their spouse/partner, child(ren), other family, and friends. Among the four sources of perceived social support, significant perceived spousal/partner support (all partnership types) was associated with the greatest decrease in predicted depressive symptoms, followed by significant perceived support from children, other family, and friends. This finding is consistent with prior literature that shows spousal/partner support is an especially powerful predictor of mental health in older adulthood (Ashida & Heaney, 2008; Ryan et al., 2014; Tucker & Bishop, 2020).

I was unable to examine the relationship between significant perceived social support from a same-sex partner and suicidal ideation because no same-sex partnered participants endorsed suicidal ideation. Among the remaining sources of perceived social support, only significant perceived support from different-sex/sex-unknown spouses/partners and significant perceived support from other family were associated with a statistically significant decrease in the predicted likelihood of endorsing suicidal ideation. Lack of perceived spousal/partner support has been associated with increased suicidal ideation, but otherwise this finding is surprising because extant literature suggests that similar to depressive symptoms, significant perceived

social support from any source is typically associated with a decrease in suicidal ideation (Fässberg et al., 2012). However, comparing the predicted percentage of participants who endorsed suicidal ideation for each stratum shows that strata composed of significant perceived support from all four sources had the lowest percentage of participants endorsing suicidal ideation and strata without significant perceived support from any source had the highest percentage of participants endorsing suicidal ideation. This finding was true for males and females.

Regarding the association between perceived spousal/partner support and depressive symptoms and suicidal ideation, for males, belonging to the stratum with only significant perceived spousal/partner support and no other sources of significant perceived support (12111) was associated with fewer than expected (compared to the predicted grand mean for males) depressive symptoms. This finding is in line with my third hypothesis and prior studies that for males, having found spousal/partner support alone to be associated with better mental and physical health (Antonucci & Akiyama, 1987; Umberson et al., 1996). A similar pattern was not observed for females belonging to stratum 22111 (significant perceived spousal/partner support and no other sources of significant perceived support). However, inconsistent with my prediction, I did not find additional evidence that significant perceived spousal support was associated with a greater protective effect against predicted depressive symptoms or suicidal ideation for males compared to females. In fact, for both males and females the 50% of strata with the lowest predicted depressive symptoms and predicted percentage of participants who endorsed suicidal ideation all reported significant perceived spousal/partner support. Whether older males confer a greater protective effect through perceived spousal support against depressive symptoms and suicidal ideation compared to older females has been contested in the

literature (Hann et al., 2002; Sonnenberg et al., 2013). The findings from this dissertation further a growing body of literature showing that the effects of perceived social support on mental health do not significantly differ between older males and females.

There were insufficient numbers of same-sex partnered participants to test sex-based differences of the association between significant perceived same-sex partner support and depressive symptoms or suicidal ideation. Evaluating sex-based differences in same-sex relationship among older adults remains an important topic of further study.

For my final hypothesis examining variations based on unique combinations of sources, findings suggest that the effects are not "interactive" (i.e., explained by stratum-level variance/combinations of sources of perceived support). Instead, adding or subtracting a source of perceived social support was associated with a positive or negative change in predicted depressive symptoms or likelihood of endorsing suicidal ideation. Nevertheless, calculating predicted CES-D8 scores and percentages of participants reporting suicidal ideation for each strata yielded helpful descriptions of which combinations of perceived social supports were associated with lower symptoms of depression and rates of suicidal ideation. The most notable finding being that, while females endorsed significantly more depressive symptoms and suicidal ideation on average compared to males, females with high levels of perceived support from all four sources or from all sources excluding "other family" had comparable predicted depressive symptoms and suicidal ideation compared to most males. Conversely, males who did not endorse significant perceived support from any source, or only endorsed support from one non-spousal/partner source, had comparable predicted depressive symptoms to females. Only males who did not endorse significant perceived support from any source, or only endorsed support from other family, had comparable predicted suicidal ideation to females. Implications of these

findings are discussed below in *Sex Differences.* For both males and females strata with at least significant perceived partner/spousal support had lower predicted depressive symptoms and fewer predicted reports of suicidal ideation. I also found that generally, the more sources of significant perceived support, the lower a stratum's predicted depressive symptoms and percentage of participants who report suicidal ideation would be. Otherwise, there was significant heterogeneity and no discernible pattern among combinations of significant perceived social support and predicted depressive symptoms and suicidal ideation.

Sex Differences

On average, females reported more depressive symptoms and had a higher likelihood of endorsing suicidal ideation compared to males. Across all models, being female was associated with a significantly higher likelihood of endorsing suicidal ideation and more depressive symptoms. Most of the top half of strata with higher predicted CES-D8 scores and percent of participants who reported suicidal ideation were females, while the inverse was true for males. This finding is consistent with literature that consistently shows females and women experience significantly higher rates of depression and suicidal ideation compared to males and men (Girgus et al., 2017; Yang & Lee, 2009). While a range of biological, affective, and cognitive factors may influence the gender disparity in mental health mental health outcomes (Hyde & Mezulis, 2020), the overwhelming consensus in the literature is that sexist and oppressive societal structures that place additional stressors and burdens on women lead to a higher likelihood of women experiencing depression or suicidal ideation compared to men (Brown, 2018; Maji, 2018). Therefore, one of the most notable findings in this dissertation that a few of the "extreme" strata (e.g.., high perceived support from all four sources or low/no perceived support from all four sources) led to similar predicted depressive symptoms for both males and females. Females

with multiple sources of perceived social support were predicted to endorse low depressive symptoms at comparable rates to males. While both males and females with no significant perceived sources of social support were predicted to have similarly higher levels of depressive symptoms and likelihood of reporting suicidal ideation. Notably, the "extreme" strata were not uncommon, 11111 (n = 221), 21111 (n =311), 12222 (n = 175), and 2222 (n = 255), collectively account for 21.62% of the final analytic sample, making the finding all the more significant because MAIHDA draws predicted stratum averages towards the predicted grand mean. This finding complicates what might otherwise have been a simple narrative with a linear regression analysis of "being female is always associated with more depressive symptoms compared to being male." Instead, what the MAIHDA models show is that the complete absence of sources of significant perceived social support and the presence of many sources of perceived social support reduce, and almost eliminate, the sex disparity in depressive and suicidal ideation outcomes.

Between-group comparisons revealed significant differences in sources and amounts of perceived social support by sex and type of partnership. Males reported a higher average amount of perceived spousal/partner support (all partner types) compared to females. Females reported higher rates of perceived support from their children, other family members, and friends compared to males. This finding is in-line with previous research that shows older women have more and stronger social relationships compared to older men (Ermer, 2021). A reasonable alternative (or supplemental) explanation based on extant literature may be that older women feel more comfortable requesting, and consequently, endorsing access to social support from non-spousal sources compared to older men (Ashton & Fuehrer, 1993; Himmelstein & Sanchez, 2016). Partnered males reported higher rates of support from their partner/spouse compared to partnered females. This finding is consistent with prior research that suggests men perceive

greater levels of support from their partners/spouses compared to women (Verhofstadt et al., 2007).

Type of Partner/Spousal Support Differences

There were few statistically significant differences in study variables between same-sex and different sex/sex unknown partnered participants, but differences in perceived spousal/partner and friend support standout as protective factors for same-sex partnered participants. Same-sex partnered participants reported a higher average amount of perceived support from both their spouse/partner and from friends compared to different sex/sex unknown partnered participants. Of note same-sex partnered participants were significantly less likely to report having children compared to different sex/sex unknown partnered participants and thereby less likely to perceive significant support from this source. Same-sex partnered individuals feeling more supported by their partner/spouse and friends compared to different-sex/sex unknown participants supports extant literature's claim that same-sex community building with partners and friends is imperative across the lifespan to protect against anti-LGB hate and possible marginalization within one's family of origin (Kim et al., 2017). As Robert Espinoza, a social worker for Services and Advocacy for GLBT Elders (SAGE) stated: "friendship [is] a pillar of survival for LGBT elders" and the data from HRS demonstrated that same-sex partnered participants feel relatively well supported by their friends (Espinoza, 2013).

Unfortunately, the relatively small number of same-sex partnered participants prevented an analysis of combinations of sources of perceived social support based on partnership type. The small number of same-sex partnered participants identified in this study is unlikely to be an accurate reflection of reality is due to purposeful exclusion of data collection on sexual orientation by the HRS until 2016, as well as pervasive stigmatization, discrimination, and

structural exclusion from marriage LGB older adults faced throughout their life (Hatzenbuehler et al., 2013; H.-J. Kim et al., 2017). The main effect of perceiving significant same-sex spousal support was associated with 0.73 units lower CES-D8 score, similar in magnitude to the relationship between perceived different-sex/sex-unknown partner/spousal support and CES-D8 scores. For both males and females, the social stratum constructed for participants who endorsed significant perceived same-sex partner/spousal support had close to the same predicted CES-D8 score as participants who endorsed significant different-sex spousal support. However, interpretation of the male (13333) and female (23333) significant perceived support from same sex partner is limited due to the within-stratum heterogeneity of other sources of perceived social support. No same-sex partnered participants reported suicidal ideation, which is an unexpected finding due to past research that suggests LGB older adults face higher odds of experiencing suicidal ideation due to anti-LGB discrimination (Cooley et al., 2024). Overall, the results suggest that same-sex partner/spousal support is associated with lower depressive symptoms and lower likelihood of endorsing suicidal ideation compared to no perceived partner/spousal support.

Covariates

Race/ethnicity: I did not find a statistically significant effect of race/ethnicity on either outcome variable. This finding is not surprising for suicidal ideation because older White adults are more likely to die by suicide compared to older Black and Hispanic adults and rates of suicidal ideation do not appear to differ significantly by race or ethnicity (Choi et al., 2015). However, experiences of discrimination are associated with suicidal ideation and further study on the impact of racism on suicidal ideation is needed (Oh et al., 2019). The null effect of race/ethnicity on depressive symptoms is surprising given that Black and Hispanic older adults,

on average, report more depressive symptoms compared to White older adults (Hooker et al., 2019). One possible explanation is that since racism and discrimination are understood to cause this disparity in depression, the concept of "age as a leveler" posits that as older Black and Hispanic adults age they may have developed communal and individual coping strategies to survive and thrive despite racism, and these coping strategies may be employed against age discrimination that might otherwise contribute to increases in depressive symptoms, which in turn decreases the disparity in depressive outcomes compared to White older adults (Ferraro & Farmer, 1996). Another possible explanation for the null effect of race/ethnicity on depressive symptoms is that systemic racism led to reduced educational opportunities and denial of wealth accruement (e.g., redlining, denial of home loans) for Black and Hispanic older adults, two covariates that were significantly associated with depressive symptoms that capture the direct effects of systemic racism (Merolla & Jackson, 2019).

Age: Increased age was associated lower odds of reporting suicidal ideation and fewer depressive symptoms. While these effects were small, results are consistent with prior literature that found depressive symptoms and suicidal ideation decrease with age (Fiske et al., 2009). The higher risk of death by suicide among older adults may be explained by how lethal suicide attempts are in older adulthood, which is thought to be related to increases in planning, physical vulnerability, and method lethality (Fässberg et al., 2012).

Educational Attainment: Obtaining a high school degree or GED, attending some college/obtaining a 2-year degree, and obtaining a 4-year degree or more, were all associated with fewer depressive symptoms but not associated with a difference in likelihood of reporting suicidal ideation. This finding is consistent with research linking educational attainment with mental health outcomes in older adulthood (Chang-Quan et al., 2010). Prior research suggests

that the protective effects of early life opportunities such as attending high school or college have a cumulative protective effect against depression over the life course through the social and economic benefits educational attainment provides (Miech & Shanahan, 2000; Xue et al., 2021).

Wealth: Increased wealth was associated fewer depressive symptoms and was not significantly correlated with likelihood of reporting suicidal ideation. The effects were small, but consistent with prior research that found older adults who report financial strain and distress are more likely to experience hopelessness and other symptoms of depression (Fiske et al., 2009; Gilman et al., 2013)

Limitations & Future Directions

The primary limitation of this dissertation is that all findings describe cross-sectional, correlative relationships and cannot be used to infer a causal link between combinations of perceived social support and depressive symptoms or suicidal ideation. A longitudinal study evaluating how different combinations of sources of perceived social support affect changes in depressive symptoms or suicidal ideation over time may provide evidence of causal links between the variables. However, such a study would not escape the "chicken or the egg" dilemma since perceived social support and mental health are inextricably linked and bidirectionally affect each other in older adulthood (e.g., feeling depressed may limit interest in spending time with friends, which in turn may weaken friendships, etc.) (Turner et al., 2022). I did not analyze changes in depressive symptoms and suicidal ideation over time because the aim of this dissertation was to identify which combinations of perceived social support are associated with fewer depressive symptoms or a lower likelihood of suicidal ideation. For example, accounting for past depressive symptoms would mean analyzing how depressive symptoms have changed over time in relation to perceived social support, but such an analysis would not

examine which combinations of perceived social support are associated with the fewest depressive symptoms (e.g., participants with no significant sources of perceived social support may have the highest predicted amount of depressive symptoms, but if this remains constant over time no change would be noted in a longitudinal analysis).

In this dissertation, I also did not evaluate cultural differences in how social support is typically perceived, solicited, and provided as data on cultural affiliation and norms and beliefs were not available in this dataset. It is important to note for future research that how individuals engage in relationships, solicit and provide support, and conceptualize community varies significantly by culture and sociodemographic context. Kim et al. (2008) distinguished between implicit and explicit social support, suggesting that more individualistic cultures tend to utilize explicit social support (e.g., eliciting advice, providing emotional comfort directly) while more communitarian cultures tend to utilize implicit social support (e.g., taking comfort knowing others are invested in your wellbeing and serving your social network). There is also evidence that, across cultures, how social support is delivered influences the effectiveness of the support in reducing recipient stress. In an experimental study, Bolger & Amarel (2007) found that peer support that attended to emotions, was less directive, and subtler was more effective at reducing recipients' distress about a difficult task than more direct and explicit support or no support at all. Future work examining the effects of perceived social support should examine the variations in how social support is delivered within social contexts and its impact on health outcomes.

Another limitation of this dataset is that the HRS study conflated participant gender identity with participant biological sex and only offered two responses when assessing gender identity or sex: "male" and "female". Assessing biological sex and equating it to gender identity reinforces cisgender normativity, thereby limiting researchers' ability to understand the

experience of transgender and gender nonconforming participants. Changing HRS's data collection process to assess both sex assigned at birth and current gender identity would allow for proper evaluation of the socially and culturally-constructed interactions between one's gender identity, perceived social supports, depressive symptoms, and suicidal ideation (Hanes & Clouston, 2021). Transgender and gender nonconforming older adults have face unique forms of individual and systemic discrimination (e.g., anti-trans legislation, denial of health care services) that increase risk of depression and suicidal ideation (Addis et al., 2009). Transgender and gender nonconforming older adults also build resiliency against discrimination through supportive partner, family, and friend networks that deserve further study (White Hughto & Reisner, 2018). Therefore, it is imperative that future studies with access to more accurate data on participants' gender examine how amounts and combination of perceived social supports are related to depression and suicidal ideation among transgender and gender non-conforming older adults.

The race and ethnicity variable I used did not account for heterogeneity within racial and ethnic subgroups. Due to the data structure (racial and ethnic identities not publicly available to protect participant confidentiality) I collapsed non-White, non-Black, and non-Hispanic into a single "Other race/ethnicity" category that led to no clear data on the relationships between Asian-American, American Indian, or Alaska Native participants and depressive symptoms or suicidal ideation. Older Black, Hispanic, American Indian, Alaska Native, and Asian-American adults face racism and systemic discrimination that lead to more depressive symptoms and suicidal ideation compared to White adults (Hooker et al., 2019; Xu et al., 2010). While the effects of discrimination on mental health outcomes attenuate with age, they remain harmful in older adulthood (Xu et al., 2010). Within racial groups there is significant heterogeneity of

experiences of discrimination, protective factors, power, and privilege, therefore future studies should use MAIHDA analysis to examine the potential interactive effects of race, ethnicity, and other salient demographic characteristics (e.g., immigrant status, educational attainment, income) and perceived social support in relation to depressive symptoms and suicidal ideation. Additionally, replicating this study with the data from a sufficient number of participants who identify as Asian-American, American Indian, and/or Alaska Native would provide a more complete picture of the relationship between race, ethnicity, perceived social supports, and mental health.

While the MAIHDA analytic strategy allowed for in-depth exploration of the relationship between dozens of unique combinations of perceived social support and depression, the relatively small number of participants in same-sex relationships in the final analytic sample limits the generalizability of findings for same-sex couples. Due to the small number of participants who reported same-sex partner support all of the same-sex partnered participants were collapsed into a single social support stratum to ensure no individuals were dropped from analysis due to small stratum sample size. Therefore, findings are limited to the effect of partner support for same-sex partnered participants, and combinations of perceived social support were not explored for these participants. Further research with similar measures, but with data where same-sex couples are adequately sampled, is needed to understand the differing effects of combinations of perceived social support for same-sex couples given that LGB older adults are at higher risk of depression and suicidal ideation (Yarns et al., 2016).

The duration of the effects of varying combinations of perceived social support are not assessed. Additionally, data were gathered in the first year of the COVID-19 pandemic (March 2020-May 2021) which presented unique changes in mental health and social support that may

limit generalizability of findings to years without an acute public health crisis. However, older adults appear to have experienced fewer, if any, changes in baseline rates of depression and suicidal ideation during the pandemic compared to younger adults and children (Vahia et al., 2020) and greater perceived social support continued to be associated with fewer depressive symptoms (Grey et al., 2020). Additionally, the analytic strategy is relatively novel and has not been yet used to assess combinations of perceived social support. Directly comparing findings to previous research findings that used other analytic strategies (e.g., fixed effect multiple regression) may not be possible. Despite these limitations, the findings from this dissertation provide valuable insights into how varying amounts and combinations of perceived social support are related to depressive symptoms and suicidal ideation, and how these relationships differ by sex.

The Effects of COVID-19

I did not find statistically significant differences between CES-D8 scores in 2018 and 2020 for males or females. There was a statistically significant increase in "thoughts of death", the HRS's measure of suicidal ideation, for both males and females between 2018 and 2020. However, "thoughts of death" may have been a particularly problematic metric to measure suicidal ideation among older adults during the COVID-19 pandemic because deaths due to the pandemic were discussed across mainstream news outlets daily throughout 2020 and 2021 and older adults were at a higher risk of dying from COVID-19 compared to younger adults (Barry et al., 2020). Thus, older adults may have been more likely to be thinking about death, without thinking about ending their own life, compared to years past.

Altogether, the effects of the COVID-19 pandemic on HRS participants are unclear, but extant research suggests that older adults were relatively resilient against the deleterious mental

health effects of temporary social isolation precautions (Vahia et al., 2020) and the results of this dissertation should be interpreted with caution, but are still generalizable beyond the specific context of the COVID-19 pandemic. The most likely effect of the pandemic on this dissertation's models may have been an increase in the effects of different combinations of perceived social support on depression and suicidal ideation (e.g., spouse/partner support is associated with a lower risk of future suicidal ideation and no perceived social support is associated with a greater increase in depressive symptoms compared to non-pandemic years), but additional research on the effects of the pandemic is needed**.**

Summary and Implications

Through this dissertation I sought to contribute to literature examining the associations between perceived social support and mental health outcomes. Social support is integral to wellbeing and this study examined what combinations of sources of perceived social support were associated with fewer depressive symptoms and lower rates of suicidal ideation in older adulthood. Additionally, I examined how the relationships between these different sources of perceived social support and depression/suicidal ideation differ by participant sex and type of partnership.

Further, this dissertation represents the first time that the MAIHDA analytic strategy has been used to create a perceived social support "level 2" context that allows for examination of a wide range of distinct combinations of sources of perceive social support simultaneously. The effects of perceived social support are typically examined source by source or as an aggregate measure wherein the unique effects of different combinations of perceived support cannot be estimated. Examining perceived social support as a specific context of multiple sources of

perceived support is an important lens through which to explore the relationship between perceived social support and mental health outcomes.

The results from this dissertation are correlational in nature, and causal associations between sources of perceived social support, depressive symptoms, and suicidal ideation were not examined. Nevertheless, understanding descriptive patterns of these relationships may inform primary care physicians, mental health providers, and community organizers on what combinations of social support may be most beneficial to focus on increasing for older adults, and how the importance of these sources may differ between males and females, when treating depression and suicidal ideation. American Psychological Association guidelines for treating depression in older adulthood all aim to improve relationships and build social connections (Guideline Development Panel for the Treatment of Depressive Disorders, 2022), highlighting the essential role that improving social relationships plays in treating depression in older adulthood. Older adults are also less likely to seek out and engage in mental health treatment (Valtorta et al., 2018), meaning social support is often the first and only resource older adults draw upon to alleviate symptoms of depression or suicidal ideation. This dissertation's findings suggest that comprehensive assessments of perceived social support may help clinicians identify older adults at risk of depression (e.g., an older female patient who only perceives significant support from her brother may be at higher risk of experiencing depression and benefit from increasing his sources of perceived support). Findings also provide further evidence that strengthening sources of social support, and possibly focusing on bringing awareness to (i.e., increasing perception of) available sources of social support, remains a helpful component of treating depression and suicidal ideation in older adulthood. Among partnered males and females, strengthening a partnership may be a particularly effective strategy to reduce depressive

symptoms and suicidal ideation. For older females, who are at higher risk of depression and suicidal ideation, taking care to build a diverse network of sources of social support may mitigate their risk of worse mental health outcomes compared to older males.

Finally, this dissertation aims to provide information on what combinations of social support are associated with the fewest depressive symptoms and suicidal ideation for groups that are at a significantly higher risk of experiencing depression, such as older females. I found that for female participants, perceiving significant support from a partner/spouse, child(ren), and friends was associated with similar predicted depressive symptoms and likelihood of endorsing suicidal ideation to that of males with a range of different sources of significant perceived support. Findings related to the differing effects of perceived support of same-sex couples compared to different-sex couples are limited by same-sex partners sample size, but provide further evidence that perceived partner/spousal support is beneficial for same-sex older adults, who are at increased risk of depression and suicidal ideation in older adulthood compared to heterosexual older adults. Perceived social support is clearly related to depressive symptoms and suicidal ideation in older adulthood. Findings from this dissertation provide additional insight into this relationship and highlight how cultivating strong relationships across multiple sources is critical for wellbeing in older adulthood.

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APPENDIX

Table A - 1

Non-weighted descriptive Statistics: variations based on whether participant selected to complete the HRS Leave Behind (LB) Psychosocial Questionnaire in 2020 completed and returned the questionnaire.

	Completed LB Questionnaire (% or Mean (SD)) (n = 4,451)	Did not Completed LB Questionnaire (% or Mean (SD)) (n = 2,348)	Mean Difference t-test (p-value) or Chi2 (p-value)	Total (% or Mean (SD)) (n = 6,799)
8-item CES-D (2018 Depressive Symptoms)	1.23 (1.83)	1.62 (2.09)	7.60 (<0.01)*	1.37 (1.93)
8-item CES-D (2020 Depressive Symptoms)	1.29 (1.88)	1.66 (2.16)	7.00 (<0.01)*	1.42 (1.99)
Change in 8-item CES-D (2018 to 2020)	0.06 (1.68)	0.04 (1.95)	-0.41 (0.68)	0.05 (1.78)
Endorsed being depressed for 2 weeks in last year (2020)	15.15%	22.24%	49.73 (<0.01)*	17.52%
If yes above: Depressed all day/almost all day (2020)	45.62%	50.73%	2.68 (0.10)	47.78%
If yes above: Depressed every day or almost every day (2020)	87.84%	84.65%	0.90 (0.34)	86.41%
If yes above: Loss of interest in more things than usual (2020)	84.94%	85.29%	<0.00 (1.00)	85.10%
If yes above: Suicidal Ideation (2020)	72.31%	68.47%	0.63 (0.43)	70.62%
Perceived Spousal/Partner Support	3.48 (0.65)	-	-	3.48 (0.65)
Perceived Support from Child (ren)	3.29 (0.74)	-	-	3.29 (0.74)
Perceived Other Family Support	2.95 (0.87)	-	-	2.95 (0.87)
Perceived Support from Friend(s)	3.13 (0.73)	-	-	3.13 (0.73)
Age (years)	69.10 (10.44)	66.67 (11.43)	-8.57 (<0.01)*	68.26 (10.85)
Gender	-	-	1.34 (0.25)	-
Female	60.55%	59.07%	-	60.04%

Table A – 1 (continued).

Male	39.45%	40.93%	-	39.96%
Race/Ethnicity	-	-	191.89 (<0.01)*	-
Non-Hispanic Black	18.62%	27.33%	-	21.63%
Hispanic	14.35%	21.69%	-	16.88%
Non-Hispanic White	62.87%	45.39%	-	56.84%
Non-Hispanic Other	4.16%	5.59%	-	4.66%
Educational Attainment	-	-	113.16 (<0.01)*	-
No High School Degree/GED	12.24%	20.57%	-	15.12%
High School Degree/GED	46.98%	42.50%	-	45.43%
Some College/2-year degree	11.53%	14.40%	-	12.52%
4-year degree or higher	29.25%	22.53%	-	26.93%
Total Wealth ($100,000)	6.34 (24.07)	4.03 (12.92)	-5.14 (<0.01)*	5.54 (20.93)
Total	65.47%	34.53%	-	100%

Note. * Significance level of $p < 0.05$. Values significant at $p < 0.05$ are in bold. Variables assessed during 2018 data collection are noted in table above, all other variables were assessed during 2020 data collection. Perceived support scales range from 1 to 4, with 4 indicating the highest level of perceived support. Only participants who completed the LB Questionnaire in 2020 were included in the final sample and analyses (i.e. the first column, "Completed LB Questionnaire" are the descriptive statistics for the final analytic sample).

Table A - 2

Weighted and non-weighted descriptive statistics of final analytic sample. The total population size used to weight individuals was 28,910,992.

	Non-Weighted Final Analytic Sample (% or Mean (SD)) (n = 4,451)	Weighted Final Analytic Sample (% or Mean (SD)) (n = 4,451)
8-item CES-D (2018 Depressive Symptoms)	1.23 (1.83)	1.11 (1.71)
8-item CES-D (2020 Depressive Symptoms)	1.29 (1.88)	1.13 (1.78)
Change in 8-item CES-D (2018 to 2020)	0.06 (1.68)	0.02 (1.61)
Endorsed being depressed for 2 weeks in last year (2020)	15.15%	13.45%
If yes above: Depressed all day/almost all day (2020)	45.62%	46.80%
If yes above: Depressed every day or almost every day (2020)	87.84%	89.13%
If yes above: Loss of interest in more things than usual (2020)	84.94%	81.49%
If yes above: Suicidal Ideation (2020)	72.31%	67.32%
Suicidal Ideation (Percentage of total participants)	4.34%	3.74%
Perceived Spousal/Partner Support	3.48 (0.65)	3.52 (0.60)
Perceived Support from Child (ren)	3.29 (0.74)	3.29 (0.72)
Perceived Other Family Support	2.95 (0.87)	2.91 (0.87)
Perceived Support from Friend(s)	3.13 (0.73)	3.13 (0.72)
Age (years)	69.10 (10.44)	68.30 (9.14)
Gender	-	-
Female	60.55%	55.21%
Male	39.45%	44.79%
Race/Ethnicity	-	-

Table A – 2 (continued).

Non-Hispanic Black	18.62%	8.71%
Hispanic	14.35%	8.16%
Non-Hispanic White	62.87%	77.95%
Non-Hispanic Other	4.16%	5.18%
Educational Attainment	-	-
No High School Degree/GED	12.24%	7.64%
High School Degree/GED	46.98%	45.36%
Some College/2-year degree	11.53%	11.93%
4-year degree or higher	29.25%	35.08%
Total Wealth ($100,000)	6.34 (24.07)	8.38 (23.73)
Same-Sex Relationship	1.48%	1.15%

Table A - 3

List of level 2 strata with descriptive statistics, ordered by number of participants in each stratum.

Stratum ID	Stratum Composition	Number of Participants	Percentage of Final Sample n = 4,451)
	Males		
11111	No spouse/partner support, no child(ren) support, no other family support, no friend support.	221	4.97%
11112	No spouse/partner support, child(ren) support, other family support, friend support.	59	1.33%
11121	Different-sex/sex unknown spouse/partner support, child(ren) support, other family support, friend support.	53	1.19%
11122	Different-sex/sex unknown spouse/partner support, no child(ren) support, no other family support, no friend support.	47	1.06%

Table A – 3 (continued).

11211	No spouse/partner support, child(ren) support, no other family support, no friend support.	92	2.07%
11212	Different-sex/sex unknown spouse/partner support, child(ren) support, no other family support, no friend support.	43	0.97%
11221	No spouse/partner support, child(ren) support, other family support, no friend support.	73	1.64%
11222	No spouse/partner support, no child(ren) support, no other family support, friend support.	57	1.28%
12111	Different-sex/sex unknown spouse/partner support, child(ren) support, other family support, no friend support.	278	6.25%
12112	No spouse/partner support, child(ren) support, no other family support, friend support.	80	1.8%
12121	Different-sex/sex unknown spouse/partner support, child(ren) support, no other family support, friend support.	59	1.33%
12122	No spouse/partner support, no child(ren) support, other family support, friend support.	51	1.15%
12211	No spouse/partner support, no child(ren) support, other family support, no friend support.	222	4.99%
12212	Different-sex/sex unknown spouse/partner support, no child(ren) support, no other family support, friend support.	88	1.98%
12221	Different-sex/sex unknown spouse/partner support, no child(ren) support, other family support, no friend support.	143	3.21%
12222	Different-sex/sex unknown spouse/partner support, no child(ren) support, other family support, friend support.	175	3.93%
13333	Same-sex spouse/partner support; all other combinations sources of perceived social support included.	15	0.34%

Table A – 3 (continued).

Females			
21111	No spouse/partner support, no child(ren) support, no other family support, no friend support.	311	6.99%
21112	No spouse/partner support, child(ren) support, other family support, friend support.	169	3.8%
21121	Different-sex/sex unknown spouse/partner support, child(ren) support, other family support, friend support.	97	2.18%
21122	Different-sex/sex unknown spouse/partner support, no child(ren) support, no other family support, no friend support.	122	2.74%
21211	No spouse/partner support, child(ren) support, no other family support, no friend support.	242	5.44%
21212	Different-sex/sex unknown spouse/partner support, child(ren) support, no other family support, no friend support.	173	3.89%
21221	No spouse/partner support, child(ren) support, other family support, no friend support.	212	4.76%
21222	No spouse/partner support, no child(ren) support, no other family support, friend support.	315	7.08%
22111	Different-sex/sex unknown spouse/partner support, child(ren) support, other family support, no friend support.	137	3.08%
22112	No spouse/partner support, child(ren) support, no other family support, friend support.	94	2.11%
22121	Different-sex/sex unknown spouse/partner support, child(ren) support, no other family support, friend support.	54	1.21%

Table A – 3 (continued).

22122	No spouse/partner support, no child(ren) support, other family support, friend support.	67	1.51%
22211	No spouse/partner support, no child(ren) support, other family support, no friend support.	140	3.15%
22212	Different-sex/sex unknown spouse/partner support, no child(ren) support, no other family support, friend support.	151	3.39%
22221	Different-sex/sex unknown spouse/partner support, no child(ren) support, other family support, no friend support.	139	3.12%
22222	Different-sex/sex unknown spouse/partner support, no child(ren) support, other family support, friend support.	255	5.73%
23333	Same-sex spouse/partner support; all other combinations sources of perceived social support included.	17	0.38%

Table A - 4

Observed and Estimated mean CES-D8 scores (range 0-8) and 95% Confidence Interval by Stratum and Sex. Bolded rows indicate strata with a 95% Confidence Interval above or below the respective total predicted mean with 95% Confidence Interval by sex.

Stratum ID (excluding sex ID)	Significant Source of Perceived Support				Males					Females				
	Spouse/Partner	Child(ren)	Other Family	Friend(s)	Estimate	95% CI		Observed Mean	Participants	Estimate	95% CI		Observed Mean	Participants
1111	No	No	No	No	1.82	1.59	2.05	1.89	221	2.32	2.13	2.52	2.38	311
1112	No	No	No	Yes	1.50	1.10	1.90	1.66	59	2.01	1.75	2.27	2.08	169
1121	No	No	Yes	No	1.37	0.95	1.78	1.49	53	1.76	1.43	2.09	1.84	97
1122	No	No	Yes	Yes	1.27	0.83	1.70	1.36	47	1.56	1.26	1.86	1.58	122
1211	No	Yes	No	No	1.42	1.08	1.75	1.50	92	1.62	1.40	1.83	1.63	242
1212	No	Yes	No	Yes	1.16	0.71	1.60	1.21	43	1.70	1.44	1.96	1.73	173
1221	No	Yes	Yes	No	1.06	0.70	1.43	1.07	73	1.56	1.32	1.79	1.57	212
1222	No	Yes	Yes	Yes	1.12	0.71	1.52	1.14	57	1.35	1.15	1.54	1.34	315
2111	Yes	No	No	No	0.83	0.62	1.04	0.81	278	1.33	1.05	1.62	1.32	137
2112	Yes	No	No	Yes	1.00	0.65	1.35	0.99	80	1.20	0.87	1.53	1.15	94
2121	Yes	No	Yes	No	0.81	0.41	1.21	0.73	59	1.32	0.91	1.73	1.28	54
2122	Yes	No	Yes	Yes	0.72	0.30	1.14	0.59	51	1.24	0.86	1.62	1.18	67
2211	Yes	Yes	No	No	0.70	0.47	0.93	0.67	222	1.12	0.84	1.40	1.07	140
2212	Yes	Yes	No	Yes	0.76	0.42	1.10	0.69	88	0.89	0.62	1.16	0.81	151

Table A – 4 (continued).

2221	Yes	Yes	Yes	No	0.80	0.53	1.08	0.77	143	1.21	0.93	1.49	1.18	139
2222	Yes	Yes	Yes	Yes	0.53	0.28	0.78	0.47	175	0.71	0.49	0.92	0.65	255
3333	(Same-Sex)	-	-	-	0.94	0.35	1.54	0.80	15	1.23	0.65	1.81	1.00	17
Total	-	-	-	-	1.05	0.87	1.22	1.05	1,756	1.42	1.21	1.62	1.40	2,695

Table A - 5

Estimated percentage of individuals who report suicidal ideation and 95% Confidence Interval by Stratum and Sex.

Stratum ID (excluding sex ID)	Significant Source of Perceived Support				Males					Females				
	Spouse/Partner	Child (ren)	Other Family Member(s)	Friend(s)	Estimated Percentage	95% CI		Observed Percentage	Participants	Estimated Percentage	95% CI		Observed Percentage	Participants
1111	No	No	No	No	4.76	2.57	8.66	6.57	221	7.94	5.11	12.15	8.94	311
1112	No	No	No	Yes	2.65	1.16	5.94	3.39	59	5.46	3.09	9.50	5.95	169
1121	No	No	Yes	No	4.10	1.85	8.85	9.62	53	5.97	3.17	10.97	7.29	97
1122	No	No	Yes	Yes	2.06	0.87	4.79	0.00	47	4.84	2.57	8.93	4.92	122
1211	No	Yes	No	No	3.06	1.41	6.53	4.49	92	6.50	3.94	10.55	7.30	242
1212	No	Yes	No	Yes	2.43	1.04	5.61	2.33	43	6.86	4.03	11.45	8.09	173
1221	No	Yes	Yes	No	2.55	1.12	5.68	2.90	73	5.10	2.93	8.72	5.31	212

Table A – 5 (continued).

1222	No	Yes	Yes	Yes	2.68	1.17	6.03	3.57	57	4.34	2.57	7.23	4.21	315
2111	Yes	No	No	No	1.94	0.95	3.91	1.51	278	4.21	2.22	7.84	3.70	137
2112	Yes	No	No	Yes	2.79	1.26	6.09	3.75	80	4.57	2.33	8.79	4.30	94
2121	Yes	No	Yes	No	2.31	1.00	5.26	1.75	59	6.36	3.18	12.33	9.26	54
2122	Yes	No	Yes	Yes	2.04	0.86	4.75	0.00	51	5.27	2.63	10.31	6.06	67
2211	Yes	Yes	No	No	1.96	0.93	4.05	1.43	222	4.61	2.46	8.47	4.48	140
2212	Yes	Yes	No	Yes	2.44	1.09	5.40	2.47	88	5.48	3.05	9.67	6.04	151
2221	Yes	Yes	Yes	No	1.82	0.82	3.95	0.71	143	2.84	1.42	5.61	0.74	139
2222	Yes	Yes	Yes	Yes	1.93	0.90	4.10	1.20	175	2.56	1.36	4.76	1.20	255
3333	(Same-Sex)	-	-	-	2.32	0.95	5.59	0.00	15	4.30	1.89	9.49	0.00	17
Total	-	-	-	-	2.58	2.17	2.98	2.69	1,692	5.13	4.43	5.83	5.16	2,643