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Abstract

Reductions in structural stigma, such as gaining access to legalized same-sex marriage, is associated with positive psychological and physical health outcomes among sexual minority adults. However, these positive outcomes may be less robust among sexual minority women (SMW; e.g., lesbian, bisexual, queer) than sexual minority men and new measures are needed to develop a more nuanced understanding of the impact of affirming policies on the health and well-being of SMW. This study assessed the psychometric properties of measures developed to assess the psychosocial impacts of legalized same-sex marriage on the lives of SMW. Participants (N=446) completed an online survey assessing the psychosocial impact of legalized same-sex marriage in five domains: 1) personal impact, 2) stigma-related concerns, 3) couple impact, 4) LGBTQ community impact, and 5) political/social environment. Psychometric properties of the scales were examined using traditional and Rasch analyses. Personal, concerns, couple, and political/social environment scales demonstrated high internal consistency ($\alpha >$ 0.80), and acceptable levels of reliability even when scales reduced to five items each. The LGBTQ community scale demonstrated adequate internal consistency ($\alpha = 0.79$) and could only be reduced to 9 items. These scales may be useful in future studies of SMW health and well-being.

Keywords: sexual minority women, same-sex marriage, survey, psychosocial impact, psychometrics

Introduction

Sexual minority women (SMW; e.g., lesbian, bisexual, queer) experience substantial health disparities, including significantly higher rates of hazardous drinking and alcohol use disorders than heterosexual women (Hughes et al., 2020). One of the primary explanations for disparities in health-related outcomes among sexual minority individuals is minority stress (Lick et al., 2013; Meyer, 2003; Meyer & Frost, 2013). According to this model, members of stigmatized minority groups are more vulnerable to substance use disorders and other poor health outcomes because of chronic stress associated with social stigma and discrimination (Lick et al., 2013). Stigma occurs and is experienced by sexual minorities at individual, interpersonal, and structural levels (Hatzenbuehler & Pachankis, 2016; Hatzenbuehler et al., 2013; Rostosky & Riggle, 2016). Consequently, understanding and addressing health disparities is best approached using a social-ecological model that considers multi-level impacts of stigma: intrapersonal (impact on stigmatized group members), interpersonal (dyadic and small group interactions) and structural (social forces and institutions such as government policies and laws) (Cook et al., 2014).

Structural stigma is defined in the literature as norms and policies on societal, institutional, and cultural levels that negatively impact the opportunities, access, and well-being of a particular group (Hatzenbuehler & Link, 2014). Structural stigma is increasingly recognized as an important driver of health disparities (Hatzenbuehler, 2014; Hatzenbuehler et al., 2010; Hatzenbuehler et al., 2013). Legal recognition of same-sex marriage represents an important reduction in structural stigma, which appears to have a positive impact on sexual minority health, but no or negligibly positive impacts on heterosexual health (Hatzenbuehler et al., 2017; Hatzenbuehler et al., 2010; Perales & Todd, 2018; Tatum, 2017).

Impact of Legal Recognition of Same-Sex Marriage on Sexual Minority Health

Herdt and Kertzner (2006) note that marriage is a fundamental part of citizenship and social participation in society. As such, equal access to the sociocultural, psychological, and tangible benefits of marriage is important to sexual minority people's health and well-being, regardless of whether they access this institution for themselves (Herdt & Kertzner, 2006). A positive association between legal recognition of same-sex marriage and sexual minority health and well-being has been documented in a relatively recent but robust body of research. For example, studies in the U.S. conducted during the time period when legal recognition of same-sex marriage differed between states found less psychological distress and better self-reported health among sexual minority individuals living in states that provided access to legal marriage, compared to those living in states that did not recognize same-sex marriage (Kail et al., 2015; Kennedy & Dalla, 2020; Ogolsky et al., 2019b; Raifman et al., 2017). Furthermore, sexual minority individuals living in states that implemented or were considering restrictions on same-sex marriage reported higher rates of alcohol use disorders and psychological distress compared to their counterparts living in states without such bans (Fingerhut et al., 2011; Flores et al., 2018; Frost & Fingerhut, 2016; Hatzenbuehler et al., 2010; Maisel & Fingerhut, 2011; Riggle et al., 2009; Rostosky et al., 2010; Tatum, 2017).

One study of the well-being of couples in both same-sex and different sex relationships during the transition to national recognition of same-sex marriage across all states in the U.S. found that levels of perceived stigma decreased over time for individuals in same-sex relationships and were unchanged for individuals in different-sex relationships (Ogolsky et al., 2019b). However, perceived past stress, psychological distress (anxiety and depression) and life satisfaction among same-sex couples did not change over time. The authors speculate that proximal stigma-related processes (e.g., skepticism about permanency of changes because of past

minority stress) may impede positive outcomes. Another study from the Netherlands underscored the importance of considering intrapersonal and interpersonal stigma, even in the context of reduced structural stigma. The study found that, despite 20 years of marriage rights, sexual minority adolescents were still at greater risk for substance use and had lower levels of well-being compared to their heterosexual peers (Kuyper et al., 2016).

Psychosocial Factors Associated with the Legal Recognition of Same-Sex Marriage

Exploring psychosocial factors associated with legal recognition of same-sex marriage is important for several reasons. First, although legalization of same-sex marriage is an important and positive shift in the sociopolitical landscape, the impact of changes in structural stigma unfold over time (Ogolsky et al., 2019a, 2019b). Second, the impacts of legal same-sex marriage interact with stigma-related experiences on multiple levels, such as interpersonal interactions in family, work and community contexts (Rostosky & Riggle, 2016; Wootton et al., 2019). Third, understanding how individuals interpret and respond to experiences of stigma is important to developing a more nuanced understanding of how stigma contributes to negative outcomes (Frost, 2011). Finally, there is a paucity of measures related to factors potentially linked to resiliency among sexual minority adults (Riggle et al., 2014) and a pressing need to develop measures grounded in the lived experiences of sexual minority individuals (Frost et al., 2015; Morrison et al., 2016).

Qualitative and mixed methods research has documented a wide array of positive effects of legal recognition of same-sex marriage on sexual minority individuals and couples. Positive psychosocial effects of same-sex marriage include perceptions of increased social acceptance and social inclusion (Badgett, 2011; Lannutti, 2014; Riggle et al., 2017) as well as decreased identity concealment, vigilance and isolation (Riggle et al., 2017). For same-sex couples, access

to legally recognized same-sex marriage provides a sense of being viewed as a "real" couple, some protection against potential discrimination, and access to specific financial and legal benefits such as taxes, healthcare insurance, and hospital visitation. (Haas & Whitton, 2015; Lannutti, 2011; LeBlanc et al., 2018; Rostosky et al., 2016; Shulman et al., 2012). Same-sex couples also often perceive that being married gives their relationship more legitimacy in the eyes of some family members, which amplifies feelings of social support and inclusion (Badgett, 2011; Kennedy et al., 2018; Ocobock, 2013; Riggle et al., 2018).

At the same time, research has also captured a wide range of concerns among sexual minority individuals and couples about continuing stigma in the current social and political environment and the unintended consequences of embracing marriage as an institution. Sexual minority individuals continue to experience stigma-related stressors, such as experiences of rejection from family (Riggle et al., 2018), hostile social climates in their state or region, (Hatzenbuehler et al., 2017; Oswald et al., 2018; Woodford et al., 2015; Wootton et al., 2019), and inconsistency in other protections against discrimination (Drabble, Wootton, et al., 2020; Wootton et al., 2019). Studies with same-sex couples have found that concerns about and experiences of interpersonal stigma persist in spite of access to legal marriage (DiGregorio, 2016; LeBlanc et al., 2018). Research has also documented some sexual minority individuals' views about marriage as conforming to heteronormative cultural norms (Hull, 2019; Jowett & Peel, 2017; MacIntosh et al., 2010), and as potentially undermining LGBTQ+ community connectedness and appreciation for relationship structures that are outside the heterosexual norm (Drabble, Wootton, et al., 2020; Lannutti, 2011; Ocobock, 2018).

Gaps in Research with Sexual Minority Women

Measures of perceptions of stigma that focus explicitly on SMW's experiences are important for several reasons. First, research has found that some sexual orientation-related health disparities are particularly pronounced among women compared to men. For example, disparities by sexual identity in hazardous drinking and alcohol use disorder are notably high among women (Hughes et al., 2020) and appear to persist over time despite changing policy contexts (Drabble, Mericle, et al., 2020; Fish et al., 2018). Second, recent research has suggested that the protective effects of policies supportive of sexual minority people may be less evident among SMW thansexual minority men (SMM). For example, one recent study found that living in states with comprehensive policy protections for sexual minorties was associated with reduced disparities in self-perceived health by sexual minority men; SMW were more likely than heterosexual women to report poor or fair health regardless of policy environment (Gonzales & Ehrenfeld, 2018). Finally, SMW remain under-represented in studies of sexual minority health and well-being (Coulter et al., 2014; Institute of Medicine, 2011; Salomaa & Matsick, 2020). Developing a more nuanced understanding of how stigma, and changes in structural stigma such as equal marriage rights, are perceived by SMW is important the development of policy as well as community/organization-level, or individual-level interventions designed to address persistent sexual orientation-related health disparities among women (Institute of Medicine, 2011; Matsick et al., 2020).

The Current Study

The current study was part of a larger mixed-methods study examining how recognition of legal marriage for same-sex couples in the U.S. may influence hazardous drinking, drug use and other health outcomes among SMW. *The aim of the current study was to develop and examine the psychometric properties of measures developed to assess how legalized same-sex marriage*

has impacted various aspects of the lives of SMW. Although there are a number of validated measures of stigma, including measures of minority stress (Balsam et al., 2013; Balsam et al., 2011; Morrison et al., 2016; Wegner & Wright, 2016), LGBTQ+ workplace climate (Holman et al., 2019), and local community climate (Oswald et al., 2010; Oswald & Holman, 2013; Oswald et al., 2018; Paceley et al., 2020), there is value in developing and employing measures that examine sexual minority people's experiences related to specific political events or crises. For example, recent studies focused on the health impacts of sexual minority perceptions of the 2016 presidential election (Brown & Keller, 2018; Veldhuis et al., 2018a, 2018b), the COVID-19 pandemic (Balsam et al., 2021), and the Pulse nightclub shooting (Boyle et al., 2017). Furthermore, although research has consistently documented the importance of structural stigma as a driver of health disparities (Hatzenbuehler, 2014, 2016), perceptions of stigma at different social-ecological levels may be differentially related to key health and behavioral health indicators. Therefore, it is important to research factors that may amplify, or undermine, the positive impact of policy protections on SMW health and well-being.

Methods

Participants and Data Collection

We assessed the psychometric properties of several measures in a subsample of SMW recruited for a larger parent study designed to examine mediators and moderators of hazardous drinking and drug use among SMW. The current study included 446 of the 732 (61%) the parent study participants. Participants in the parent study were recruited from two different commercial online panels: an LGBT-specific panel and a general population panel. Over one-half of the sample (n=273) is from Community Marketing & Insights (CMI) and drew from a diverse panel of LGBTQ participants across all states in the U.S., including 20,000 SMW. The remainder of

the sample (n=173) is from MFour and drew from a general population panel of approximately 2.5 million active participants in the U.S. The 732 women in the parent study were sent an invitation to participate in the current study. Non-respondents were sent several reminder invitations. Participants were compensated through the panel companies following their standard payment protocols.

Eligibility for participation in the parent study was restricted to participants over the age of 18 who identified as lesbian, bisexual, or queer (not heterosexual or mostly heterosexual), resided in the U.S. and identified as female at the time of the screening. The parent study was designed to over-sample SMW who identified as African-American or Latinx, which is reflected in the distribution of the final sample (see Table 1 for a description of the current study sample). The majority of the sample identified as lesbian/gay, employed, and 30 years old or older. Twenty-eight percent of the sample was legally married, in a civil union, or in a legally recognized domestic partnership. Only participants who identified themselves as female in each of the panels were eligible for the study; we did not assess whether participants were assigned female at birth. Only the LGBT-specific panel (n=273) allowed participants to select multiple gender identity categories in demographic questions; in addition to identifying as female as at least one identity category at the time of screening, 19.5% (n=53) also endorsed one or more nonbinary identities (e.g., nonbinary, genderfluid, agender) and 2.5% endorsed trans identities (e.g., transgender, transgender female, transgender male).

Item Development

Item generation for the current study was informed by results of two qualitative studies. First, we conducted in-depth telephone interviews in 2016 with 20 adult SMW about how legalization of same-sex marriage impacted their lives, their interpersonal relationships, and their experiences

in broader community contexts. Methodological details and findings from these interviews are reported elsewhere (Riggle et al., 2018; Wootton et al., 2019). Second, we conducted a national online survey (December 2016-August 2017) that included multiple open-ended questions about the impact of legalization of same-sex marriage, as well as other recent political events, on perceptions of health and well-being. That study included 969 survey participants, 418 of whom responded to the open-ended questions (Drabble, Wootton, et al., 2020). Both studies used inductive thematic analysis of narrative responses (Braun & Clarke, 2006) to identify patterned responses or meanings associated with the perceived impact of legalized same-sex marriage. Methodological details, including strategies to ensure trustworthiness of data analysis and findings from these studies are reported elsewhere (Drabble, Wootton, et al., 2020; Riggle et al., 2018; Wootton et al., 2019). Data from the studies revealed five domains of perceived impact of legalized same-sex marriage spanning multiple levels of a social-ecological spectrum: individual impact (e.g., emotional and tangible benefits); interpersonal (such as relationships as a couple); impacts on LGBTQ communities; stigma-related concerns in interactions with non-LGBTQ communities and institutions; and broader political/social climate (including the importance of other policy protections). Questions were developed that reflected statements categorized within one of these five domains.

Individual coded statements from derived from narratives in each of the two qualitative studies were collated and re-analyzed to identify common meaning units, which were used to generate a list of 74 potential survey items. The initial list of provisional items was crafted to closely echo wording from the qualitative studies. Similar items across studies were consolidated into single statements. To assess face validity and minimize duplication of item content, preliminary items were reviewed by seven methodological experts, including psychologists,

epidemiologists, and social scientists with expertise in psychometrics—all with expertise in SMW's health. We asked these experts for guidance in identifying and correcting duplicative, poorly worded, ambiguous, and potentially confusing items. Based on preliminary feedback, we revised multiple items to improve comprehension and ease of response. Finally, the third and fourth authors pilot tested the survey in-person with three SMW to assess wording of items, ease of following instructions, length and flow of the survey. Based on the expert reviews and pilot testing, potential items were reduced from 74 to 56 statements, which were included in the current study for psychometric testing and additional reduction (see Table 2).

Measures

The 56 items were organized into five scales based on categories generated in the pilot study findings (Table 2). For each item associated with *Personal Impact*, *Stigma-related Concerns*, *Couple Impact*, and *LGBT Community Impact*, respondents were instructed to rate on a 6-point scale whether they: 1=Strongly Agree; 2=Agree; 3=Somewhat Agree; 4=Somewhat Disagree; 5=Disagree; 6=Strongly Disagree. For items related to *Political and Social Environment*, participants were invited to indicate their perceptions of whether the political and social environment had changed since the legalization of same-sex marriage in 2015; Response options were: 1=Gotten much better; 2= Gotten somewhat better; 3=Stayed the same; 4=Gotten somewhat worse and 5=Gotten much worse.

Data Analysis

Traditional and item-response theory (IRT) approaches were used to assess the psychometric properties of each of the five scales. First, responses for items in each scale were examined to assess missing data (skipped items or those marked not applicable). We paid particular attention to these items given the possibility that participants did not understand the question. We then

looked at measures of internal consistency (average inter-item covariance and Cronbach's alpha) to examine the direction and magnitude of how items were correlated with one another. Items that were negatively correlated with majority of the other items were reverse coded and then subjected to exploratory factor analyses (EFA) to investigate whether they primarily represented one or more factors (i.e., whether there was more than one factor with an Eigen value greater than 1.0). These analyses were conducted in Stata v.16.0 (StataCorp, 2019).

Items in each scale were then subjected to Rasch rating scale analyses (Andrich, 1978; Wright & Masters, 1982) using the software program WINSTEPS v.4.5.4 (Linacre, 2020b). Rasch rating scale analysis is an item-response theory approach that facilitates the psychometric evaluation of items measuring latent traits based on whether responses to items fit assumptions of the Rasch model. When applied in analyses of rating scale data, the odds of a respondent choosing a given response category for a particular item is the exponential of an additive function of respondent ability (e.g., amount of the latent trait being measured), item difficulty, and step difficulty of the rating scale response categories (Andrich, 1988; Wright & Masters, 1982). Person and item scores are expressed in log-odd units (i.e., logits) that can theoretically range from +/− infinity but typically range from −5 to 5 when the mean item difficulty is set at 0. To simplify interpretation and make the scores more "user friendly" (Linacre, 2020a), we rescaled scores so that the mean item score was anchored at 50 and a shift in 10 units up or down the measure equaled a shift in one logit. The result of this transformation is a measure that ranges roughly from 0 to 100, depending on the upper/lower level of the latent trait.

The WINSTEPS program produces several indicators of reliability to represent the reproducibility of respondents' relative measure location: the person separation coefficient and the separation index. The separation index is based on the separation coefficient and roughly

analogous to more traditional measures of reliability (e.g., KR-20 and Cronbach's alpha; Linacre, 2020a). WINSTEPS produces different versions of these statistics. We present the lower and upper bound of each.

WINSTEPS also provides several useful ways to investigate aspects of content and construct validity (Baghaei, 2008; Linacre, 2004). We first examined item fit statistics (e.g, INFIT MNSQ and OUTFIT MNSQ), which compare and test the fit of the observed responses to those expected by the Rasch model (Smith Jr, 2001; Smith, 2000; Wright & Stone, 1979). We considered items to "fit" if their MNSQ fell within the range of 0.6 to 1.4 (Wright et al., 1994). We also examined the standardized MNSQ fit statistics (ZSTD) and item discrimination. A ZSTD value of >2.0 is often used as an indication of misfit and has been found to be a sensitive indicator of misfit across simulations with varying sample sizes (Smith et al., 1998). Discrimination values less than 1 indicate under-discrimination, which indicates weak differentiation from one level of the measure to the next (Linacre, 2020a).

To ensure that the response categories of the measures were used by respondents in the intended manner, we followed the guidelines offered by Linacre (Linacre, 1997, 2002). We first examined category usage for infrequently and irregularly used response options. We then examined the average measures of item difficulty, respondent ability, and the step calibration for each response category to ensure that these values advance monotonically with each advance in response options. We also examined OUTFIT MNSQ and Coherence values of each response option. The OUTFIT MNSQ of response options is the average of the OUTFIT MNSQs associated with the responses in each category (Linacre, 2020a). An OUTFIT MNSQ statistic that is greater than 2.0 signals expected category usage. The COHERENCE statistics compare

observed and expected category usage. We considered the categories to be coherent if at least half (50%) of the expected responses were actually observed for each response category.

The degree to which items within scales were unidimensional was further examined using principal component analyses (PCA) of the Rasch measure *model residuals*. The purpose of PCA in this context is to examine whether there are patterns in residuals after taking into account the observed variance explained by the Rasch measure (Brentani & Golia, 2007). If the Eigenvalue of the first contrast (or first PCA component in the correlation matrix of the residuals) is small (usually less than 2.0), the first contrast is generally considered negligible or at the "noise" level (Linacre, 2020a).

Results

Traditional Analyses

With the exception of two scales, traditional analyses of the items in these five scales revealed relatively little missing data, satisfactory internal consistency, and unidimensional factor structure. As shown in Table 2, there was minimal missing data (5% or less) except in the Couple Impact scale. Each item in this scale had 5% or more missing responses among respondents who were in a relationship. Despite varying in size (from 9-14 items), most scales had high internal consistency (Cronbach's alpha's >0.80); only the LGBT Community Impact scale was lower (0.79). This was also the only scale in which EFA found more than one factor with Eigen values greater than 1. The two factors in this scale generally differentiated the reverse-scored items from those that did not need reverse scoring.

Rasch Analyses

Measures of separation/reliability were generally high for all scales except the LGBT Impact Community scale. Table 2 lists key fit statistics for items in each scale. Items in boldface font

had out-of-range INFIT/OUTFIT statistics and/or low discrimination. Category functioning and dimensionality were also investigated. Although OUTFIT MNSQs associated with responses in each category across scales were generally acceptable, there was indication that the 6-category rating scale performed sub-optimally. For three of the scales (Personal Impact, Stigma-Related Concerns, and Couple Impact), COHERENCE statistics suggested that this could be remedied by collapsing categories 4 (Somewhat disagree) and 5 (Disagree). Category functioning was worst with the LGBT Community Impact scale. With that scale, COHERENCE statistics were below 50% for categories 2-5, so category 2 (Agree) was collapsed with 3 (Somewhat agree), and category 4 (Somewhat disagree) was collapsed with 5 (Disagree). With respect to dimensionality, the PCA Eigen values for the first contrast in the Rasch model measure residuals were generally negligible for all scales except for the LGBT Impact Community scale. Items reflected in the first contrast for this scale were the same as those identified in the traditional EFA and also included items flagged as misfitting.

Refinement of the Scales

Dropping the poorest fitting items (those in bold typeface in Table 2) and collapsing categories improved the properties (separation/reliability, item fit, and dimensionality) of the scales or left the properties largely unchanged. To further refine the scales and to investigate whether even briefer 5-item scales could be created, we removed additional items (using the same approach as used with the original scales) and reanalyzed the remaining items in WINSTEPS. With the exception of the LGBT Community Impact scale, all scales could be reduced to five items without degrading separation/reliability or other properties of the measures (separation/reliability and item fit statistics available from the corresponding author). These items are denoted in Table 2 as “core” items. We have also provided a user-friendly version of

the scale with recommended response categories and notes for prospective users as a supplemental document (Supplemental Table 1). A table summarizing correlations between scales is also available in a supplemental document (Supplemental Table 2).

Discussion

Through qualitative interviews, feedback from experts, and extensive pilot testing, we identified or developed questions to assess the impact of legalization of same sex-marriage across five domains: 1) personal impact, 2) stigma-related concerns, 3) couple impact, 4) LGBTQ community impact, and 5) political and social environment. Using traditional and IRT analytic methods, we examined the psychometric properties of the five scales representing these domains. Overall, psychometric analyses suggest that these measures have utility in research with SMW designed to examine health outcomes or demographic differences related to the impact of legalized sex-marriage.

The strongest scales were those that measure perceived personal impact of same-sex marriage legalization and continued concerns about interpersonal or structural stigma despite marriage equality: Personal Impact, Stigma-Related Concerns, and Political and Social Environment scales. Items in these three scales were sufficiently strong that only five were needed to capture relevant constructs. We also found that respondents rarely used the 6-category Likert scale response options in the intended manner and determined that 5-category responses are optimal. These measures complement previous work on the development of measures to assess various aspects LGBTQ people's experiences and perceptions such as LGBTQ minority stress (Balsam et al., 2013; Balsam et al., 2011; Morrison et al., 2016; Wegner & Wright, 2016), resilience (Riggle et al., 2014; Testa et al., 2015), and impact of local community climate (Oswald et al., 2010; Oswald & Holman, 2013; Oswald et al., 2018; Paceley et al., 2020).

Measures developed in the current study may be particularly useful in examining associations between various health behaviors and outcomes and perceived benefits of marriage legalization. They may also be helpful in tracking changes in perceptions of the benefits and threats related to same-sex marriage legalization. Prior research suggests that the impact of marriage varies based on relationship status, sexual identity, and race/ethnicity (Drabble, Wootton, et al., 2020; Everett et al., 2016; Lee, 2018, 2020). Understanding sexual identity (e.g., lesbian, bisexual, mostly heterosexual) and sex/gender differences in responses to these new measures may also improve understanding of the impacts of major policies on the health of sexual and gender minority people.

Our study also extends research pertaining to the measurement of couple-level minority stress, a relatively novel area of inquiry (Neilands et al., 2020). Having a psychometrically sound measure of how the legalization of same-sex marriage has affected romantic relationships can be used to capture variation in couple-level social acceptance in interactions with families, extended social networks, and in communities. Such research may be particularly useful demonstrating the importance of policy protections or the differential benefits of such protections; for example, being married appears to be less protective for SMW than heterosexual women (Trocki et al., 2020) or SMM (Goldsen et al., 2017; Gonzales & Ehrenfeld, 2018). Although properties of the Couple Impact scale were strong, we encountered minor problems that are worth noting. All items in this scale were missing data from 5% or more of respondents in relationships. Based on pre-testing, three items in the Couple Impact Scale were assessed as difficult to answer or of limited relevance to SMW in committed relationships with men: “I am less likely to hide the fact that I am in a relationship with a same-sex or gender non-binary partner,” “my relationship feels more equal to heterosexual couples,” and “my partner and I are treated equally to heterosexuals.”

These items displayed only for respondents who selected “female” or “other” for the gender of the persons with whom they were in a currently in a relationship, partnership, or marriage. Missing data for those items are largely related to this skip pattern. Although we believe inclusion of participants who were not solely in relationships with same-sex partners was a strength of the study, it likely contributed to some of the weaknesses in this measure.

Given that many participants in relationships who could have answered these questions did not (or marked N/A), we conducted post-hoc sensitivity analyses of the Couples Impact scale. We examined variation in responses based on whether the participant belonged to one of three groups: those with incomplete data because they were married (and not asked an extra question that was directed to only those in unmarried committed relationships); those in unmarried committed relationships with complete data; and those in unmarried committed relationships with incomplete data. Using a differential item functioning (DIF) analysis approach —a technique that is often used to detect testing bias (Smith, 1994), we found that DIF was minimal. It was present in just one item when other misfitting items were dropped and would be considered insignificant when correcting the alpha for running tests on each item (i.e., a Bonferroni-type correction).

As described above, LGBT Community Impact was the weakest scale, although the 9-item version demonstrated acceptable reliability. Items in this scale asked how legalization of marriage for same-sex couples has affected LGBT communities, which may be useful to extending research documenting both perceived benefits and limitations (e.g., related to increased assimilation and weakening reliance on LGBTQ community) (Drabble, Wootton, et al., 2020; Lannutti, 2005, 2011, 2018; Ocobock, 2018). This scale may also be useful in examining potential demographics differences suggested by prior research in perceptions of

same-sex marriage legalization, such as possible differences by sex, sexual identity, relationship status, or race/ethnicity qualitative literature (Drabble, Wootton, et al., 2020; Lannutti, 2007a, 2007b; Lee, 2020). It also extends research focusing on measures designed to assess attitudes about same-sex marriage among heterosexual samples (Lannutti & Lachlan, 2008).

The original 14 items in the LGBTQ Community Impact scale included several that required reverse coding and were misfitting. There were also problems with dimensionality in that many of the reverse-coded items clustered together and not with the non-reverse coded items. Post-hoc sensitivity analyses were conducted to determine whether the six reverse-coded items represented a distinct scale, but these items had generally low separation/reliability, which could not be improved by dropping misfitting items or optimizing the rating scale. Although problems with dimensionality are minimized the 9-item scale, it could be that, in addition to measuring impact on LGBT communities, items in this scale also captured elements of other constructs—e.g., passion, activism, belonging—which reduced the strength of these items to measure the construct of interest. Findings from the qualitative studies used to inform the development of items lend credence to this possibility. In these studies, most SMW described marriage legalization as an important milestone in advancing social validation and legal protections for sexual minority individuals (Drabble, Wootton, et al., 2020; Riggle et al., 2018; Wootton et al., 2019). However, many of these same participants passionately described concerns that marriage as an institution might foster conformity to heterosexist norms and undermine appreciation for diverse relationship structures in LGBT communities (Drabble, Wootton, et al., 2020). It was also not unusual for participants to a hold contrasting views about what was beneficial or important to others in the LGBTQ+ community and what was important to them. It is likely that mixed opinions about some of these items influenced the psychometrics of the scale.

Limitations

Findings should be interpreted in the context of study limitations. While the sample was drawn from a parent study with a large panel sample of SMW across the U.S., it was a non-probability sample and, consequently, not representative of the U.S. population. SMW in the sample had notably high levels of educational attainment; only 13% reported having high school education or less, compared to approximately 37% of women in the U.S. (U.S. Census Bureau, 2020). The sample included only SMW. Although there is a need for research specific to the concerns of SMW (Coulter et al., 2014; Institute of Medicine, 2011), study findings may not be applicable to sexual minority men. We also do not know how the measures would perform in studies with primarily transgender and gender nonbinary individuals. The current and parent studies oversampled African American and Latinx SMW; although this diversity was a strength of the study, findings may be less representative of Asian, Pacific Islander, Native American, or individuals who identify with other racial or ethnic communities.

Furthermore, as noted above, response categories were collapsed for several of the scales in the process of optimization. Our findings suggest that using a 5-point agreement scale (e.g., strongly agree, agree, neither agree nor disagree, disagree, strongly disagree) for the Personal Impact, Stigma-related Concerns and Couple Impact, and LGBT Community Impact scales would yield similarly superior psychometric properties. A four-category response option (strongly agree, agree, disagree, strongly disagree) would appear to be the only viable option for the weaker Community Impact Scale, and might also be an alternative for the Personal Impact, Stigma Related Concerns, and Couple Impact scales. However, future research should verify psychometric properties scales with the alternative response categories.

Although the measures developed in this study span different dimensions of the social-ecological continuum, there are likely important constructs that were not included. For example, seven items assessing how many individuals in participants' families expressed certain positive and negative attitudes toward same-sex marriage were dropped because they did not perform well. Two additional items (using a similar 4-point scale) asked participants to rate the number of family members who were supportive of legalization of same-sex marriage ("Immediate members of my family of origin [e.g., parents, caregivers and siblings] are supportive of same-sex marriage" and "Extended members of my family of origin [e.g., aunts, uncles, cousins] are supportive of same-sex marriage). Although these items had acceptable reliability (alpha coefficient =.74), there were not a sufficient number of them to create a scale related to family attitudes and support. Future research is needed to develop and assess measures of family of origin attitudes and responses to same-sex marriage, which, according to qualitative studies (Clark et al., 2015; Riggle et al., 2018) vary considerably and may impact SMW's health and well-being.

Summary and Future Directions

Despite these limitations, we developed psychometrically sound measures, which can be used to assess impacts of same-sex marriage and the persistence of stigma-related concerns. We found that Political and Social Climate items (assessed on a 5-point change scale) produced a psychometrically sound measure of how respondents perceived that legalization of marriage for same-sex couples had affected larger socio-environmental realms. These scales retained acceptable psychometric properties when reduced to five "core" items which may be helpful if these measures were being added to a larger survey and only a limited number of items for these

constructs could be included. Even the weakest measure, focusing on perceived impact of marriage legalization on LGBT communities demonstrated acceptable reliability.

Given the relatively recent policy change legalizing same-sex marriage in the U.S., SMW's perceptions about may evolve over time, especially as additional policy changes are enacted that intersect with marriage or LGBTQ community life. There is a need for ongoing assessment to identify whether SMW's stigma-related experiences in multiple contexts (e.g., couple, family, workplace) shift over time or whether policy changes such as marriage legalization have an initial impact that then levels off. Because experiences of stigma have been linked with negative health and mental health outcomes in SMW, measures that accurately capture their lived experiences around marriage and stigma can help inform the development of interventions to improve well-being. The measures we developed help fill gaps in the literature because they were purposively designed for SMW and the specific policy issue of interest. These measures will facilitate examination of the impact of legalized marriage by specifically addressing areas of SMW's lived experience that are culturally relevant and less represented in general measures of policy approval or impacts. They measures could also be a useful starting point for examining sexual minority men's (and possibility transgender/gender nonbinary individuals') perceptions of the impact of legalized same sex-marriage.

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Table 1. Sample Characteristics (N=446)

		n	%
Sexual Identity			
	Lesbian	278	62%
	Bisexual	130	29%
	Queer or other	38	9%
Relationship Status			
	Married	124	28%
	Unmarried, committed relationship	167	37%
	Single or dating	140	31%
	Divorced/widowed/separated	15	3%
Race/ethnicity			
	Black/African American	102	23%
	Latinx	147	33%
	White	173	39%
	API, AIAN, or Other race/ethnicity	24	5%
Employment Status			
	Employed	359	80%
	Unemployed	28	6%
	Not looking for employment (in school, retired, disabled, fulltime homemaker)	59	13%
Education			
	HS graduate or less	60	13%
	Some college or more	386	87%
Age			
	18-29	173	39%
	30-49	192	43%
	50+	81	18%

Table 2. Traditional Psychometric and Rasch Model Person Separation and Item Fit Statistics										
		Missing	Rasch Measure	Stand-ard Error	INFIT		OUTFIT		Discrimi-nation	Core Item
					MNSQ	ZSTD	MNSQ	ZSTD		
PERSONAL IMPACT Because of same-sex marriage legalization…										
1	I feel that I have access to more legal protections if I need them.	2%	**58.9**	**0.6**	**1.32**	**4.07**	**1.21**	**2.74**	**0.74**	
2	I continue to be careful about disclosing my sexual identity to others.*	<1%	**37.8**	**0.5**	**1.83**	**9.90**	**2.01**	**9.90**	**-0.36**	
3	I feel more accepted in society as an LGBTQ person.	<1%	50.4	0.5	0.67	-5.26	0.67	-5.25	1.39	†
4	I feel safer in my neighborhood.	4%	46.9	0.5	0.86	-2.21	0.88	-1.75	1.14	
5	I am more comfortable being openly LGBTQ in public.	<1%	49.6	0.5	0.78	-3.43	0.76	-3.78	1.28	
6	I am less worried about traveling to other states in the U.S.	3%	**42.8**	**0.5**	**1.06**	**0.99**	**1.12**	**1.70**	**0.86**	
7	I feel validated as an LGBTQ person.	2%	52.8	0.5	0.95	-0.63	0.90	-1.39	1.12	
8	It is easier to plan for my future.	5%	53.9	0.6	0.94	-0.80	0.90	-1.39	1.13	
9	I feel less safe being out as an LGBTQ person.*	1%	**50.3**	**0.5**	**1.71**	**8.44**	**1.87**	**9.90**	**0.23**	
10	Same-sex relationships are more accepted.	<1%	52.5	0.5	0.77	-3.50	0.94	-0.80	1.25	†
11	[IF EMPLOYED] I feel safer where I work.	5%	**53.8**	**0.6**	**1.18**	**2.09**	**1.10**	**1.21**	**0.85**	
12	It is easier to be open with people about my sexual identity.	<1%	50.6	0.5	0.70	-4.80	0.69	-4.99	1.34	†
13	In general, I feel safer.	2%	48.0	0.5	0.59	-7.09	0.58	-7.10	1.43	†
14	I believe that LGBTQ people are more accepted as part of everyday life.	<1%	51.7	0.5	0.70	-4.72	0.72	-4.45	1.37	†
	Rating Scale: 1=Strongly Agree; 2=Agree; 3=Somewhat Agree; 4=Somewhat Disagree; 5=Disagree; 6=Strongly Disagree									
	Cronbach's Alpha: 0.88 (13 Items) and 0.89 (14 items among those employed); Rasch Separation Coefficient: (2.35-2.81) ; Rasch Separation Index: (0.86-0.89)									

	9 Items and 5-Category Rating Scale-Rasch Separation Coefficient: (2.54-3.00); Rasch Separation Index: (0.87-0.90) 5 Items and 5-Category Rating Scale-Rasch Separation Coefficient: (2.13-2.70); Rasch Separation Index: (0.82-0.88)									
STIGMA-RELATED CONCERNS Even though same-sex marriage is legal….										
1	I am concerned about experiencing discrimination because of my gender identity.	4%	**45.7**	**0.5**	**1.43**	**5.81**	**1.42**	**5.60**	**0.58**	
2	I worry same-sex marriage rights will be taken away in the future.	<1%	**53.6**	**0.5**	**1.28**	**3.78**	**1.25**	**3.23**	**0.80**	
3	I witness hostility against others because of their sexual identity.	2%	53.6	0.5	0.96	-0.56	0.92	-1.14	1.08	†
4	There is now a backlash against same-sex marriage.	2%	48.3	0.5	0.79	3.42	0.80	-3.13	1.21	†
5	I am concerned about experiencing discrimination because of my sexual identity.	1%	50.3	0.5	0.68	5.49	0.66	-5.70	1.41	†
6	There is now a backlash against LGBTQ people in general.	1%	49.8	0.5	0.76	4.03	0.76	-3.76	1.22	†
7	I experience hostility against me because of my sexual identity.	2%	38.7	0.5	0.89	1.77	0.89	-1.73	1.05	†
8	I am concerned about traveling to conservative or unfamiliar places.	1%	55.4	0.5	1.12	1.67	1.08	1.11	0.94	
9	I am careful about disclosing my sexual identity with unfamiliar people.	<1%	**54.7**	**0.5**	**1.21**	**2.94**	**1.38**	**4.73**	**0.76**	
	Rating Scale: 1=Strongly Agree; 2=Agree; 3=Somewhat Agree; 4=Somewhat Disagree; 5=Disagree; 6=Strongly Disagree									
	Cronbach's Alpha: 0.85; Rasch Separation Coefficient: (2.05-2.37); Rasch Separation Index: (0.81-0.85) 6 Items and 5-Category Rating Scale-Rasch Separation Coefficient: (1.96-2.36); Rasch Separation Index: (0.79-0.85) 5 Items and 5-Category Rating Scale-Rasch Separation Coefficient: (1.93-2.38); Rasch Separation Index: (0.79-0.85)									
COUPLE IMPACT (asked of those in relationships) Because of same-sex marriage legalization…										
1	I feel more secure in my romantic relationship.	7%	**56.6**	**0.7**	**1.36**	**3.65**	**1.34**	**3.50**	**0.63**	
2	My relationship feels more equal to heterosexual couples.	24%	**56.0**	**0.8**	**1.15**	**1.47**	**1.15**	**1.51**	**0.88**	

3	My partner and I are treated equally to heterosexuals.	25%	46.0	0.7	0.89	-1.14	0.92	-0.81	1.08	
4	My family treats my relationship with greater respect.	10%	**48.3**	**0.7**	**1.28**	**2.99**	**1.27**	**2.88**	**0.72**	
5	Other people treat my relationship with greater respect.	8%	51.8	0.7	0.62	-5.02	0.62	-4.96	1.39	†
6	My relationship is treated as more "legitimate".	8%	53.4	0.7	0.60	-5.28	0.59	-5.46	1.45	†
7	I am more likely to be open about my relationship with others.	5%	52.7	0.7	0.66	-4.38	0.66	-4.50	1.39	†
8	Now I share more details about my relationship with other people.	5%	49.6	0.7	0.69	-4.13	0.67	-4.44	1.38	†
9	I am less likely to hide the fact that I am in a relationship with a same-sex or gender non-binary partner.	24%	50.6	0.7	0.97	-0.27	0.97	-0.30	1.08	†
10	[OF THOSE UNMARRIED]I feel more pressured by my partner to get married.	7%	**35.0**	**0.8**	**2.39**	**9.49**	**2.47**	**9.24**	**-0.70**	
	Rating Scale: 1=Strongly Agree; 2=Agree; 3=Somewhat Agree; 4=Somewhat Disagree; 5=Disagree; 6=Strongly Disagree									
	Cronbach's Alpha: 0.85; Rasch Separation Coefficient: (1.93-2.29); Rasch Separtion Index: (0.79-0.84) 6 Items and 5-Category Rating Scale-Rasch Separation Coefficient: (2.07-2.63); Rasch Separation Index: (0.81-0.87) 5 Items and 5-Category Rating Scale-Rasch Separation Coefficient: (2.00-2.63); Rasch Separation Index: (0.80-0.87)									
LGBT COMMUNITY IMPACT Please rate your level of agreement with the following statements.										
1	Same-sex marriage is important to LGBTQ people who are close to me.*	1%	**42.6**	**0.6**	**1.15**	**1.88**	**1.24**	**2.68**	**0.92**	
2	I am happy for other same sex couples who want to get married.*	<1%	29.2	1.0	0.97	-0.19	0.78	-1.81	1.07	
3	Same-sex marriage makes me feel more connected to other LGBTQ people.*	3%	**49.4**	**0.5**	**1.20**	**2.77**	**1.27**	**3.54**	**0.80**	
4	Increased focus on marriage made me feel less connected to other LGBTQ people.	4%	50.6	0.5	0.72	-4.74	0.70	-4.93	1.36	

5	Same-sex marriage legalization positively affected other LGBTQ people more than it did for me.	3%	**63.3**	**0.4**	**1.36**	**5.19**	**1.37**	**5.02**	**0.52**	
6	Same-sex marriage is a step towards more legal rights for LGBTQ people.*	<1%	42.0	0.6	0.90	-1.23	0.86	-1.69	1.07	
7	There is an expectation that same-sex couples in long-term relationships will get married.	1%	**65.5**	**0.4**	**1.24**	**3.43**	**1.39**	**5.11**	**0.48**	
8	There is less validation for couples who are not married.	2%	59.4	0.4	0.99	-0.15	1.00	0.08	0.95	
9	The marriage equality movement was alienating for me.	4%	48.5	0.5	0.85	-2.19	0.84	-2.28	1.24	
10	I worry that same-sex marriage will increase conformity among LGBTQ people.	3%	54.3	0.4	0.95	-0.86	0.93	-1.08	1.19	
11	Same-sex marriage was a victory for LGBTQ communities.*	<1%	36.0	0.7	0.87	-1.35	0.77	-2.41	1.12	
12	Same-sex marriage is important to me.*	2%	41.9	0.6	1.03	0.39	1.00	0.04	1.08	
13	Marriage is not the most important political goal for LGBTQ people.	1%	**66.5**	**0.5**	**1.32**	**4.32**	**1.31**	**4.05**	**0.69**	
14	The LGBTQ community has become less supportive of those who do not want to marry.	4%	50.8	0.4	0.81	-3.00	0.81	-2.95	1.19	
	Rating Scale: 1=Strongly Agree; 2=Agree; 3=Somewhat Agree; 4=Somewhat Disagree; 5=Disagree; 6=Strongly Disagree									
	Cronbach's Alpha: 0.79; Rasch Separation Coefficient: (1.72-1.92) ; Rasch Separation Index: (0.75-0.79) 9 Items and 4-Category Rating Scale-Rasch Separation Coefficient: (1.73-2.04); Rasch Separation Index: (0.75-0.81) 5 Items and 4-Category Rating Scale-Rasch Separation Coefficient: (1.14-1.54); Rasch Separation Index: (0.57-0.70)									
POLITICAL AND SOCIAL ENVIRONMENT Think about whether the social and political climate related to protections of LGBTQ people has changed since the legalization of same-sex marriage in 2015. Please choose whether you think the social and political climate in each of the following areas is getting better, getting worse, or not changing.										

1	Employment discrimination on the basis of sexual or gender identity	0%	57.2	0.7	1.01	0.16	0.97	-0.41	1.01	†
2	Housing discrimination on the basis of sexual or gender identity	<1%	56.8	0.7	0.81	-3.01	0.84	-2.55	1.15	
3	Hate crimes legislation	<1%	48.2	0.7	1.03	0.44	1.07	1.01	0.94	†
4	Transgender-related health care coverage	<1%	50.0	0.7	1.05	0.84	1.02	0.27	0.96	†
5	Discrimination against same-sex foster or adoptive parents	<1%	52.4	0.7	0.88	-1.95	0.88	-1.78	1.13	†
6	Protections for LGBTQ foster youth	<1%	**52.6**	**0.7**	**0.68**	**-5.38**	**0.69**	**-5.16**	**1.32**	
7	Rights of LGBTQ immigrants and asylum-seekers	<1%	38.1	0.7	1.14	2.07	1.08	1.11	0.91	
8	Policies that allow access to facilities (e.g., bathrooms) based on gender identity (rather than sex assigned at birth)	<1%	**52.8**	**0.7**	**1.54**	**7.03**	**1.52**	**6.72**	**0.50**	
9	Discrimination against LGBTQ people based on religious or moral beliefs	<1%	41.9	0.7	0.86	-2.22	0.87	-1.93	1.15	†
	Rating Scale: 1=Gotten Much Better; 2=Gotten Somewhat Better; 3=Stay the Same; 4=Gotten Somewhat Worse; 5=Gotten Much Worse									
	Cronbach's Alpha: 0.89; Rasch Separation Coefficient: (2.50-2.89); Rasch Separation Index: (0.86-0.89) 7 Items and 5-Category Rating Scale-Rasch Separation Coefficient: (2.30-2.69); Rasch Separation Index: (0.84-0.88) 5 Items and 5-Category Rating Scale-Rasch Separation Coefficient: (1.95-2.37); Rasch Separation Index: (0.79-0.85)									

Notes. Items with an * require reverse coding. Boldface font was used to highlight misfit and low discrimination. Core items (those denoted with the symbol †) represent items that can be used in a 5-item version of the scale.

Supplemental Table 1. Measures assessing the impacts of the legalization of same sex marriage

Domain, Items, and Notes
Personal Impact
Because of same-sex marriage legalization…
I feel more accepted in society as an LGBTQ person.*
I feel safer in my neighborhood.
I am more comfortable being openly LGBTQ in public.
I feel validated as an LGBTQ person.
It is easier to plan for my future.
Same-sex relationships are more accepted.*
It is easier to be open with people about my sexual identity.*
In general, I feel safer.*
I believe that LGBTQ people are more accepted as part of everyday life.*
NOTES: Recommend 5-point scale with higher scores indicating greater level of agreement. Rasch Separation Index: [1] 9-item version=0.87-0.90; *5-item version=0.82-0.88.
Stigma-related Concerns
Even though same-sex marriage is legal….
I witness hostility against others because of their sexual identity.*
There is now a backlash against same-sex marriage.*
I am concerned about experiencing discrimination because of my sexual identity.*
There is now a backlash against LGBTQ people in general.*
I experience hostility against me because of my sexual identity.*
I am concerned about traveling to conservative or unfamiliar places.
NOTES: Recommend 5-point scale with higher scores indicating greater level of agreement. Rasch Separation Index: [1] 6-item version=0.79-0.85; *5-item version=0.79-0.85
Couple Impact
Because of same-sex marriage legalization…
My partner and I are treated equally to heterosexuals.
Other people treat my relationship with greater respect.*
My relationship is treated as more "legitimate".*
I am more likely to be open about my relationship with others.*
Now I share more details about my relationship with other people.*
I am less likely to hide the fact that I am in a relationship with a same-sex or gender non-binary partner.*
NOTES: Recommend 5-point scale with higher scores indicating greater level of agreement. Rasch Separation Index: [1] 6-item version=0.81-0.87.; *5-item version=0.80-0.87.

LGBT Community Impact

These next statements are about LGBTQ communities and your feelings, beliefs, and experiences about the legalization of marriage for same-sex couples. Please rate your level of agreement with the following statements.

I am happy for other same sex couples who want to get married.
Increased focus on marriage made me feel less connected to other LGBTQ people.[R]
Same-sex marriage is a step towards more legal rights for LGBTQ people.
There is less validation for couples who are not married. [R]
The marriage equality movement was alienating for me.[R]
I worry that same-sex marriage will increase conformity among LGBTQ people.[R]
Same-sex marriage was a victory for LGBTQ communities.
Same-sex marriage is important to me.
The LGBTQ community has become less supportive of those who do not want to marry.[R]

NOTES: Recommend 4-point scale with higher scores indicating greater level of agreement. Items with an [R] require reverse coding so that the items reflect greater agreement with *positive* impacts. Rasch Separation Index: [1] 9-item=0.75-0.81.

Political & Social Environment

Think about whether the social and political climate related to protections of LGBTQ people has changed since the legalization of same-sex marriage in 2015.
Please choose whether you think the social and political climate in each of the following areas is getting better, getting worse, or not changing.

Employment discrimination on the basis of sexual or gender identity.*
Housing discrimination on the basis of sexual or gender identity.
Hate crimes legislation.*
Transgender-related health care coverage.*
Discrimination against same-sex foster or adoptive parents.*
Discrimination against LGBTQ people based on religious or moral beliefs.*
Rights of LGBTQ immigrants and asylum-seekers.

NOTES: Recommend 5-points rating scale, with higher number indicating improvement: 5=Gotten Much Better; 4=Gotten Somewhat Better; 3=Stay the Same; 2=Gotten Somewhat Worse; 1=Gotten Much Worse. Rasch Separation Index: [1] 7-item version=0.84-0.88; *5-item version=0.79-0.85.

[1]Rasch separation index is analogous to a reliability index

Supplemental Table 2: Pearson correlations between scales measuring the impact of legalized same sex marriage

Variable	*n*	M	SD	Personal Impact	Stigma-related concerns	Couple impact	LGBT Community Impact	Political and social environment
Personal impact	445	58.4	18.4	-	-	-	-	-
Stigma-related concerns	445	57.7	16.2	-.225**	-	-	.-	-
Couple impact	278	56.7	22.5	.648**	-.146*	-	-	-
LGBT Community Impact	445	28.4	16.4	-.307**	.069	-.261**	-	-
Political and social environment	446	47.3	16.9	.400**	-.312**	.289**	-.128**	-

* $p < .05$; **p < .01

NOTES: correlations represent the recommended items and recommended number of categories with higher scores reflecting greater agreement with statements, as specified in Supplemental Table 1, with the exception of the LGBT Community Impact Scale. In the LGBT Community Impact scale, higher mean indicates higher levels of disagreement.