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Sexual Orientation Concealment and Mental Health: A Conceptual and Meta-Analytic Review

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Abstract

Identity concealment affects all sexual minority individuals, with potentially complex mental health implications. Concealing a sexual minority identity can simultaneously generate the stress of hiding, protect against the stress of discrimination, and keep one apart from sexual minority communities and their norms and supports. Not surprisingly, existing studies of the association between sexual orientation concealment and mental health problems show contradictory associations—from positive to negative to null. This meta-analysis attempts to resolve these contradictions. Across 193 studies (n = 92,236) we find a small *positive* association between sexual orientation concealment and internalizing mental health problems (i.e., depression, anxiety, distress, problematic eating; ES_r = 0.126; 95% CI [0.102, 0.151]) and a small *negative* association between concealment and substance use problems (ES_r = −0.061; 95% CI [−0.096, −0.026]). The association between concealment and internalizing mental health problems was larger for those studies that assessed concealment as lack of open behavior, those conducted recently, and those with younger samples; it was smaller in exclusively bisexual samples. Year of data collection, study location, and sample gender, education, and racial/ethnic composition did not explain between-study heterogeneity. Results extend existing theories of stigma and sexual minority mental health, suggesting potentially distinct stress processes for internalizing problems versus substance use problems, life course fluctuations in the experience of concealment, distinct experiences of concealment for bisexual individuals, and measurement recommendations for future studies. Small overall effects, heavy reliance on cross-sectional designs, relatively few

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Study data and analysis code for all analyses contained in this article are located at https://osf.io/4e2bs/.

effects for substance use problems, and the necessarily coarse classification of effect moderators in this meta-analysis suggest future needed methodological advances to further understand the mental health of this still-increasingly visible population.

Keywords

bisexual; depression and anxiety; sexual orientation; stigma concealment; substance use problems

From its start, the field of stigma studies has distinguished between visible and concealable stigmas in terms of the unique psychosocial challenges they pose to the stigmatized. Goffman (1963) highlights this distinction when referring to visible stigmas, such as being a racial or ethnic minority or having an obvious physical disability, as "discredited," and concealable stigmas, such as being a sexual minority or having had an abortion, as "discreditable." The visibly stigmatized must contend with the interpersonal costs, including stereotypes and discrimination, of being publicly known as a stigmatized individual; they are thereby, without choice, discredited as a matter of existence in a stigmatizing world. In contrast, those with a concealable stigma uniquely face the intrapsychic costs of choosing whether, when, how, and to whom to disclose their stigma (Chaudoir & Fisher, 2010); they are only discreditable when known by others to possess a stigma. Experimental and observational studies show that concealing a stigma is associated with negative cognitive (e.g., preoccupation), affective (e.g., shame), behavioral (e.g., social avoidance), and self-evaluative (e.g., lack of access to group-based protective resources) consequences (e.g., Frable, Platt, & Hoey, 1998; Major & Gramzow, 1999; Smart & Wegner, 1999), whereas stigma disclosure can potentially alleviate these burdens if met with a supportive reaction (Chaudoir & Fisher, 2010; Pachankis & Bränström, 2018).

The psychosocial challenges of possessing a concealable stigma have been proposed to be an important stressor that begins early in development and partially explains the substantial disparities in mental health problems affecting sexual minorities (e.g., those who identify as lesbian, gay, bisexual; Meyer, 2003). Sexual minorities most commonly become aware of their minority sexual orientation in adolescence and first disclose their sexual orientation several years later, in early adulthood according to the best-available population-based estimates (Calzo, Antonucci, Mays, & Cochran, 2011), and perhaps earlier among more recent cohorts (Russell & Fish, 2019). However, even after their initial disclosure, sexual minority individuals often continue to conceal their sexual orientation by choice or necessity from various individuals and in various situations (Beals, Peplau, & Gable, 2009; Pachankis, Westmaas, & Dougherty, 2011) and even initial disclosure can range from a simple statement to a lifelong conversation (Mohr & Fassinger, 2000). Thus, sexual orientation disclosure is not necessarily only a single event but rather can represent an ongoing response to contextual demands and personal decision making (Chaudoir & Fisher, 2010). Through the cognitive, affective, behavioral, and self-evaluative demands facing individuals with a concealable stigma, the stress of sexual orientation concealment is hypothesized to partially drive sexual minorities' increased experience of stress-sensitive mental health problems, including internalizing mental health problems (e.g., depression, anxiety, psychological distress, problematic eating) and substance use problems (Pachankis, 2007).

Despite this plausible hypothesis—that sexual orientation concealment should be associated with stress-sensitive mental health problems—quantitative studies of this association have produced contradictory results. Indeed, some studies show positive associations between sexual orientation concealment and mental health problems (e.g., Ayala & Coleman, 2000; Lehavot & Simoni, 2011), others show negative associations (e.g., Dyar & London, 2018; Huebner & Davis, 2005), and still others show no significant association (e.g., Kamen, Jabson, Mustian, & Boehmer, 2017; Lewis, Milletich, Mason, & Derlega, 2014). Explanations for these inconsistencies have only recently emerged (e.g., Jackson & Mohr, 2016; Meidlinger & Hope, 2014; Schrimshaw, Siegel, Downing, & Parsons, 2013) and potentially include: (a) the relative lack of population-based sampling in studies of sexual orientation concealment, yielding systematic underrepresentation of those who highly conceal; (b) inconsistencies in the operationalization of concealment; (c) use of different mental health outcomes, including internalizing mental health problems and substance use problems, without consideration of their conceptually meaningful distinctions; and (d) typically unexamined contextual and personal background factors that might affect the association between sexual orientation concealment and mental health problems.

The Challenge of Studying Sexual Minorities Who Conceal

Any study of sexual orientation concealment faces the known methodological challenges of ascertaining representative sexual minority samples (Meyer & Wilson, 2009) combined with the added challenge of ascertaining individuals across the range of concealment experiences, especially those who are highly concealed. Only two published studies of sexual orientation concealment and mental health problems have used probability-based sampling, in which all residents of the geographic area of study have equal likelihood of being selected into the sample. The results of these studies—that concealment is associated with fewer mental health problems, at least among some sexual minorities (Pachankis, Cochran, & Mays, 2015; van der Star, Pachankis, & Bränström, 2019)—perhaps contradict the assumption drawn across the more common nonrepresentative sampling approaches—that concealment predicts greater mental health problems (e.g., Jackson & Mohr, 2016). Yet studies relying on nonprobability samples overrepresent the experience of sexual minorities who are relatively out and who are otherwise unrepresentative of the general sexual minority population (e.g., consistently younger; Hottes, Bogaert, Rhodes, Brennan, & Gesink, 2016; Kuyper, Fernee, & Keuzenkamp, 2016).

Highlighting the importance of probability-based sampling for sexual orientation concealment-related research questions in particular, the two published studies utilizing such sampling find that a sizable proportion (around 10%) of sexual minorities, in both California (Pachankis et al., 2015) and Sweden (van der Star et al., 2019), report completely concealing their sexual orientation from all others. One of these studies found that sexual minority men who have never told another person of their sexual minority status experienced significantly lower odds of major depression than out sexual minority men (Pachankis et al., 2015), whereas the other found that sexual orientation concealment protects against depression for sexual minorities with high social support (van der Star et al., 2019). Population-based studies would likely find that sexual minority individuals living in less-supportive environments are even more likely to conceal their sexual orientation from all others, with

potentially distinct pathways to and buffers against mental health problems compared with those living in California and Sweden (Pachankis & Bränström, 2018).

Yet, even probability-based sampling cannot overcome the fact that some sexual minorities will not feel comfortable identifying themselves as such to researchers. For example, 30% of sexual minority male respondents in a nonprobability-based study indicate that they would not provide their sexual orientation on a national health survey (Ferlatte, Hottes, Trussler, & Marchand, 2017), with significant impact on estimates of mental health outcomes (Hottes et al., 2016). This challenge is amplified by the fact that most studies of sexual orientation concealment identify their samples through their endorsement of a sexual minority identity (e.g., as lesbian, gay, or bisexual; e.g., Puckett, Maroney, Levitt, & Horne, 2016), rather than a recent and/or persistent pattern of same-sex behavior or same-sex attraction, thereby excluding sexual minority individuals who might be uncomfortable identifying as such despite otherwise possessing a sexual minority orientation. Even more challenging is that, theoretically, some sexual minorities might not feel comfortable identifying as such even to themselves (Stein, 1999). Thus, studies of sexual orientation concealment will always be biased by the very phenomenon under investigation. Although this problem poses particular challenge to generating accurate estimates of the size of the sexual minority population and prevalence estimates of mental health problems therein, it poses less threat to the validity of studies examining associations between mental health problems and its determinants, as long as there is sufficient variation in both (Meyer & Wilson, 2009).

The Inconsistent Operationalization of Sexual Orientation Concealment

The inconsistent operationalization of sexual orientation concealment across studies has also been raised as a potential explanation for the inconsistent associations between sexual orientation concealment and mental health (Meidlinger & Hope, 2014), but has received scant empirical attention. Indeed, measures of concealment range from self-reports of a lack of sexual orientation disclosure—a relatively objective behavior (e.g., spoken disclosure of one's sexual orientation to others)—to self-reports of general, more poorly defined states such as a lack of general "openness" (e.g., "Are you open about your sexual orientation with [a] family, with [b] friends, with [c] acquaintances, with [d] colleagues?" Persson, Pfaus, & Ryder, 2015), or a lack of public knowledge (e.g., "how many people know [that you are a sexual minority]?" Sandfort, Bos, & Reddy, 2018). As reviewed below, these approaches capture potentially distinct phenomena with distinct implications for mental health.

Terminology

Here we review not only the variability in how self-report scales operationalize concealment (from the absence of active behavioral disclosure to more general states), but also the variability in terms used to describe it. Across studies, the construct is variably referred to as a lack of disclosure (e.g., Rosario, Schrimshaw, & Hunter, 2009), lack of open behavior (e.g., Kosciw, Palmer, & Kull, 2015), which is also sometimes called a lack of outness (e.g., Paul, Smith, Mohr, & Ross, 2014); and lack of general openness (e.g., Meidlinger & Hope, 2014). Throughout this review, we treat a lack of disclosure as the lack of an "active indication of one's sexual orientation through speech or action" (Meidlinger & Hope, 2014;

p. 490). Lack of open behavioral refers to whether and to what extent one discusses or otherwise behaviorally manages their sexual orientation in interactions with others (Mohr & Fassinger, 2000). Lack of general openness, in contrast, represents one's perception that they conceal their sexual orientation; however, lack of general openness does not necessarily capture whether or not disclosure has occurred. Lack of public knowledge represents an additional related construct referring to one's perception that others' do not know about one's sexual orientation, regardless of whether or not disclosure has occurred (Sandfort et al., 2018).

We use *concealment* as an umbrella term for the related constructs we explore throughout this article (e.g., Pachankis, 2007). Concealment refers to a behavioral construct (e.g., the observable reality of not disclosing or not discussing one's sexual orientation) informed by cognitive factors (i.e., the perception that one is not open with others about their sexual orientation and that others are not aware of one's sexual orientation). In addition to including reports of behavioral manifestations, our operationalization of concealment also includes these latter cognitive factors given that the self-perception of not being open with others and the perception of others' not knowing one's sexual orientation are likely strong indicators of one's actual concealment behavior.

When referring to the specific behavioral or cognitive aspects of concealment, we use the respective terms "lack of disclosure," "lack of open behavior," "lack of general openness," and "lack of public knowledge" intentionally. Of course, we are also intentional about direction, such that we always refer to concealment in terms of a *lack of* disclosure, *lack of* openness, *lack of* general openness, and *lack of* public knowledge. We do this for ease of interpretation despite the fact that many studies frame concealment in terms of its opposite (e.g., disclosure).

In the following sections, we review various approaches to measuring concealment organized into four categories: lack of disclosure, lack of open behavior, lack of general openness, and lack of public knowledge.

Lack of Active Disclosure (Category 1)

Several studies assess sexual orientation concealment as a behavior, namely the number or proportion of people in a given social category (e.g., friends, family, medical providers) to whom a sexual minority individual has *not explicitly disclosed* their sexual orientation (e.g., Ragins, Singh, & Cornwell, 2007; Shilo & Savaya, 2012). Because it focuses on objective behavior—namely, explicit disclosure acts to distinct people—this approach likely more reliably assesses concealment than those that rely on self-report of less behaviorally defined states, such as a lack of general openness. This assessment approach effectively distinguishes, for example, between an individual who has not shared their sexual orientation with many people in many domains from an individual who has actively disclosed their sexual orientation to many family, friends, and coworkers. Across these studies, the number or proportion of people to whom one has not disclosed their sexual orientation is typically (e.g., Shilo & Savaya, 2012), although not always (Bosker, 2002; Oetjen & Rothblum, 2000; Ragins et al., 2007), related to more symptoms of depression, anxiety, and general psychological distress.

Lack of Open Behavior (Category 2)

Recognizing that disclosure is not necessarily a static event with static interpersonal and mental health implications, other studies have attempted to capture both *whether others know or do not know about one's sexual orientation* and *how frequently or infrequently one's sexual orientation is presently discussed* in various relationships (e.g., Mohr & Fassinger, 2000). Because this approach captures lack of active discussion, or other behavioral indicators of concealing one's sexual orientation (e.g., the monitoring of appearance or mannerisms; Jackson & Mohr, 2016), it can be considered relatively behavioral in nature, although importantly, it does not capture lack of active disclosure (i.e., direct explicit statement of one's sexual orientation) unlike those measures in Category 1. The most common measure that employs this approach—the Outness Inventory (Mohr & Fassinger, 2000)—asks respondents to describe their relationships with 11 categories of people (e.g., mother, father, work peers) by selecting one of seven descriptions that combine whether those people know of their sexual orientation (from "definitely does not know" to "definitely knows") with how often they openly talk about it with those people (from "never" to "openly"). This assessment approach can distinguish, for example, between an individual who does not discuss their sexual orientation, takes steps to hide or downplay their orientation, and of whose sexual orientation few others are aware from an individual who openly discusses their sexual orientation at least on occasion and does not particularly hide or downplay verbal or behavioral indicators of their sexual orientation. Studies that use the Outness Inventory and similar scales (e.g., Clemens, 2004) sometimes find positive associations between sexual orientation concealment and mental health problems (e.g., Birichi, 2015; Chiang, 2009; Foster, Brewster, Velez, Eklund, & Keum, 2017) and sometimes find negative or no such association (e.g., Beaber, 2008; Livingston, Christianson, & Cochran, 2016; Nance, 2008; Paul et al., 2014).

Lack of General Openness (Category 3)

A less behavioral, more abstract way of assessing sexual orientation concealment is to measure concealment as a general state by asking sexual minorities to indicate *how generally open or not open they are* (e.g., McGarrity & Huebner, 2014; Pilkington & D'Augelli, 1995). This approach does not assess specific behavior, unlike those that assess lack of active disclosure (Category 1) or lack of open behavior (Category 2). This approach can simply distinguish individuals who do not believe or perceive that they are open about their sexual orientation from those who do. Because this approach relies on sexual minorities' overall perceptions of their concealment, it is likely influenced by general psychological tendencies, reporting style, and personality factors (Larson, Chastain, Hoyt, & Ayzenberg, 2015). To the degree that these factors similarly influence both the relevant predictors (e.g., concealment) and outcomes (e.g., reports of depression, anxiety, or psychological distress), this approach might yield inflated estimates due to same-source confounding (Watson & Pennebaker, 1989). In fact, many studies using this approach find positive associations between lack of general openness and mental health problems (e.g., Meidlinger & Hope, 2014; Velez, Moradi, & Brewster, 2013), although whether these associations are valid or instead due to same-source confounding remains unknown.

Lack of Public Knowledge (Category 4)

Some concealment measures altogether avoid capturing any active behavioral indicators of concealment (e.g., lack of active disclosure, lack of open behaviors, lack of general openness) and instead only assess *whether others do not know about* one's sexual orientation (e.g., Sandfort et al., 2018). Assessing concealment as whether others do not know about one's sexual orientation weakens construct validity because whether or not others know about one's sexual orientation is influenced by numerous, often unexamined factors potentially unrelated to a person's behavioral attempts to conceal. In fact, for some sexual minorities, "being out" (i.e., being known as a sexual minority) represents a nonvolitional, externally imposed circumstance. For example, if a sexual minority is discovered engaging in same-sex sexual behavior, news of their behavior and of their assumed sexual minority identity could become public knowledge. Although this person would be "not concealed" according to a scale that simply assesses others' knowledge of their sexual orientation, they might have never disclosed their sexual orientation and, instead, might have preferred to keep it concealed (D'Augelli, Hershberger, & Pilkington, 1998; Friedman, Marshal, Stall, Cheong, & Wright, 2008). As another example, gender nonconforming expression represents a visible sign through which others may (often correctly) assume one's sexual orientation even without disclosure (e.g., Rieger, Linsenmeier, Gygax, Garcia, & Bailey, 2010). At the same time, for most individuals, lack of public knowledge is likely a strong indicator of whether that person has, in fact, successfully concealed their sexual orientation. Still, studies assessing sexual orientation concealment in this way tend to produce small (e.g., Kuyper & Bos, 2016) or nonsignificant (e.g., Sandfort et al., 2018) associations with mental health problems.

Use of Dichotomous Versus Continuous Measures of Concealment

Studies that use dichotomous measures of concealment should show smaller associations with mental health problems than those that use continuous measures. Dichotomous measures of concealment likely preclude capturing at least some variance in the phenomenon under study, thereby excluding important information, missing any nonlinearity in associations with mental health problems, and reducing statistical power to detect associations with mental health problems (Altman & Royston, 2006).

Distinctions Between Internalizing Mental Health Problems and Substance Use Problems in the Study of Sexual Minority Mental Health Determinants

Whether the association between concealment and mental health problems differs depending on the specific mental health problem under investigation has not been systematically examined despite its importance for theoretical accounts of sexual minority stigma, stress, and mental health.

Most studies of the association between sexual orientation concealment and mental health examine depression, anxiety, and general psychological distress as outcomes (Jackson & Mohr, 2016; Meidlinger & Hope, 2014). A few other studies examine problematic eating and substance use problems (Currin et al., 2018; Lehavot & Simoni, 2011; Mason, Lewis, & Heron, 2017; Watson, Velez, Brownfield, & Flores, 2016). All of these mental health

problems are united in being particularly sensitive to social stressors such as concealment (Hammen, 2005; Mineka & Zinbarg, 2006) and in being elevated among sexual minorities compared with heterosexuals (Cochran & Mays, 2009; Feldman & Meyer, 2007; Meyer, 2003). However, substance use problems differ from depression, anxiety, psychological distress, and problematic eating in being an *externalizing mental health problem* (Forbush et al., 2010; Krueger, Markon, Patrick, Benning, & Kramer, 2007; Mitchell, Wolf, Reardon, & Miller, 2014). Whereas internalizing mental health problems share high comorbidity and underlying mechanisms grounded in cognitive-affective neuroscience models of stress, emotions, and coping (Clark & Watson, 1991; Krueger, Watson, & Barlow, 2005; Shin & Liberzon, 2010), externalizing problems are united in sharing underlying tendencies toward disinhibition (Krueger, Markon, Patrick, & Iacono, 2005). Externalizing problems also differ from internalizing problems in their outward display of behavior, rather than inward direction of distress (Krueger et al., 2005).

Substance use problems are also often influenced by social network characteristics (Rosenquist, Murabito, Fowler, & Christakis, 2010). In fact, a few studies have suggested that the sexual orientation disparity in substance use problems might be at least partially explained by sexual orientation differences in sexual network characteristics (Hatzenbuehler, McLaughlin, & Xuan, 2015), including greater perceptions of normative substance use by sexual minorities compared with heterosexuals (Cochran, Grella, & Mays, 2012; Hatzenbuehler, Corbin, & Fromme, 2008). Yet, most studies simply explain sexual minorities' greater tendency to use substances in terms of their disproportionate exposure to minority stressors such as concealment and associated discrimination (Feinstein, Dyar, & London, 2017), viewing it through the same theoretical lens as internalizing problems. This approach might obscure distinct determinants of internalizing versus externalizing mental health problems among sexual minorities, which emerging research suggests might exist (Rodriguez-Seijas, Eaton, & Pachankis, 2019).

Sexual orientation concealment is expected to show positive and similarly sized associations with all internalizing problems—whether depression, anxiety, psychological distress, and eating problems—given their high degree of comorbidity and symptom overlap with the cognitive (e.g., rejection hyper-vigilance), affective (e.g., guilt), and behavioral (e.g., avoidance) stressors of concealment (Pachankis, 2007). In fact, similar associations across diverse internalizing mental health problems have been found for other minority stressors, such as internalized homophobia (Newcomb & Mustanski, 2010).

Yet, we hypothesize that concealment might show negative associations with substance use problems given that concealment might keep sexual minorities from the more normative substance use in sexual minority, compared with heterosexual, communities (Cochran et al., 2012; Hatzenbuehler et al., 2008; Hatzenbuehler et al., 2015), likely in part owing to the history of more normative socializing in venues in which substance use is common among sexual minorities (Hughes, Wilsnack, & Kantor, 2016; Trocki, Drabble, & Midanik, 2005). Finding opposite associations for concealment with internalizing mental health problems versus substance use problems would expand minority stress theory's focus on the solely stress-related consequences of concealment (Meyer, 2003) to other social influences on sexual minority health, including those stemming from exposure to sexual minority

community norms and network influences (e.g., Burton, Clark, & Pachankis, 2020; Pachankis et al., 2020).

Similar to the scaling considerations for sexual orientation concealment described above, when measured dichotomously, mental health outcomes are expected to show smaller associations with concealment than when mental health outcomes are measured continuously (Altman & Royston, 2006).

Potential Contextual and Personal Moderators of the Association Between Sexual Orientation Concealment and Mental Health

It is unclear to what extent often-unexamined contextual and personal factors might explain the inconsistent association between concealment and mental health problems across studies (Legate, Ryan, & Weinstein, 2012). Indeed, rather than uniformly placing sexual minorities at risk of stress-sensitive mental health problems, concealment might exert a less stressful effect for some sexual minorities or might even protect some sexual minorities against other minority stressors like homophobic/biphobic discrimination (McGarrity & Huebner, 2014; Pachankis & Bränström, 2018; Pachankis et al., 2015). The ability of concealment to potentiate or protect against stress likely varies as a function of contextual or personal factors. As reviewed below, relevant factors potentially include age, the time period in which sexual minorities live, the geographic location in which sexual minorities live, gender, educational background, race and ethnicity, and bisexuality.

Age

A life course approach to sexual minority mental health and its determinants requires consideration of both age and period effects. In terms of age, although concealment has some adaptive benefits across the life span, those benefits might be more outweighed by concealment's risks earlier in development. Concealment might pose a greater mental health burden to younger sexual minorities because younger individuals might possess fewer psychological resources for coping with stress than older individuals (Casey, Jones, & Hare, 2008). Further, younger sexual minorities might exist in more constrained environments than older sexual minorities, such as under conditions of parental control or limited options for social or geographic mobility or affirmative mental health care (Durso & Meyer, 2013; Hatzenbuehler & Pachankis, 2016), and therefore have fewer material resources for coping with concealment. Further, to the extent that concealment drives chronic and anxious expectations of rejection and negative emotions such as shame (Pachankis, 2007), evidence suggests that these experiences have their greatest mental health impact during the developmentally sensitive periods of adolescence and young adulthood (Andersen & Teicher, 2008; Charmandari, Kino, Souvatzoglou, & Chrousos, 2003; Leussis & Andersen, 2008; Murphy, Slavich, Rohleder, & Miller, 2013; Romeo et al., 2006). Although outness certainly has risks across the lifespan (Pachankis & Bränström, 2018), including among younger sexual minorities (D'Augelli, 2002), weight of the evidence suggests a stronger association between concealment and mental health problems for younger, compared with older, sexual minorities.

Time Period

Life course models of sexual minority mental health highlight the impact of the rapidly changing societal context surrounding this population (e.g., Cohler & Hammack, 2007). Indeed, the experience of being a sexual minority has changed so rapidly that distinct sexual minority experiences can be found not just across successive generations, but even decade-to-decade or possibly year-to-year (e.g., Hammack, Frost, Meyer, & Pletta, 2018; Russell & Fish, 2019). For instance, over the span of 10 years in the United States, same-sex behavior was decriminalized (2003), federal hate crimes laws were expanded to recognize sexual orientation (2009), sexual minorities were allowed to serve openly in the military (2010), and the definition of marriage as between a man and woman was declared unconstitutional (2013). Concealment might represent an experience whose meaning and mental health implications have changed concomitantly fast over recent history. Given the relatively rapid increase in public support for sexual minorities in many countries in recent periods, concealment might be less adaptive as a protection against discrimination and victimization for sexual minorities today than in years past. In fact, recent evidence shows that the mental health of sexual minorities has improved over time as a function of their decreased exposure to discrimination and victimization (Hatzenbuehler, Bränström, & Pachankis, 2018). At the same time, perhaps today's more supportive climates raise the threshold required for concealment, such that those who are most burdened by poor mental health are most likely to conceal. In fact, societal improvements affecting the stigmatized can exacerbate inequalities within them, such that those who are otherwise disadvantaged do not benefit as much from those societal improvements as those who are not so relatively disadvantaged (Phelan, Link, & Tehranifar, 2010). Those who conceal for reasons other than societal constraints against openness might also be those who experience poorer mental health as a result of other causes. Conversely, concealment would be expected to be associated with better mental health in past periods given the greater threat facing open sexual minorities. For these reasons, concealment is likely associated with poorer mental health in studies in which data were more recently collected.

Study Location

Theoretical accounts of stigma concealment suggest that sexual minorities living in more structurally homophobic geographic contexts face higher consequences to disclosure than those living in structurally supportive contexts (Pachankis, 2007). In fact, recent data collected across 28 structurally diverse countries finds that sexual orientation concealment is only associated with positive life satisfaction in structurally homophobic contexts, but not in structurally supportive contexts (Pachankis & Bränström, 2018). This effect was mediated by exposure to discrimination and victimization. In structurally homophobic contexts (i.e., those containing discriminatory laws, policies, and community attitudes affecting sexual minorities; Hatzenbuehler, 2016), concealment protected against discrimination and victimization, whereas in structurally supportive contexts (i.e., those with laws, policies and attitudes that offer protection for sexual minorities), the likelihood of discrimination and victimization were equally low for highly concealed and nonconcealed sexual minorities. Mental health problems were not assessed in this study, and to our knowledge, no such cross-country examination of sexual orientation concealment and mental health problems exists. Because most studies of sexual orientation concealment and mental health problems

are conducted in North America, insufficient evidence exists from which to hypothesize whether other global regions would demonstrate similar associations between concealment and mental health problems. Also unknown is whether a sufficient number of non–North American studies exists to test such a hypothesis.

Gender

The mental health cost of disclosure is likely greater for sexual minority men than for sexual minority women. Several studies, for instance, find that sexual minority men experience more homophobic victimization than do sexual minority women (Balsam, Rothblum, & Beauchaine, 2005; D'Augelli, Pilkington, & Hershberger, 2002; Herek, 2000). Further, in one of the only population-based studies of sexual orientation concealment and mental health, sexual minority men who had disclosed their sexual orientation reported higher odds of major depressive disorder than sexual minority men who concealed their sexual orientation from all others; sexual minority women experienced comparable odds of depression regardless of their concealment status (Pachankis et al., 2015). Of course, within sexual minority populations, the experience of gender often cannot be separated from the experience of sexual identity, such that sexual minority men often identify as gay men and sexual minority women often identify as lesbian women. Examinations of gender within sexual minority populations are therefore often conflated with these distinct sexual identities.

Educational Attainment

Recent evidence suggests that the health benefits of being out might be limited to sexual minorities with higher educational attainment. In fact, among sexual minority men with higher educational attainment, a positive association between being out and physical health has been found, whereas a negative association exists between being out and physical health for sexual minority men with lower educational attainment (McGarrity & Huebner, 2014). Whereas this evidence is limited to physical health among sexual minority men, it coheres with population-based evidence that sexual minorities, across the gender spectrum, with lower educational attainment are burdened by poorer mental health than those with higher educational attainment (Barnes, Hatzenbuehler, Hamilton, & Keyes, 2014). Further supporting the potential disproportionate mental health benefits of being out for sexual minorities with higher educational attainment, sexual minorities from lower socioeconomic positions are less likely to receive support from sexual minority communities (Barrett & Pollack, 2005) and are more likely to report stress from those communities (Pachankis et al., 2019), thereby diminishing this potential benefit of being out.

Race and Ethnicity

For racial and ethnic minorities, being out as a sexual minority might not confer the same mental health benefit that it does for nonracial/ethnic-minority individuals. First, racial and ethnic identities are often more central than sexual minority identities; therefore, coming out as a sexual minority might be of secondary importance compared with possessing a more central racial or ethnic identity (Akerlund & Cheung, 2000; Ross, 2005). Second, racial and ethnic minorities might face racial and ethnic stigma from within gay communities at the same time that they might lose support from their racial and ethnic minority communities

when they are out (Akerlund & Cheung, 2000; Dubé & Savin-Williams, 1999; Ross, 2005). In fact, concealment has shown associations with mental health problems only for White sexual minority men, but not for Latino sexual minority men (Villicana, Delucio, & Biernat, 2016). Research has shown that, compared with White sexual minorities, Latinx sexual minorities might be more likely to engage in tacit disclosure, whereby they do not actively hide their sexual orientation at the same time that they have not disclosed it (e.g., bringing a same-gender partner to a family event despite never having verbally disclosed their sexual orientation). Tacit disclosure might be just as indicative of an authentic self-presentation for some racial and ethnic minorities as verbal disclosure (Villicana et al., 2016). Overall, research suggests that sexual orientation concealment might have weaker implications for mental health among racial and ethnic minority individuals than it does for nonracial/ethnic minorities.

Bisexual Identity

Although bisexual individuals consistently report poorer mental health than gay men and lesbian women (Bostwick, Boyd, Hughes, & McCabe, 2010; Conron, Mimiaga, & Landers, 2010) and are more likely to conceal their sexual orientation than gay men and lesbian women (Balsam & Mohr, 2007; Lewis, Derlega, Brown, Rose, & Henson, 2009; Rosario, Schrimshaw, & Hunter, 2008; Stokes, Vanable, & McKirnan, 1997), existing evidence suggests that concealment has a relatively weaker influence on the mental health of bisexuals than gay men and lesbian women. Although their higher likelihood of concealment might explain why bisexuals experience less homophobic victimization and discrimination than gay men and lesbian women (Chesir-Teran & Hughes, 2009; Herek, 2009; Kuyper & Fokkema, 2011), bisexuals' sexual identities have been found to be less central to their overall identities than gay men and lesbian women's sexual identities (Dyar, Feinstein, & London, 2015). Therefore, concealment of a bisexual identity might have a relatively small impact on mental health than concealment of a gay or lesbian identity. Further, to the extent that bisexual individuals' identities are less reflected in institutions and normative discourse both within general society and within gay and lesbian communities (Steinman, 2000), any protective effects of disclosure, such as increased social support or access to other identity-specific protections (Chaudoir & Fisher, 2010), are likely to be smaller, and thus the costs of concealment are likely not as high as they are for gay and lesbian individuals (Beals et al., 2009).

Aims and Hypotheses

The present meta-analysis aggregates the results of all previous studies that have examined the association between sexual orientation concealment and mental health problems to determine the overall association between these variables. Previous studies typically show null, small, or contradictory associations between sexual orientation concealment and mental health problems. As reviewed above, lack of representative sampling, inconsistent measurement of concealment, lack of conceptual distinction between internalizing and externalizing mental health problems, and unexamined contextual or personal factors in this literature might explain inconsistent effects across studies. Therefore, in addition to calculating the average effect size across studies, we also attempt to examine heterogeneity across studies as a function of approach to operationalizing concealment; mean participant

age; time period of data collection; the gender composition of the sample; educational attainment of the sample; racial and ethnic composition of the sample; whether the sample was composed exclusively of bisexual individuals; and whether the study used dichotomous or continuous concealment and mental health scales. Further, to begin to extend the conceptual distinction between internalizing and externalizing mental health problems to theorizing about sexual minority mental health and its determinants, we also examine the association between sexual orientation and mental health problems distinctly for internalizing mental health problems and substance use problems.

In terms of a priori directional hypotheses, we expected that studies utilizing behavioral operationalizations of concealment (e.g., lack of active disclosure, lack of open behavior) will show larger associations between concealment and mental health problems than studies using nonbehavioral operationalizations (e.g., lack of general openness, lack of public knowledge) given potentially extraneous influences captured by nonbehavioral measures. We expected to find the smallest association between concealment operationalized as lack of public knowledge and mental health problems given the threats to construct validity posed by the many potential factors influencing whether others know of one's sexual orientation.

In terms of contextual and personal moderators of the association between sexual orientation concealment and mental health problems, based on the evidence reviewed above, we hypothesized, a priori, that studies containing younger samples, conducted more recently, composed of mostly men, with a greater proportion of individuals with lower educational attainment, with a greater proportion of White individuals, and whose sample composition is exclusively bisexual would evidence larger associations between concealment and mental health problems. As a post hoc exploration, we examined whether studies utilizing dichotomous measures of concealment and/or mental health would yield smaller effect sizes than those utilizing continuous measures of those constructs. As a second post hoc exploration, we examined whether studies of internalizing problems would show positive associations with concealment, whereas studies of substance use problems would show negative associations with concealment.

Results of this meta-analysis, the first to examine the association between sexual orientation concealment and mental health problems, have the potential to resolve increasingly obvious inconsistencies across studies into these constructs. This study can bring us closer to answering how and under what circumstances sexual orientation concealment—a pervasive aspect of the sexual minority experience—comes to shape the mental health of this increasingly visible population. By testing the above hypotheses, this analysis can support existing, and perhaps advance novel, theories regarding sexual minority mental health.

Method

Inclusion and Exclusion Criteria

Studies included in the final analyses: (a) contained a measure of the statistical association between sexual orientation concealment (i.e., lack of disclosure, lack of open behavior, lack of general openness, lack of public knowledge) and depression, anxiety, general psychological distress, problematic eating, and/or substance use problems or the author

provided such an association upon request; (b) included sexual minority participants and reported a separate analyses for these participants; and (c) used unique data in their analyses (i.e., data that were not analyzed in any other report included in the meta-analysis). Otherwise, studies were only excluded if they did not include an appropriate concealment measure or mental health measure or if information necessary for calculating an association between concealment and mental health was not available within the study or provided by the studies' authors.

Search Strategy

A search strategy was implemented across three electronic databases (i.e., PsycINFO, Medline, and Web of Science) to identify studies related to sexual orientation concealment and mental health problems among sexual minorities. Publication date was not restricted; thus, the search included the earliest relevant studies up until the date the final search was carried out (i.e., May 22, 2019). Using their respective controlled terms, customized search strategies were developed for each database consisting of key terms related to sexual orientation concealment, mental health problems, and sexual minorities (see the Appendix for full PsycINFO search strategy). Databases were searched for both published peer-reviewed studies and dissertations.

A reference librarian, experienced in meta-analytic searches, reviewed our Boolean and proximity indicators, subject headings and controlled terms, search term spelling and syntax, and limits and filters; advised our text word search process (e.g., identifying missing terms, missing word forms); suggested databases to retrieve non–English language studies; and tested our searches.

The reference lists of all records suitable for inclusion were manually checked, and the authors of all records deemed eligible for inclusion were emailed to request potentially relevant unpublished data in their possession. Specifically, we contacted 148 authors of studies initially marked for inclusion to request any unpublished data that may be relevant for inclusion in the meta-analysis. We received replies from 35.1% of authors, leading to the inclusion of an additional 15 studies. We also posted requests for relevant data on the listservs of professional organizations of scholars conducting sexual minority mental health research, resulting in the inclusion of three additional studies. For those studies containing assessments of sexual orientation concealment and mental health problems that were missing other key information (e.g., an effect size), we requested missing information from the authors. Specifically, we contacted 102 authors whose study (or studies) was (were) missing this information; 22% of authors replied with the requested data. In three of these cases, the provided data led us to deem the study as not suitable for inclusion.

Data Extraction

Two reviewers independently screened the abstracts of all records retrieved in the search. Following the abstract review, both reviewers read the full texts of records deemed potentially eligible for inclusion. We generated multiple measures of interrater reliability at various stages of the review process. Cohen's statistic estimates chance agreement between two coders and removes it from the estimation of reliability (Viera & Garrett, 2005). A

Cohen's κ score was calculated to determine the level of agreement between the two coders at the abstract review and full-text review stages. The following indices were used to interpret the results: values ≤0 indicate no agreement and 0.01–0.20 as none to slight, 0.21–0.40 as fair, 0.41–0.60 as moderate, 0.61–0.80 as substantial, and 0.81–1.00 as almost perfect agreement (McHugh, 2012). Interrater reliability was subtantial at the abstract review (κ = .86) and full-text review stage (κ = .73). Discrepancies between reviewers' inclusion determinations were solved through further discussion among all study authors.

Data extracted from each record included authors' name, sample size, type of publication (i.e., journal article, dissertation, or unpublished), year of publication, location, sample characteristics (i.e., age, gender composition, racial and ethnic composition, educational attainment [% some college education or above], and sexual orientation composition [i.e., exclusively bisexual]), sexual orientation concealment measures used, and mental health outcome measures used. Table 1 summarizes all extracted data.

Most of the included records reported Pearson product–moment correlations. Being an appropriate measure of effect size, the correlation coefficient was therefore chosen as the effect size statistic (ES_r). In cases where records did not report a correlation coefficient, a request was sent to the study authors. When the authors did not reply or were unable to retrieve the relevant correlation coefficient, the reported statistics (e.g., from an ANOVA) were converted to ES_r, when available.

Measures of Sexual Orientation Concealment

A variety of sexual orientation concealment measures were used in the included studies, which we categorized using the four categories described above: Lack of active disclosure (Category 1), lack of open behavior (Category 2), lack of general openness (Category 3), and lack of public knowledge (Category 4). Studies in Category 1 used a concealment measure that captured the number or proportion of people in a given social category (e.g., friends, family) to whom a sexual minority individual had not explicitly disclosed their sexual orientation. Studies in Category 2 used a concealment measure that captured both the extent to which people in a given social category (e.g., coworkers, heterosexual friends) do not know about an individual's sexual orientation *and* how infrequently one's sexual orientation is presently discussed in those relationships. Studies in Category 3 used a concealment measure that captured an individual's lack of general openness about their sexual orientation with people in a given social category (e.g., parents, people in general). Studies in Category 4 used a concealment measure that captured a lack of public knowledge among people in a given social category (e.g., peers, spouse's family) regarding an individual's sexual orientation.

Concealment measures that captured multiple categories could not be assigned a category but instead only contributed to analyses of pooled effect sizes (e.g., Nash, 1990; Schrimshaw et al., 2013; Shilo & Savaya, 2011). For studies that used multiple measures of sexual orientation concealment ($k = 17$), separate effect sizes were extracted for each of the four categories. The majority (54.4%) of effects derived from commonly used concealment measures (e.g., the Outness Inventory) with high reliability and established psychometric

properties. The remaining effects derive from one-item (31.5%) or multiitem (14.1%) instruments without established reliability.

In our search, we also identified a small number of studies whose concealment measures did not match any of our four a priori concealment categories, but which we nonetheless decided to retain since they did capture sexual orientation concealment. These studies (n = 3) all captured concealment from one other person or a small group of people in a very circumscribed social domain (i.e., mental health providers, Owens, Riggle, & Rostosky, 2007; health care provider, Sun, Tobin, Spikes, & Latkin, 2019; and adult children, Tornello & Patterson, 2018). Although these very specific domains of concealment were not expected to have broad implications for mental health, we nonetheless included these three studies in a sensitivity analysis of our primary analysis to determine the robustness of our results when these specific manifestations of concealment are included.

To establish the reliability of our concealment categorization, one coder classified each measure used in each study. The second coder then reviewed this classification and indicated whether he agreed. Raters agreed on almost every (97.5%) classification of effects into the four concealment categories.

Measures of Mental Health Problems

The studies in the final sample utilized various measures of mental health problems, listed in Table 2. The types of measures were classified into five main categories: depression, anxiety, general psychological distress, problematic eating, and substance use problems, which were further classified as internalizing mental health problems (depression, anxiety, general psychological distress, problematic eating) and substance use problems, based on empirically derived psychiatric classification schemes (Forbush et al., 2010; Krueger & Markon, 2006). For studies that reported more than one outcome or more than one measure of mental health problems, we extracted all relevant data separately. We also included fear of negative evaluation and rumination as outcomes given that fear of negative evaluation is a pathognomonic feature of social anxiety disorder and that rumination is associated with depression and anxiety disorders.

The majority (98.4%) of effects derived from commonly used mental health measures (e.g., the Center for Epidemiological Studies Depression Scale) with high reliability and established psychometric properties. The remainder of effects (1.6%) derived from instruments without established reliability.

Hypothesized Effect Moderators

Table 1 summarizes all hypothesized moderators in terms of their extracted information, coding, and average distribution across studies. In addition to the four distinct categories of concealment described above, hypothesized moderators of the association between sexual orientation concealment and mental health problems included: time period (i.e., estimated year of data collection [for studies lacking this information, we used year of publication minus the average publication lag across studies (i.e., 8 years)]), study location (i.e., studies conducted in North America vs. studies conducted outside of North America), whether the study used dichotomous measures for concealment and mental health problems, age (i.e.,

mean age of study participants), gender (i.e., proportion of the sample composed of male participants), educational attainment (i.e., proportion of the sample that had completed at least some college), race/ethnicity (i.e., studies containing a majority of racial/ethnic minority participants), and studies with an exclusive bisexual sample.

Analytic Strategies

Correlation coefficients were used as the measure of effect size. All effects were coded such that a positive effect indicates an association between concealment and *mental health problems* whereas a negative effect indicates an association between concealment and *favorable mental health*. Before the primary analyses, we transformed the correlations derived from the studies with Fisher's *r*-to-*z* transformation to be able to compare studies on a scale with approximately normal distribution and stabilized variance. After the analyses, results were transformed back to *r* for interpretation. Random effect models were used to calculate pooled effect sizes; these are presented as correlations. Because many studies contributed multiple effect sizes, we both (a) calculated the standardized average mean of mental health problems for each study and (b) used robust variance estimation models to make use of all effect sizes available in each study adjusting for dependency between effect sizes coming from the same study (Hedges, Tipton, & Johnson, 2010; Tanner-Smith & Tipton, 2014). We interpret effect sizes as small ($r = .1$), medium ($r = .3$), and large ($r = .5$), according to Cohen's conventions (Cohen, 1988; Cohen, 1992). Heterogeneity between studies was examined with the Q, I^2, and τ^2 statistics, to assess both the size and significance of heterogeneity between studies.

We conducted post hoc moderation analyses using metaregression, examining the potential effect of various study and sample characteristics as explanatory factors of between-study heterogeneity. The variables examined as potential moderators of the association between sexual orientation concealment and mental health problems were: type of mental health problem (i.e., depression, anxiety, general distress, problematic eating, substance use problems); type of measure used to assess sexual orientation concealment (i.e., Category 1 to 4); study characteristics (i.e., time period, study location, use of dichotomous measure of concealment, use of dichotomous measure of mental health problems); and sample characteristics (i.e., age, gender, educational attainment, race/ethnicity, exclusive bisexual sample composition).

We analyzed study heterogeneity across a number of steps. First, we assessed whether the relationship between sexual orientation concealment and mental health problems differed based on the type of mental health problem. For these analyses we entered dummy-coded variables for each type of mental health problem (i.e., depression, anxiety, general distress, problematic eating, and substance use) into separate bivariate metaregression analyses. For these analyses, we included all studies that contributed effect sizes for any mental health problem. For studies in which effect sizes could be extracted separately for more than one mental health problem, multiple separate effect sizes were used in the analysis.

Second, we examined whether the relationship between sexual orientation concealment and mental health problems differed based on the type of sexual orientation concealment classification derived from our four-category scheme. In these analyses, studies measuring

concealment using more than one type of concealment measure were allowed to contribute multiple effect sizes. Similar to the analyses of different mental health outcomes, dummy-coded variables for each type of concealment measure were entered separately into bivariate metaregression analyses. Third, we examined study and sample characteristics as potential moderators using bivariate metaregression analyses. Finally, we entered all variables that significantly contributed to heterogeneity in the bivariate analyses into a multivariate metaregression analysis; nonsignificant moderators were removed using backward deletion

We conducted several tests to ascertain potential study selection bias and to examine indications that statistically nonsignificant, or unexpected, results are systematically excluded from the literature (i.e., “file-drawer bias”). First, we analyzed the potential moderating effect of publication type (i.e., whether data were published in a peer-reviewed journal vs. unpublished) using metaregression. Second, we used the trim-and-fill procedure to search for indications of publication bias and to examine whether effect sizes change in analyses that adjust for this bias (Duval & Tweedie, 2000; Egger, Davey Smith, Schneider, & Minder, 1997). Third, we conducted sensitivity analyses comparing the average effect size using all studies with the average effect size using only sufficiently powered studies (Carter, Schönbrodt, Gervais, & Hilgard, 2019; Stanley, Doucouliagos, & Ioannidis, 2017).

Finally, we conducted sensitivity analyses that included the three studies that utilized highly specific manifestations of concealment. These sensitivity analyses were performed on both the overall association between sexual orientation concealment and mental health outcomes as well as on associations between sexual orientation concealment and each of the internalizing (i.e., depression, anxiety, general psychological distress, and problematic eating) and externalizing (i.e., substance use) mental health problems.

Statistical analyses were performed using Stata 15 and the macros *metan*, *metareg*, and *robumeta* (StataCorp, 2017).

Results

Figure 1 illustrates the selection process. The initial electronic searches yielded 5,988 records, and 49 additional records were located through manually searching reference lists of included reports and contacting authors of these reports. There were 4,184 unique records once duplicates were removed. Overall, 3,546 records were excluded at the abstract review stage. The remaining 638 records were reviewed in full, and 428 records were excluded at this stage (see Figure 1 for reasons for exclusion). Two hundred ten records detailing 193 unique studies were deemed eligible for inclusion (see Table 1). The 193 studies included a total of 92,236 study participants. The majority of these studies ($k = 119$; 61.7%) were published in peer-reviewed journals, 51 (26.6%) were unpublished doctoral dissertations, and 21 studies (10.9%) were unpublished; one study was published in a book chapter and one study was an unpublished master’s thesis. We extracted 423 effects of the association between sexual orientation concealment and mental health problems from these 193 unique samples.

Overall Effect Size

Table 3 presents the results from the main analysis examining the association between standardized sexual orientation concealment and mental health problems. The analyses showed a small positive association between sexual orientation concealment and mental health problems ($k = 193$; effect size [ES_r] = 0.116 [$p < .001$]; 95% CI [0.093, 0.141]). Considerable heterogeneity existed between studies: 94.9% of variation between studies was attributable to heterogeneity rather than chance ($I^2 = 94.9\%$; $\tau^2 = 0.0325$).

Factors Contributing to Between-Study Heterogeneity: For Whom and Under What Conditions Is Sexual Orientation Concealment Associated With Mental Health Problems?

In our first analysis of study heterogeneity, we explored potential differences attributable to the type of outcome measure used to assess mental health problems (i.e., depression, anxiety, general psychological distress, problematic eating, and substance use problems). These analyses utilized all available effect sizes from all studies. The analyses showed that mental health problems measured as general psychological distress ($b = 0.061$ [$p = .018$]; 95% CI [0.011, 0.111]) and substance use problems ($b = -0.166$ [$p = .001$]; 95% CI [−0.247, −0.085]) significantly contributed to between-study heterogeneity. Because the type of mental health problem contributed to between-study heterogeneity, we calculated pooled average effects sizes for each mental health problem separately using robust variance estimation (see Table 3). Studies using a measure of general psychological distress to assess mental health problems demonstrated the strongest association between sexual orientation concealment and mental health problems ($k = 65$; $ES_r = 0.163$ [$p < .001$]; 95% CI [0.122, 0.204]). Studies using a measure of substance use problems—the only externalizing mental health problem examined here—showed an association between sexual orientation concealment and mental health in the opposite direction, indicating a negative association between concealment and substance use problems ($k = 20$; $ESr = -0.061$ [$p = .002$]; 95% CI [−0.096, −0.026]). That is, whereas sexual orientation concealment showed a small positive association with internalizing mental health problems, it showed a small negative association with substance use problems.

Because the results above showed that the association between sexual orientation concealment and mental health problems operated in opposite directions for internalizing mental health problems and substance use problems, subsequent analyses of heterogeneity were stratified and analyzed separately for these two broad types of mental health problems. Power calculations (Valentine, Pigott, & Rothstein, 2010) were used to assess the appropriateness of subsequent tests of moderation. Given the high number of studies contributing effect sizes for internalizing mental health problems ($k = 188$; average sample size: $n = 482$), analyses of study heterogeneity could be conducted with sufficient power for all hypothesized moderators. Yet, given the relatively smaller number of studies contributing effect sizes for substance use problems ($k = 20$; average sample size: $n = 886$), analyses of heterogeneity for these studies must be interpreted with caution because the nonsignificant results for these analyses could be due to insufficient power, rather than true lack of association.

As the next step in examining the contribution of study and sample characteristics to between-study heterogeneity, we conducted metaregressions in which type of measure of sexual orientation concealment (i.e., lack of active disclosure, lack of open behavior, lack of general openness, and lack of public knowledge), time period (i.e., year of data collection), study location, use of dichotomous measure of concealment, use of dichotomous measure of mental health problem, mean age of participants, proportion of the sample that is male, proportion of the sample that completed at least some college, whether the sample was composed of mostly racial/ethnic minority participants, and whether the sample was exclusively bisexual were used to predict between-study heterogeneity in separate bivariate metaanalyses (see Table 4).

In bivariate analyses among studies examining the association between concealment and internalizing mental health problems, those that measured sexual orientation concealment as lack of open behavior and had data that were collected more recently showed stronger associations between concealment and internalizing mental health problems. In contrast, studies that measured sexual orientation concealment as lack of active disclosure or public knowledge, used a dichotomous measure of concealment, contained participants with an older mean age, and utilized exclusively bisexual samples showed significantly smaller associations between concealment and internalizing mental health problems. We graphically depicted the bivariate associations involving continuous variables. Figure 2 graphically depicts the bivariate association between time period and study effect for the association between sexual orientation concealment and internalizing mental health problems, whereas Figure 3 displays the bivariate association between mean age of study participants and study effect for the association between sexual orientation concealment and internalizing mental health problems. Only one of the proposed moderators was found to significantly explain between-study heterogeneity in the association between concealment and substance use problems, namely whether studies employed a dichotomous measure of substance use problems. Specifically, studies using a dichotomous measure of substance use problems showed significantly smaller associations between concealment and substance use problems than studies using continuous measures of substance use problems. The small number of significant moderators of between-study heterogeneity for substance use problems could, as noted above, be attributable to low power rather than lack of true effect.

All variables that significantly contributed to between-study heterogeneity in the association between concealment and internalizing mental health problems in the above bivariate analyses were then entered into a multivariate metaregression analysis, and nonsignificant moderators were removed using backward deletion. The results of the final multivariate metaregression analyses are presented in Table 5. The model included studies measuring sexual orientation concealment as lack of open behavior, mean age of participants, studies using exclusively bisexual samples, and studies using a dichotomous measure of concealment as moderators. The model showed that 16.2% of between-study heterogeneity could be explained by these variables, although a fair amount of unexplained between-study variance remained.

Publication Bias

We conducted several tests to ascertain potential publication bias. First, we analyzed the potential moderating effect of publication type (i.e., whether data were published in a peer-reviewed journal vs. unpublished) using metaregression. The effect reported in published studies was not significantly different from the effect reported in unpublished studies (internalizing mental health problems: $b = 0.032$ [$p = .094$]; 95% CI [−0.005, 0.069]; substance use problems: $b = -0.050$ [$p = .079$]; 95% CI [−0.106, 0.006]. Second, we used the trim-and-fill procedure to inspect potential change in the effect size in analyses that adjusted for publication bias. Using the trim-and-fill procedure, we did not estimate any "missing" studies; that is, the distribution of study effect sizes was sufficiently symmetric for studies of both internalizing mental health problems and substance use problems. As a third strategy to analyze potential publication bias, we conducted sensitivity analyses comparing the average effect size using all studies with the average effect size using only sufficiently powered studies. We identified a total of 34 sufficiently powered studies using internalizing mental health problems as an outcome. A sensitivity analysis of the average effect size using only sufficiently powered studies (i.e., studies with *N*s > 645) produced a slightly lower average effect size ($k = 34$; $ES_r = .080$ [$p = .005$]; 95% CI [0.027, 0.134]) than the effect size found across all studies ($k = 188$; $ES_r = .123$ [$p < .001$]; 95% CI [0.103, 0.144]). For studies reporting results for substance use problems, there was only one sufficiently powered study in our records, precluding additional sensitivity analyses. Based on these three means of testing potential publication bias, we conclude that it is unlikely that publication bias substantially affected these meta-analytic results. Potentially, there might be a slight overestimation of our average effect size for studies of the association between concealment and internalizing mental health problems, although the fact that our review finds several null or unexpected associations provides evidence that there is not systematic bias on selecting only significant effects into the literature.

Sensitivity Analysis

In a sensitivity analysis that included the three identified studies using concealment measures that did not match any of the four categories, but which nonetheless captured sexual orientation concealment, albeit from very limited domains (i.e., mental health providers, health care provider, and adult children), we found an identical pattern of results with the only difference from the primary analyses being slightly smaller effect sizes for the associations between sexual orientation concealment and mental health in the sensitivity analysis (see Table 1 in the online supplemental materials).

Discussion

Across 193 unique studies containing a total of 92,236 participants, this conceptual and meta-analytic review finds a small positive association between sexual orientation concealment and mental health problems. Studies that measured mental health in terms of general psychological distress and substance use problems explained a significant proportion of between-study heterogeneity. Studies that examined associations between sexual orientation concealment and internalizing mental health problems (i.e., depression, anxiety, psychological distress, eating problems) showed a small positive association, whereas those

that examined associations between sexual orientation concealment and substance use problems showed a small negative association. Further, studies that assessed sexual orientation concealment as lack of open behavior (vs. lack of active disclosure, lack of general openness, and lack of public knowledge) showed larger associations between concealment and internalizing mental health problems. Among studies of internalizing mental health outcomes, those conducted more recently, with younger participants, with exclusively bisexual samples, and with continuous measures of concealment and/or mental health problems showed larger associations than those conducted in the more distant past, with older participants, with heterogeneous minority sexual identities, and with dichotomous measures of concealment and mental health problems. In the multivariate model, the significant moderating effect of time period disappeared but the other significant bivariate moderating effects remained. Study location, sample gender composition, educational attainment, and sample racial and ethnic composition did not explain between-study heterogeneity. Our examination of potential publication bias indicated that the pooled effects of this meta-analysis are likely not influenced by publication bias. Results have implications for conceptual distinctions among mental health problems, measurement selection, life course considerations, and the distinct determinants of bisexual mental health in the study of sexual minority mental health.

Implications for Internalizing Versus Externalizing Mental Health Problems

Results have implications for the conceptual distinction between internalizing and externalizing mental health problems in studies of sexual orientation concealment, and perhaps for the study of sexual minority mental health more broadly. Whereas minority stress theory (Meyer, 2003) represents the most plausible explanation for the association between sexual orientation concealment and internalizing mental health problems, social norms within sexual minority communities have also been found to serve as an additional source of the sexual orientation disparity in substance use (e.g., Cochran et al., 2012; Hatzenbuehler et al., 2008; Hatzenbuehler et al., 2015), although less thoroughly considered than minority stress. On the one hand, our results are consistent with minority stress theory (Meyer, 2003) and the psychosocial model of stigma concealment (Pachankis, 2007), which propose that sexual orientation concealment drives internalizing mental health problems because of its associations with cognitive, affective, and behavioral stress responses to anticipated rejection upon disclosure. On the other hand, our results also expand those theories to further consider the perhaps paradoxical negative association of concealment with substance use problems—the one externalizing mental health problem examined here. Specifically, perhaps sexual minorities who conceal are less embedded within sexual minority communities than those who are open, which would lead to less exposure to the more permissive norms about substance use in sexual minority communities (compared with heterosexual communities) and therefore less substance use among sexual minorities who conceal (Cochran et al., 2012). This finding is further supported by sociological accounts of substance use within sexual minority communities, which find that stigma has historically constrained sexual minority socializing to venues in which substance use is common (Hughes et al., 2016; Trocki et al., 2005).

Taken together, results are consistent with minority stress theory's proposed positive association between concealment and mental health problems when those problems are operationalized as internalizing problems. Although the minority stress of concealment might also contribute to sexual minorities' substance use, other protective factors seem to outweigh those stressors to predict a negative association between concealment and this externalizing outcome. Based on the present findings, future studies of sexual minority mental health might seriously consider examining distinct determinants of, or distinct patterns of associations between, social determinants of mental health and internalizing versus externalizing mental health problems separately. At the same time, the average size of the association between concealment and both internalizing mental health problems and substance use problems is small, making tentative any practical implications of these findings.

Implications for Measurement

Results also have implications for measurement. Studies that measured sexual orientation as lack of open behavior showed significantly larger associations between concealment and internalizing mental health problems than studies that measured sexual orientation concealment as lack of active disclosure, lack of general openness, and participants' perceptions that others were not aware of their sexual orientation. Studies of concealment as lack of open behavior are those that focus on behaviorally managing the visibility of one's sexual minority status in interactions with others (e.g., through avoiding certain topics of conservation, such as dating). This construct is most frequently measured with the Outness Inventory (Mohr & Fassinger, 2000), which assesses both whether important others do not know of one's sexual orientation and how infrequently it is discussed with them, thereby distinguishing it from studies of lack of active disclosure, lack of general openness, or lack of public knowledge. Our finding of a comparatively larger association between this measure of concealment (vs. the other concealment operationalizations) and internalizing mental problems therefore suggests that sexual orientation concealment, when conceptualized as this deeper, more ongoing level of engagement with one's identity (rather than an all-or-nothing disclosure on the one hand or general openness on the other), has significantly stronger implications for mental health. Perhaps some sexual minorities who are "out" nonetheless still grapple with their sexual identity. This grappling, perhaps, is captured by the "how infrequently it is discussed" component of the Outness Inventory, which applies even to those who are already out. Measures in our open behavior category catch this nuance and its implications for mental health, but measures in the other categories may not distinguish as well between those who are out without ambivalence and those who may be out but still find their sexual orientation to be difficult to discuss or to otherwise more deeply engage on an ongoing basis. Of course, given that our analysis cannot establish directionality, perhaps the inverse is also true—that internalizing mental health problems leads one to avoid that type of deeper, ongoing public engagement of their sexual orientation more than it leads them to avoid more discrete disclosures or more general open behavior.

The larger association with internalizing mental health problems found for studies measuring concealment as lack of open behavior might also be a function of the types of studies represented in this review. Because most studies concerning sexual orientation

concealment and mental health problems are conducted using nonprobability samples of relatively open participants in relatively accepting societies, perhaps many participants have already actively disclosed their sexual orientation to many or most others in their lives (Category 1: lack of active disclosure) and consider themselves to be generally open (Category 3: lack of general openness). Therefore, measuring concealment in these ways might not yield sufficient variation from which to meaningfully predict mental health. Still, even those sexual minorities who have disclosed their sexual orientation and are generally open might nonetheless suppress open behavior, mannerisms, and appearance on a day-to-day basis, especially depending on their daily social context. Therefore, we recommend that future studies conducted with relatively open sexual minority samples in relatively accepting societal contexts at least assess sexual orientation concealment as lack of open behavior (Category 2: lack of open behavior), whether or not they also assess concealment using one of the other approaches reviewed here. Of course, future studies in contexts in which acceptance, and therefore openness, are not the norm might find that assessing concealment as lack of active disclosure and lack of general openness also yields sufficient variation for meaningful prediction.

Practically, our results show that researchers might wish to conceptualize and measure sexual orientation concealment in terms of lack of open behavior rather than lack of active disclosure, lack of general openness, or lack of public knowledge, when examining associations with mental health. Of course, construct selection depends on study purpose and studies seeking to understand mental health implications of discrete disclosures or general open behavior ought to select measures of those respective constructs and be prepared to understand the theoretical meaning of weak associations that might result. The present meta-analysis did not investigate associations between concealment and outcomes other than mental health (e.g., physical health, social behavior) or social determinants of concealment (e.g., childhood influences, current social context). Researchers of those constructs should therefore consider the present findings in light of the theoretical associations among those constructs.

Life Course Implications

Results also have implications for the life course study of sexual minority mental health. Compared with more distantly conducted studies, more recently conducted studies demonstrated a significantly larger association between sexual orientation concealment and internalizing mental health problems. This finding can potentially be interpreted in terms of the substantial cohort effects affecting this population (e.g., Cohler & Hammack, 2007; Hammack et al., 2018; Russell & Fish, 2019). For instance, the association between concealment and internalizing mental health problems might be more marked for more recent cohorts because of the relatively fewer benefits of remaining closeted today than in years past, at least in the relatively accepting contexts in which most of the included studies were conducted. The disclosure process model (Chaudoir & Fisher, 2010) suggests that the decision to conceal a stigmatized identity is a function of the perceived benefits of concealment weighed against the costs of disclosure. In the primarily North American research field that we review in the present study, the costs of disclosure for today's sexual minorities are, for many, notably fewer than the costs of concealment because of the rapid

societal change that has afforded sexual minorities numerous advantages of disclosure that did not exist in previous decades (e.g., Flores, 2019).

Life course considerations of sexual minority mental health are also expanded by the age effects found here. Specifically, we find that studies of younger participants demonstrated a larger association between concealment and mental health problems than studies of older participants, inviting the possibility that younger sexual minorities possess fewer psychological (e.g., emotion regulation) and contextual (e.g., geographic mobility, affirmative mental health care) resources for coping with the stressors of concealment than older sexual minorities (Casey et al., 2008; Durso & Meyer, 2013; Hatzenbuehler & Pachankis, 2016). Further, social stressors such as concealment—especially if motivated by fears of targeted rejection—might have a relatively larger impact during adolescence and young adulthood than in later adulthood (Andersen & Teicher, 2008; Charmandari et al., 2003; Leussis & Andersen, 2008; Murphy et al., 2013; Romeo et al., 2006). Notably, although several studies in this review were comprised of young adults (e.g., D'Augelli et al., 2002; Rosario, Schrimshaw, & Hunter, 2006; Shilo & Savaya, 2012), very few were comprised solely of adolescents (e.g., Kosciw et al., 2015). Together, these results suggest the essential role of life course considerations in studies of sexual orientation concealment and mental health problems and call for future studies across age cohorts, as further emphasized below.

Distinct Implications of Concealing Bisexuality

Results also have implications for understanding the significant mental health disparity between bisexual versus gay and lesbian individuals (Bostwick et al., 2010). We find that the association between concealment and internalizing mental health problems is smaller for bisexual compared with gay and lesbian individuals. As noted earlier, bisexual individuals endorse less centrality of their minority sexual identities to their overall sense of self than do gay and lesbian individuals (e.g., Dyar, Feinstein, & London, 2014). Any stressors associated with such an identity are therefore likely to be less impactful for bisexual individuals' mental health, as their bisexual identities might not be as deeply tied to their overall sources of personal and collective esteem as are gay and lesbian identities (Ashmore, Deaux, & McLaughlin-Volpe, 2004). Further, the smaller association between concealment and mental health problems found for studies of exclusive bisexual composition might be attributble to stigma. Specifically, because bisexual individuals' identities are less reflected in institutions and normative discourse both within general society and within gay and lesbian communities (Steinman, 2000), any protective effects of disclosure, such as increased social support or access to other identity-specific protections (Chaudoir & Fisher, 2010), are likely to be smaller. Of course, bisexuality comprises a remarkably diverse set of experiences, calling for future research to examine subgroup differences within bisexual populations in the association between concealment and mental health problems and the mechanisms that unite them or not in this population.

Methodological Limitations of Existing Research and Future Directions

The fact that study location, sample gender composition, educational attainment, and sample racial and ethnic composition did not explain between-study heterogeneity highlights some

of the distinct methodological features and limitations of the studies included here. These common study limitations in turn suggest several methodological improvements for future research.

First, understanding the mental health consequences of concealment requires methodological designs capable of establishing causal inference. With notable exceptions (e.g., Pachankis, Sullivan, Feinstein, & Newcomb, 2018; Rosario et al., 2009), few longitudinal studies have been conducted on the association between sexual orientation concealment and mental health and no experimental study has been conducted that has manipulated the concealment demands placed upon sexual minorities to examine downstream mental health. Related research has found that sexual minorities exposed to a discriminatory video clip are less likely to disclose their sexual orientation in a subsequent written reflection task than those exposed to an affirming video clip (Seager, 2016). Conversely, other experimental research shows that sexual minority men who write about minority stress experiences are more likely to disclose their sexual orientation three months later (Pachankis & Goldfried, 2010). Whereas these studies suggest that discrimination can cause sexual orientation concealment and writing about minority stress can encourage disclosure, they do not examine whether sexual orientation concealment causes mental health problems. Experimental research with other populations with concealable stigmas (e.g., those with eating disorders) suggests that stigma concealment can drive cognitive, affective, and behavioral manifestations of internalizing problems (e.g., Smart & Wegner, 1999). Still, future research is needed to rule out reverse causality, as depression and anxiety might also diminish sexual orientation disclosure (Mohr & Fassinger, 2003), perhaps through personality traits that explain tendencies toward both concealment and internalizing problems (e.g., Larson et al., 2015).

Second, nearly all studies included in this meta-analysis utilized nonprobability sampling and many recruited participants by posting messages in online forums geared to sexual minority communities. Although nonprobability sampling can generate samples of sexual minorities that are uncharacteristic of the total sexual minority population, this concern is particularly problematic when the sample unrepresentativeness directly relates to the variables under study (Meyer & Wilson, 2009), as is the case with studies of concealment. Specifically, nonprobability sampling overrepresents the experience of sexual minorities who are open about their sexual orientation, compared with those who are not open (Hottes et al., 2016; Kuyper et al., 2016). Nonprobability samples also tend to overrepresent the experience of those who are young, preventing stronger tests of the life course effects suggested here. The very few published population-based studies of sexual orientation concealment and mental health find that a substantial number of sexual minorities in the general population report not being out to others and that mental health varies as a function of concealment (Pachankis et al., 2015; van der Star et al., 2018). Future research ought to take advantage of increasing opportunities to use probability-based designs, which are particularly suited to studying phenomena like concealment that are directly related to sampling. Population-based cohort studies, in particular, would allow a strong test of both developmental and cohort influences on concealment and mental health problems, thereby offering a stronger test of the causal direction of these variables than currently exists.

Third, the lack of significant moderating effects for certain demographic factors might be explained by the necessarily crude approach used to classify moderator variables across 193 studies. For instance, this meta-analysis examined race and ethnicity as the proportion of the study sample that was composed of racial and ethnic minority participants. The crude manner by which we examined the moderating influence of ethnicity and race (i.e., in terms of the proportion of the sample that identified as any racial or ethnic minority) prevented us from examining distinct experiences among different racial and ethnic minority subgroups. Indeed, concealment is unlikely to be experienced identically across all races and ethnicities (e.g., Villicana et al., 2016). Therefore, future investigations into the concealment-related experiences of diverse sexual minority populations might consider first qualitatively exploring whether and how diverse populations experience sexual orientation concealment (e.g., Bowleg, Burkholder, Teti, & Craig, 2008) so as to capture relevant mechanisms or moderators of the association between concealment and mental health problems across subgroups.

Fourth, study location was coded as whether or not a study was conducted in North America. Several factors limited our ability to conduct a finer-grained examination of the geographic influences on the association between concealment and mental health. First, preventing analysis of state/provincial effects, approximately two thirds of included studies were collected in general U.S. samples across multiple states and regions, many completely online. Preventing analysis of country effects, only 22.3% of studies contained data collected outside of North America. Given wide variation of sexual minority-related structural stigma within states/provinces and countries, ideally geographic effects would utilize structural stigma measured at the city, municipality, or county level. Yet, only 4.2% of studies contained this information and nearly all of these reported data from large U.S. cities (e.g., New York, Los Angeles, Miami) that contain high degrees of sexual minority acceptance, precluding sufficient variation in geography-bound structural stigma necessary to detect its influence on the association between concealment and mental health. Nonetheless, the finding regarding the lack of difference in effects between studies conducted within versus outside North America tentatively suggests the geographic generalizability of the effect found here. Future research could link indicators of community-level structural stigma, such as those in the General Social Survey or Project Implicit, to nationwide surveys that contain measures of sexual orientation concealment and mental health (e.g., Lattanner et al., 2020).

Fifth, measurement approaches commonly utilized across studies of sexual orientation concealment and mental health problems constrain results and suggest future directions. For instance, most studies utilized self-reports of concealment and mental health. In addition to introducing same-source confounding, such measurements potentially weaken associations because of weak psychometric properties. Although most included studies utilized established measures of mental health outcomes with high reliability, distinct outcomes (e.g., depression and anxiety) were often examined using subscales of the same scale, potentially introducing artificial overlap not explained by true comorbidity across conditions. To increase validity of findings in this area, future research ought to employ interviewer-based assessments with strong construct validity. Our findings also suggest that the use of continuous measures of concealment and mental health outcomes are likely to yield stronger effects, given preserved power when using continuous rather than dichotomous measures

(Altman & Royston, 2006). Future studies might also consider expanding outcomes to include physical health outcomes. In fact, compelling evidence suggests that stigma-related stress can have distinct, even opposite, implications for physical and mental health (Jackson, Knight, & Rafferty, 2010), which our analysis could not capture.

Finally, this meta-analysis finds a small average effect size between concealment and mental health problems, suggesting that future research, including meta-analytic studies, seek to identify the relative mental health impact of concealment alongside the other factors suggested by existing theories of stigma and sexual minority mental health. As noted earlier, minority stress theory (Meyer, 2003), the psychological mediation framework (e.g., Hatzenbuehler, 2009), and the disclosure process model (Chaudoir & Fisher, 2010) specify numerous other factors that likely contribute to this population's mental health, which studies are increasingly examining simultaneously (e.g., Timmins, Rimes, & Rahman, 2020). To the extent that meta-analytic evidence could be brought to bear on the relative influence of these factors—from discrimination and victimization to anticipated rejection, rumination, social support, and community norms—psychological science will be best positioned to intervene effectively.

Conclusions

In conclusion, this meta-analysis reveals a small positive association between sexual orientation concealment and internalizing mental health problems and a small negative association between sexual orientation concealment and substance use problems. The association between sexual orientation concealment and internalizing mental health problems was somewhat larger in those studies that assessed concealment as lack of open behavior, those conducted recently, and those with younger samples; it was smaller in exclusively bisexual samples. This review highlights several directions in future measurement of sexual orientation concealment and the need for stronger tests of causality, representative sampling, more nuanced assessment of potential effect moderators, geographic diversity, more valid measurement approaches, and meta-analytic examinations of concealment alongside the numerous other determinants of this population's mental health. Although these recommendations apply to all sexual minority mental health research, they are particularly relevant to the study of sexual orientation concealment given the distinct methodological challenges posed by this phenomenon. These advances will allow researchers to come closer to answering how and under what circumstances sexual orientation concealment—a pervasive aspect of the sexual minority experience—comes to shape the health of this population.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Appendix: Full PsycINFO Search Strategy

Field Labels

- exp/= exploded controlled term
- /= non exploded controlled term
- .ti,ab,id. = title, abstract and author keywords
- cq,ca,in = Correspondence address, corporate/institutional author, institution
- adjx = within *x* words, regardless of order

* = truncation of word for alternate endings

1. bisexuality/
2. exp homosexuality/
3. same sex intercourse/
4. same sex couples/
5. same sex marriage/
6. (queer* or LGB* or LGBTQ or LGBQ or LGBTQI or GLB or LGB or LGBT or GLBT or homosexual* or lesbian* or gay* or bisexual* or bisexual* or sexual minorit* or sexual orientation* or bicurious or lesbigay* or men who have sex with men or MSM or MSMW or men loving men or same sex or same sex couple* or same sex relation* or women loving women or “women who have sex with women” or WSW or same gender loving or same-gender loving or same-gender-loving or asexual* or demisexual* or pansexual* or polysexual* or polyamor*).ti,ab,id.
7. or/1–6
8. exp mental disorders/
9. exp mental health/
10. exp chronic mental illness/
11. exp anxiety disorders/
12. exp affective disorders/
13. exp eating disorders/
14. exp substance use disorder/
15. exp drug seeking/
16. exp drug addiction/

17. exp drug usage/
18. exp amphetamine/
19. exp hallucinogenic drugs/
20. exp alcohol drinking patterns/
21. exp alcoholism/
22. cocaine/
23. tobacco smoking/
24. binge eating/
25. anxiety/
26. social anxiety/
27. “depression (emotion)”/
28. stress/
29. chronic stress/
30. psychological stress/
31. social stress/
32. (mental health or mental disorder* or mental illness* or behavioral health or behavioral health or anxiety or feeding disorder* or eating disorder* or appetite disorder* or anorexi* or binge-eating or bulimi* or rumination disorder or food addict* or compulsive eating or night eating or pica or allotriophagy or geophagia or mood disorder* or affective disorder or depressive or depression or melancholia* or dysthymic or stress* or psychological distress* or distress* or psychological wellbeing or wellbeing or psychological well-being or well-being or addict* or etoh or alcohol* or alcohol us* or alcohol abuse or alcohol dependen* or drug* or drug us* or drug abuse or drug dependen* or substance* or substance us* or substance abuse or substance dependence or cocaine or amphetamine* or methamphetamine* or smoking or cigarette or tobacco or marijuana or cannabis or hallucinogen* or ecstasy or crystal meth or heroin or MDMA or GHB or ketamine or LSD).ti,ab,id.
33. or/8–32
34. (conceal* OR closet* OR disclos* OR nondisclos* OR undisclos* OR outness OR coming-out OR coming out OR open* OR cover*).ti,ab,id.
35. 7 and 33 and 34

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Public Significance Statement

Across 193 studies, sexual orientation concealment demonstrates small positive associations with internalizing mental health problems (i.e., depression, anxiety, distress, problematic eating) and a small negative association with substance use problems, suggesting potentially distinct pathways to these outcomes among sexual minorities. The association between sexual orientation concealment and mental health likely depends on the time period in which the study was conducted, the specific measurement of concealment used, and the age and sexual identity of sexual minority participants.

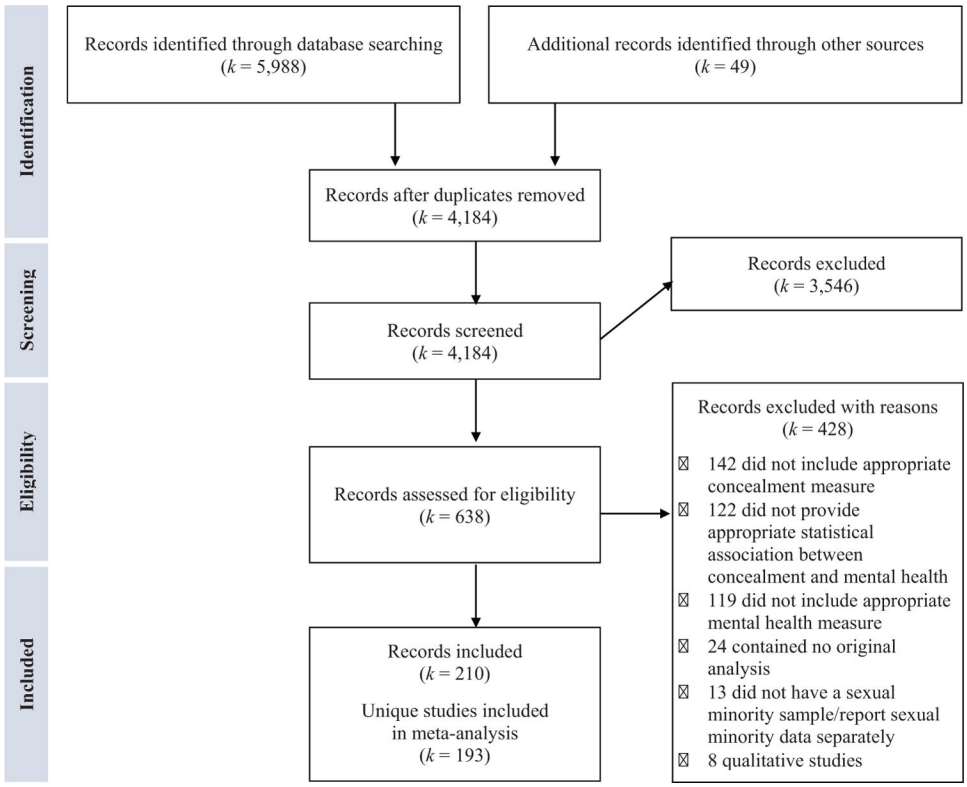

Figure 1.
Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram of article selection.

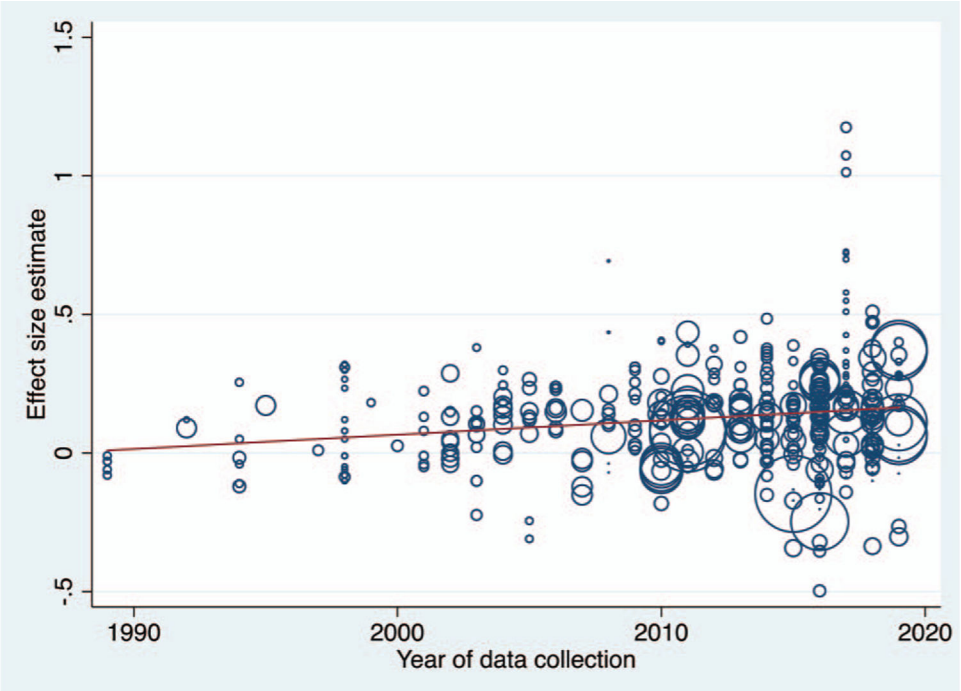

Figure 2.

Year of data collection as moderator of the association between sexual orientation concealment and internalizing mental health problems.

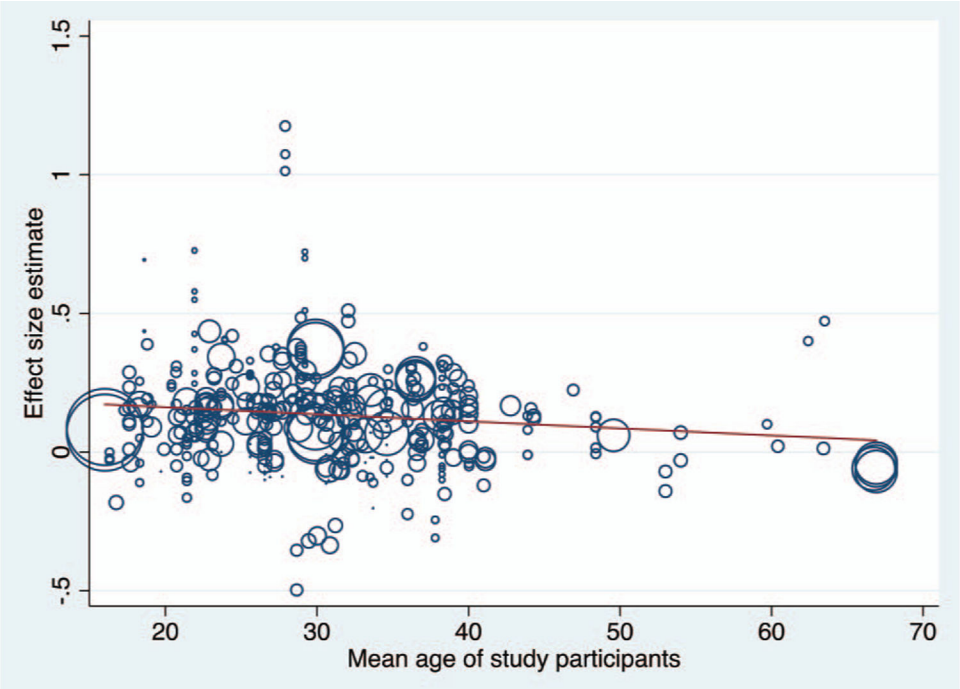

Figure 3.

Mean age of study participants as moderator of the association between sexual orientation concealment and internalizing mental health problems.

Table 1

Summary of Hypothesized Moderators in Terms of Their Extracted Information, Coding, and Average Distribution Across Studies

Moderator	Value	Coding description and criteria	Descriptive statistics
Concealment operationalization			
Lack of active disclosure	0 = No 1 = Yes	Categorical variable representing whether or not the study used a concealment measure that captured the number or proportion of people in a given social category (e.g., friends, family) to whom a sexual minority individual *has* not explicitly disclosed their sexual orientation.	*k* = 193 No *k* = 171 (88.6%) Yes *k* = 22 (11.4%)
Lack of open behavior	0 = No 1 = Yes	Categorical variable representing whether or not the study used a concealment measure that captured *both* the extent to which people in a given social category (e.g., coworkers, heterosexual friends) do not know about an individual's sexual orientation *and* how infrequently one's sexual orientation is presently discussed in those relationships.	*k* = 193 No k = 106 (54.9%) Yes k = 87 (45.1%)
Lack of general openness	0 = No 1 = Yes	Categorical variable representing whether or not the study used a concealment measure that captured an individual's lack of general openness about their sexual orientation with people in a given social category (e.g., parents, people in general).	*k* = 193 No *k* = 135 (69.9%) Yes *k* = 58 (30.1%)
Lack of public knowledge	0 = No 1 = Yes	Categorical variable representing whether or not the study used a concealment measure that captured a lack of public knowledge on behalf of people in a given social category (e.g., peers, spouse's family) regarding an individual's sexual orientation.	*k* = 193 No *k* = 160 (82.9%) Yes *k* = 33 (17.1%)
Study characteristics			
Time period	Continuous	Continuous variable representing estimated year of data collection (or year of publication minus 8 years for studies lacking this information).	*k* = 193 M = 2007 *SD* = 8 Range = 1983–2019
Study location	0 = Outside North America 1 = Within North America 2 = Combination of Outside and Within North America	Categorical variable representing whether the sample was drawn from outside North America, within North America, or a combination of the two.	*k* = 193 Outside North America *k* = 34 (17.6%) Within North America *k* = 148 (76.7%) Combination *k* = 9 (4.7%) Missing *k* = 2 (1.0%)
Use of dichotomous measure of concealment	0 = No 1 = Yes	Categorical variable representing whether or not the study used a dichotomous measure of concealment.	*k* = 193 No *k* = 186 Yes *k* = 7
Use of dichotomous measure of mental health problems	0 = No 1 = Yes	Categorical variable representing whether or not the study used a dichotomous measure of concealment.	*k* = 193 No *k* = 189 Yes *k* = 4
Sample characteristics			
Age	Continuous	Continuous variable representing the mean age of the sample.	*k* = 170 M = 31.60 *SD* = 10.08 Range = 16.00–66.90
Gender	Continuous	Continuous variable representing the proportion of the sample that identified as cisgender males.	*k* = 192 M = 52.44

Moderator	Value	Coding description and criteria	Descriptive statistics
			SD = 35.18 Range = 0–100
Educational attainment	Continuous	Continuous variable representing the proportion that had completed at least some college.	*k* = 139 M = 76.57 *SD* = 23.22 Range = 0–100
Race/ethnicity	0 = No 1 = Yes	Categorical variable representing whether or not the majority of participants identified as racial/ethnic minority.	*k* = 193 No *k* = 140 (72.5%) Yes *k* = 25 (13.0%) Missing *k* = 28 (14.5%)
Exclusive bisexual composition	0 = No 1 = Yes	Categorical variable representing whether the sample consisted exclusively of bisexual participants.	*k* = 193 No *k* = 169 (87.6%) Yes = 10 (5.2%) Missing *k* = 14 (7.3%)
Dependent variable characteristics			
Depression symptoms	0 = No 1 = Yes	Categorical variable representing whether or not the study included a measure of depression symptoms.	*k* = 193 No *k* = 72 (37.3%) Yes *k* = 121 (62.7%)
Anxiety symptoms	0 = No 1 = Yes	Categorical variable representing whether or not the study included a measure of anxiety symptoms (including generalized anxiety, social anxiety, and fear of negative evaluation).	*k* = 193 No *k* = 126 (65.3%) Yes *k* = 67 (34.7%)
General psychological distress	0 = No 1 = Yes	Categorical variable representing whether or not the study included a measure of general psychological distress (including rumination and combined measures of anxiety and depression).	*k* = 193 No *k* = 128 (66.3%) Yes *k* = 65 (33.7%)
Problematic eating	0 = No 1 = Yes	Categorical variable representing whether or not the study included a measure of problematic eating.	*k* = 193 No *k* = 186 (96.4%) Yes k = 7 (3.6%)
Substance use problems	0 = No 1 = Yes	Categorical variable representing whether or not the study included a measure of substance use (i.e., drug and alcohol use) problems.	*k* = 193 No *k* = 174 (90.2%) Yes *k* = 19 (9.8%)

Table 2

Descriptive Information of Included Studies of Sexual Orientation Concealment and Mental Health Problems

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
Antebi-Gruszka and Schrimshaw (2018)	Journal article	203	2007–2010	USA	36.9	11.2	100.0	69.5	73.4	No	Lack of Active Identity Disclosure; Lack of Public Knowledge	Mental Health Inventory	0.05
Aranda (2010)	Dissertation	349[b]	2000–2005	USA	38.4	11.9	0.0	59.8	46.2	No	Lack of Public Knowledge	Diagnostic Interview Schedule	−0.07
Ayala and Coleman (2000)	Journal article	117	1997–1998	Canada	–	–	0.0	82.9	9.0	No	Lack of General Openness	Generalized Contentment Scale	0.30
Baams, Dubas, Russell, Buikema, and van Aken (2018); Kaufman, Baams, and Dubas (2017)	Journal article; Unpublished effect size	209[b]	2014	The Netherlands	17.6	1.9	28.8	66.4	–	No	Lack of Public Knowledge	Depressive Mood List; Screen for Child Anxiety-Related Emotional Disorders	0.15
Baams, Grossman, and Russell (2015)	Journal article	876	2007[*]	USA	18.3	1.8	46.2	34.1	56.0	No	Lack of Public Knowledge	Beck Depression Inventory for Youth	0.17
Balsam and Mohr (2007)	Journal article	613	1999[*]	USA	36.3	11.5	36.4	75.7	9.6	No	Lack of Open Behavior	Brief Symptom Inventory	0.15
Beaber (2008)	Dissertation	208	2000[*]	Global	30.3	8.7	0.0	91.9	24.9	Yes	Lack of Open Behavior	Center for Epidemiologic Studies Depression Scale	0.11
Beard, Eames, and Withers (2017)	Journal article	139	2012–2013	UK	38.3	11.6	95.0	–	5.8	No	Lack of Open Behavior	BBC Well-being Scale	0.30
Becraft (1992)	Master's thesis	42	1984[*]	USA	30.7	5.6	0.0	95.2	24.0	No	Lack of General Openness	Center for Epidemiologic Studies Depression Scale	0.12

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
Bejakovich and Flett (2018)	Journal article	402	2010*	New Zealand	28.7	10.2	27.9	–	18.9	No	Lack of Open Behavior	Affectometer 2	0.36
Birichi (2015)	Dissertation	226	2007*	USA	29.1	9.5	100.0	88.6	28.8	No	Lack of Open Behavior	Positive and Negative Affect Scale	0.17
Bittner (2016, Full study)	Dissertation	263	2008*	USA	29.5	11.6	33.3	40.2	9.5	No	Lack of Active Identity Disclosure	Symptom Checklist-90-Revised	0.25
Blashill (2016)	Unpublished	231	2016	USA	24.7	5.4	100	–	38.8	No	Lack of Open Behavior	Dysmorphic Concerns Questionnaire	0.30
Blashill (2018)	Unpublished	961	2018	USA	23.7	3.7	49.8	–	66.9	No	Lack of Open Behavior	Dysmorphic Concerns Questionnaire; Eating Disorder Examination Questionnaire	0.33
Bosker (2002)	Dissertation	102	2001	USA	43.9	16–73	57.8	66.7	15.7	No	Lack of Active Identity Disclosure; Lack of Public Knowledge	Beck Anxiety Inventory; Beck Depression Inventory-II	0.05
Bränström (2019)	Unpublished effect size	2,539	2016	Sweden	34.6	13.0	87.4	42.8	–	No	Lack of General Openness	Alcohol Use Disorders Identification Test; Brief Symptom Inventory	0.04
Brewster, Moradi, DeBlaere, and Velez (2013); Brewster (2011)	Dissertation; Journal article	411	2003*	USA	34.3	14.0	37.0	91.0	21.0	No	Lack of Open Behavior	Hopkins Symptoms Checklist-21	0.08
Byrd (2015, sexual minority sample)	Dissertation	93	2013–2014	USA	16.3	1.1	30.1	0.0	33.3	No	Lack of Active Identity Disclosure	Center for Epidemiologic Studies Depression Scale; Screen for Child Anxiety-Related Emotional Disorders	−0.02
Carden (2009)	Dissertation	183	2009	USA	–	–	49.2	–	15.2	No	Lack of Open Behavior	Mood and Anxiety Symptom	0.16

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
												Questionnaire—Short Form	
Carroll (1995)	Dissertation	205	1994	USA	41.0	10.7	0.0	94.1	42.5	No	Lack of General Openness	Symptom Checklist-90-Revised	−0.14
Chan (2017)	Dissertation	140	2016	Hong Kong	26.7	5.3	36.4	–	100.0	No	Lack of General Openness	Brief Symptom Inventory	0.15
Chan, Operario, and Mak (2020)	Journal article	931	2011*	Hong Kong	25.3	6.6	50.3	89.4	96.5	No	Lack of Open Behavior	Generalized Anxiety Disorder-7; Patient Health Questionnaire-9	0.17
Chaudoir and Quinn (2016)	Journal article; Unpublished effect size	9	2008	USA	18.6	0.8	44.4	100.0	33.3	No	Lack of Public Knowledge	Center for Epidemiologic Studies Depression Scale	0.51
Chiang (2009)	Dissertation	136	2009	USA	36.2	18–79	97.3	92.0	42.0	No	Lack of Open Behavior	Hospital Anxiety and Depression Scale	0.27
Clark (2012)	Dissertation	271	2004*	USA	32.3	9.5	0.0	96.3	17.6	Yes	Lack of Open Behavior	Center for Epidemiologic Studies Depression Scale	0.17
Clemens (2004)	Dissertation	113	1999–2001	USA	40.0	9.5	0.0	62.7	100.0	No	Lack of Active Identity Disclosure; Lack of Public Knowledge	Center for Epidemiologic Studies Depression Scale	−0.05
Cohen (2016, Study 1)[c]; Cohen, Blasey, Barr Taylor, Weiss, and Newman (2016)	Dissertation; Journal article	156	2014–2015	USA	18.8	1.1	36.0	100.0	26.5	No	Lack of General Openness	Beck Depression Inventory-II; Generalized Anxiety Disorder Questionnaire-IV; Social Phobia Diagnostic Questionnaire	0.22
Cohen (2016, Study 2)[c]	Dissertation	101	2008*	USA	21.4	36	100.0	100.0	38.7	No	Lack of General Openness	Beck Depression Inventory-II; Brief Fear of Negative Evaluation Scale; Generalized Anxiety Disorder Questionnaire-IV; Social Phobia Diagnostic Questionnaire	−0.01

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
Cole, Kemeny, Taylor, Visscher, and Fahey (1996)	Journal article	80	1984–1993	USA	–	23–50	100.0	86.0	4.0	No	Lack of General Openness	Center for Epidemiologic Studies Depression Scale; Profile of Mood States; Taylor Manifest Anxiety Scale	−0.04
Corrington, Nittrouer, Trump-Steele, and Hebl (2019)	Journal article	219	2010*	Amazon Mechanical Turk	32.1	8.7	100.0	–	22.0	No	Lack of Open Behavior	Brief Symptom Inventory	0.31
Currin et al. (2018)	Journal article	209	2010*	USA	34.6	12.7	100.0	82.8	19.7	No	Lack of Open Behavior; Lack of Public Knowledge	Alcohol Use Disorders Identification Test; Center for Epidemiologic Studies Depression Scale Revised; Drug Abuse Screening Test-10	0.05
D'Augelli (2002); D'Augelli (2003)	Journal article	500	1987–1989; 1995–1997	Canada, USA	19.1	1.5	62.0	–	–	No	Lack of General Openness	Brief Symptom Inventory	0.09
Deitch (2002)	Dissertation	362	1994*	USA	36.6	9.0	47.0	–	11.0	No	Lack of General Openness; Lack of Public Knowledge	Brief Symptom Inventory	0.01
De Lucia, Smith, Ross, Mohr, and King (2018)	Unpublished	718	2018	USA	38.3	13.9	100.0	–	21.2	Yes	Lack of Open Behavior	State-Trait Anxiety Inventory	0.14
Detwiler (2015)	Dissertation	189	2007*	USA	60.4	7.8	–	97.3	10.0	No	Lack of Open Behavior	Kessler Psychological Distress Scale	0.02
Diaz et al. (2018)	Unpublished	421	2010–2013	USA	30.6	9.5	100.0	78.1	–	No	Lack of Public Knowledge	Patient Health Questionnaire-9	−0.06
DiPlacido (1998)	Book chapter	17	1990*	USA	32.0	–	0.0	–	12.0	No	No category	Center for Epidemiologic Studies Depression Scale; Negative affect	0.55

Psychol Bull. Author manuscript; available in PMC 2021 June 01.

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
Doane (2017, Wave 1 pilot)[c]	Dissertation	337	2016	Amazon Mechanical Turk	32.1	10.2	44.8	92.4	21.4	No	Lack of General Openness; Lack of Open Behavior	Five-item index of mental health	0.27
Doane (2017, Study 1)[c]	Dissertation	2,115	2016	USA	36.5	14.7	64.0	94.9	16.7	No	Lack of General Openness	Depression Anxiety and Stress Scale-21; Positive and Negative Affect Scale	0.26
Dunn, Gonzalez, Costa, Nardi, and Iantaffi (2014)	Journal article	388	2012	Brazil	25.3	7.9	100.0	75.9	44.0	No	Lack of General Openness	Center for Epidemiologic Studies Depression Scale	−0.18
Dyar (2016); Dyar and London (2018)	Dissertation; Journal article; Unpublished effect size	180	2008*	USA	28.7	3.8	0.0	99.5	7.9	Yes	Lack of Open Behavior	Center for Epidemiologic Studies Depression Scale; Generalized Anxiety Disorder-7	−0.40
Dyar, Feinstein, and London (2014); Dyar, Feinstein, Eaton, and London (2016, Study 2); Dyar, Feinstein, Eaton, and London (2018)	Journal article	300	2006*	Australia, Canada, UK, USA	26.8	8.5	0.0	89.4	23.6	No	Lack of Open Behavior	Brief Fear of Negative Evaluation Scale; Generalized Anxiety Disorder-7	0.16
Dyar, Feinstein, Schick, and Davila (2017)	Journal article; Unpublished effect size	390	2009*	USA	27.2	9.9	26.7	87.4	17.9	No	Lack of Open Behavior	Generalized Anxiety Disorder-7; Patient Health Questionnaire-8	−0.03
Earle (1999)	Dissertation	82	1991*	USA	28.8	18–66	0.0	92.6	9.8	No	Lack of General Openness	Multiscore Depression Inventory-Short Form	0.18
Elizur and Ziv (2001)	Journal article	114	1993*	Israel	–	16–55	100.0	57.0	–	No	Lack of Public Knowledge	Mental Health Inventory	0.22
Escher et al. (2019)	Journal article	102	2011*	USA	62.4	5.9	55.9	77.5	15.6	No	Lack of General Openness	Center for Epidemiologic	−0.38

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
												Studies Depression Scale	
Evans (2016); Evans et al. (2018)	Dissertation; Journal article	236	2014–2015	USA	30.1	–	71.8	91.3	15.0	No	Lack of Open Behavior	Generalized Anxiety Disorder-7; Patient Health Questionnaire-8	0.15
Fairlie, Feinstein, Lee, and Kaysen (2018)	Journal article	670	2010*	USA	21.2	2.1	0.0	64.8	32.7	No	Lack of Open Behavior	Young Adult Alcohol Consequences Questionnaire	0.06
Feinstein (2019)	Unpublished	633[b]	2018	USA	26.1	8.2	27.0	84.1	16.9	No	Lack of Open Behavior; Lack of Public Knowledge	Generalized Anxiety Disorder-7; Patient Health Questionnaire-8	0.08
Feinstein et al. (2019)	Journal article	169	2007–2014	USA	20.7	1.3	41.4	48.5	84.0	No	Lack of Open Behavior	Brief Symptom Inventory	−0.02
Feinstein, Dyar, and London (2017)	Journal article	288	2009*	USA	26.9	8.6	0.0	89.8	22.3	No	Lack of Open Behavior	Drug Abuse Screening Test-10; The Brief Michigan Alcoholism Screening Test	−0.08
Feldman (2012)	Dissertation	192	2004*	USA	31.6	10.1	51.0	–	26.2	No	Lack of Open Behavior	Brief Symptom Inventory	0.18
Flojo (2005)	Dissertation	236	1997*	USA	36.4	10.0	53.0	83.5	18.5	No	Lack of Open Behavior	Brief Symptom Inventory	0.25
Foster, Brewster, Velez, Eklund, and Keum (2017)	Journal article	212	2009*	USA	36.6	14.0	45.0	93.0	30.0	No	Lack of Open Behavior	Hopkins Symptoms Checklist-21	0.22
Fredriksen-Goldsen, Shiu, Bryan, Goldsen, and Kim (2017)	Journal article	2,463	2010	USA	66.7	8.9	63.2	–	13.2	No	Lack of Public Knowledge	SF-8 Health Survey	−0.06
Friedman et al. (2019)	Journal article; Unpublished effect size	4,430	2014–2017	USA	–	–	100.0	72.0	100.0	No	Lack of Public Knowledge	Center for Epidemiologic Studies Depression Scale-10	−0.24

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
Frost and Meyer (2009)	Journal article	396	2004–2005	USA	32.4	9.2	50.0	78.0	66.0	No	Lack of General Openness	Center for Epidemiologic Studies Depression Scale	0.07
Giordano (2016)	Dissertation	144	2008*	Amazon Mechanical Turk, USA	–	–	41.7	88.9	50.0	No	Lack of Open Behavior	Generalized Anxiety Disorder-7	0.20
Goodman (2008)	Dissertation	398	2000*	Global	38.3	12.9	49.0	–	31.0	No	Lack of Open Behavior	Hopkins Symptoms Checklist-21	0.21
Griffith and Hebl (2002)	Journal article	379	1994*	USA	39.0	10.0	58.0	69.0	18.0	No	Lack of General Openness; Lack of Open Behavior	Single item assessing for job-related anxiety	0.13
Guschlbauer, Grant Smith, DeStefano, and Soltis (2019)	Journal article	181	2011*	Global	34.6	12.3	35.4	–	14.0	No	Lack of Open Behavior	Kessler Psychological Distress Scale-10	0.17
Habarth (2008)	Dissertation; Unpublished effect size	178	2007–2008	USA	44.1	11.5	53.9	98.4	6.2	No	Lack of Public Knowledge	Center for Epidemiologic Studies Depression Scale	0.16
Handelman (2016)	Dissertation	214	2008*	USA	21.0	15.0	47.7	96.8	34.5	No	Lack of General Openness	Center for Epidemiologic Studies Depression Scale; Social Avoidance and Distress Scale	0.10
Haug (2018)	Dissertation	132	2017	USA	–	–	34.1	100.0	29.6	No	No category	Hopkins Symptoms Checklist-21	0.17
Herek, Cogan, Gillis, and Glunt (1998)	Journal article	147	1990*	USA	33.0	16–68	49.7	–	18.0	No	Lack of General Openness	Center for Epidemiologic Studies Depression Scale	−0.09
Hietpas-Wilson (2007, Wave 3)	Dissertation	130	2001–2002	USA	22.2	1.9	46.5	–	32.3	No	Lack of Public Knowledge	Seven-item index of depressive symptoms	0.15
Hoy-Ellis (2015); Hoy-Ellis (2016); Hoy-Ellis and Fredriksen-	Dissertation; Journal article	2,349	2010	USA	66.9	9.0	64.6	92.4	13.0	No	Lack of Public Knowledge	Center for Epidemiologic Studies Depression Scale-10	−0.05

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
Goldsen (2016)													
Huebner and Davis (2005)	Journal article	71	1997*	USA	38.1	10.6	100.0	45.0	27.0	No	Lack of Public Knowledge	Positive and Negative Affect Scale	−0.27
Jackson and Mohr (2016, Study 2)	Journal article	301	2010	Canada, USA	23.2	5.6	42.5	99.3	23.1	No	Lack of Open Behavior	Center for Epidemiologic Studies Depression Scale	0.22
Jiang, Wang, Hu, and Wang (2019)	Journal article	315	2011*	China	26.8	4.8	53.3	–	–	No	Lack of Open Behavior	Three-item index of job anxiety	0.34
Jones (2017)	Dissertation; Unpublished effect size	309	2016	USA	30.6	12.9	36.2	–	19.8	No	Lack of Open Behavior	Alcohol Use Disorders Identification Test; Drug Abuse Screening Test-10; Hopkins Symptoms Checklist-58; Ruminative Responses Scale	0.04
Jordan (1995); Jordan and Deluty (1998)	Dissertation; Journal article	499	1987*	USA	32.5	19–76	0.0	95.0	16.8	No	Lack of Active Identity Disclosure	State-Trait Anxiety Inventory	0.17
Juster, Smith, Ouellet, Sindi, and Lupien (2013); Juster et al. (2016)	Journal article	46	2010	Canada	23.9	0.8	56.5	97.5	29.8	No	Lack of Active Identity Disclosure	Beck Depression Inventory-II; State-Trait Anxiety Inventory	0.38
Kamen, Jabson, Mustian, and Boehmer (2017)	Journal article	201	2009*	USA	53.0	8.5	0.0	75.6	11.9	No	Lack of Open Behavior	Hospital Anxiety and Depression Scale	−0.11
Kappler (2011)	Dissertation	105	2010	Canada, USA	59.7	11.4	100.0	–	18.5	No	Lack of Active Identity Disclosure	The Depression-Happiness Scale	0.10
Kauth, Barrera, and Latini (2019)	Journal article; Unpublished effect size	119	2015	USA	48.4	14.5	64.7	92.1	19.8	No	Lack of Open Behavior	Overall Anxiety Severity and Impairment Scale;	0.08

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
												Patient Health Questionnaire-9	
Kavanaugh, Taylor, Stuhlsatz, Neppl, and Lohman (2019)	Journal article	941	2010	USA	21.4	18–24	46.0	–	100.0	No	Lack of General Openness	Center for Epidemiologic Studies Depression Scale	0.18
Knight (2006)	Dissertation	164	1998*	USA	39.0	9.7	100.0	97.0	32.9	No	Lack of Open Behavior	Positive and Negative Affect Scale	0.23
Konik (2005)	Dissertation	229	1997*	USA	44.3	19–74	43.4	–	8.4	No	Lack of General Openness	Brief Symptom Inventory	0.13
Kosciw, Palmer, and Kull (2015)	Journal article	7,816	2011	USA	16.0	13–20	35.2	0.0	32.1	No	Lack of General Openness	Center for Epidemiologic Studies Depression Scale	0.08
Kuyper (2015)	Journal article; Unpublished effect size	518	2012–2013	The Netherlands	42.8	11.7	40.2	55.1	–	No	Lack of Public Knowledge	Mental Component Summary of the Short Form 36 Health Survey Questionnaire	0.17
Kuyper (n.d.)	Unpublished	1,373	2012–2013	The Netherlands	49.6	9.4	39.3	16.2	–	No	Lack of Public Knowledge	Mental Component Summary of the Short Form 36 Health Survey Questionnaire	0.06
Lambe (2013)	Dissertation	203	2005*	USA	32.2	8.3	0.0	94.6	18.2	Yes	Lack of Open Behavior	Center for Epidemiologic Studies Depression Scale	0.24
Legate (2014); Legate, Ryan, and Weinstein (2012)	Dissertation; Journal article	145	2004*	USA	29.9	18–65	38.5	–	19.9	No	Lack of Open Behavior	Center for Epidemiologic Studies Depression Scale	0.26
Legate, Weinstein, Ryan, DeHaan, and Ryan (2018)	Journal article; Unpublished effect size	484	2016	Amazon Mechanical Turk	28.4	9.2	37.4	–	28.1	No	Lack of Open Behavior	Center for Epidemiologic Studies Depression Scale; State-Trait Anxiety Inventory	0.19
Lehavot (2011); Lehavot and Simoni (2011)	Dissertation; Journal article	1,381	2003*	USA	33.5	12.1	0.0	87.0	26.0	No	Lack of General Openness	The Brief Michigan Alcoholism Screening Test; Center for EpidemiologicStudies	0.11

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
												Depression Scale-10; Drug Abuse Screening Test-10; Generalized Anxiety Disorder-7	
Lewis (n.d.a)	Unpublished	1,051	2011*	USA	28.8	4.3	0.0	94.6	22.6	No	Lack of General Openness	Center for Epidemiologic Studies Depression Scale	0.09
Lewis (n.d.b)	Unpublished	656	2011*	USA	22.7	3.5	0.0	81.4	23.0	No	Lack of General Openness; Lack of Open Behavior; Lack of Public Knowledge	Mental Health Inventory-5	0.15
Lewis, Milletich, Mason, and Derlega (2014)	Journal article	220	2006*	USA	54.0	11.3	0.0	93.6	5.0	No	Lack of Open Behavior	Positive and Negative Affect Scale; Ruminative Responses Scale	0.02
Li (2018)	Dissertation	357	2010*	USA	30.9	9.5	41.7	–	39.1	No	Lack of General Openness	Hospital Anxiety and Depression Scale	−0.32
Li (2019)	Unpublished	417	2011*	USA	30.0	7.8	39.6	–	40.4	No	Lack of General Openness	Hospital Anxiety and Depression Scale	−0.29
Li and Samp (2019)	Journal article; Unpublished effect size	251	2011*	USA	31.2	9.7	41.8	–	37.6	No	Lack of General Openness	Hospital Anxiety and Depression Scale	−0.26
Liu et al. (2018)	Journal article	134[b]	2017	China	27.9	8.8	100.0	62.4	100.0	No	Lack of General Openness	Symptom Checklist-90-Revised	0.79
Liubovich (2003)	Dissertation	149	1995*	USA	36.0	9.9	0.0	86.8	12.8	No	Lack of Public Knowledge	Eating Disorders Inventory	−0.31
Livingston, Christianson, and Cochran (2016)	Journal article; Unpublished effect size	397[b]	2008*	USA	20.8	2.1	29.0	–	13.1	No	Lack of Open Behavior	Depression Anxiety and Stress Scale-21	0.09
Luu (2011)	Dissertation	662	2003*	USA	32.5	18–76	70.7	61.6	100.0	No	Lack of Open Behavior	Hopkins Symptoms Checklist-25	0.34
Mahon, Kiernan, and Gallagher (2019)	Unpublished	508	2018	Ireland	29.3	9.7	51.2	83.0	3.7	No	Lack of General Openness; Lack of Open Behavior	Brief Fear of Negative Evaluation Scale; Liebowitz Social Anxiety Scale	0.21

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
Marsack and Stephenson (2017)	Journal article	771	2014	USA	32.4	0.4	59.1	78.0	11.0	No	Lack of Open Behavior	Center for Epidemiologic Studies Depression Scale-11	0.05
Martinez (2006)	Dissertation	168	1998*	USA	40.0	11.7	79.2	89.0	35.2	No	Lack of Open Behavior	Mental Health Inventory	0.23
Mason (2016); Mason, Lewis, and Heron (2017)	Journal article	428	2008*	USA	21.9	2.9	0.0	84.0	22.7	No	Lack of General Openness	Eating Disorder Diagnostic Scale; Eating Disorder Inventory; Positive and Negative Affect Scale; SCOFF	0.10
McConnell, Clifford, Korpak, Phillips, and Birkett (2017)	Journal article	155	2013–2014	USA	23.1	1.6	38.3	–	88.4	No	Lack of General Openness	Brief Symptom Inventory	−0.02
Meidlinger and Hope (2014)	Journal article	149	2006*	USA	28.9	11.1	49.0	–	12.6	No	Lack of General Openness; Lack of Open Behavior; Lack of Public Knowledge	Brief Fear of Negative Evaluation Scale; Positive and Negative Affect Scale	0.33
Michaels, Parent, and Torrey (2016)	Journal article	167	2007*	USA	46.9	12.2	100.0	–	19.2	No	Lack of Open Behavior	Center for Epidemiologic Studies Depression Scale-7	0.22
Mohr, Jackson, and Sheets (2017, Study 2)	Journal article	240	2006	USA	22.0	4.1	17.5	99.2	16.3	Yes	Lack of Open Behavior	Center for Epidemiologic Studies Depression Scale	0.10
Mohr and Kendra (2011, Study 1)	Journal article; Unpublished effect size	654	2003*	Canada, USA	22.9	5.6	46.2	99.7	25.4	No	Lack of Open Behavior	Center for Epidemiologic Studies Depression Scale; Positive and Negative Affect Scale	0.17
Morandini, Pinkus, and Dar-Nimrod (2018)	Journal article	163	2010*	Australia	24.5	7.1	0.0	56.5	15.5	No	Lack of General Openness	Depression Anxiety and Stress Scale-21	0.12
Mustanski, Newcomb,	Journal article	425	2004–2005	USA	20.2	2.3	70.3	54.8	65.8	No	No category	Brief Symptom Inventory-18	0.01

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
and Garofalo (2011)													
Nance (2008)	Dissertation	529	2007	Canada, USA	–	–	100.0	95.8	5.0	No	Lack of Open Behavior	Depression Anxiety and Stress Scale-21	−0.14
Nash (1990)	Dissertation	134	1986–1988	USA	–	38–47	100.0	96.0	4.5	No	No category	State-Trait Anxiety Inventory	0.20
Nickels (2013, Quantitative sample)	Dissertation	252	2010	USA	16.8	2.1	35.6	–	31.1	No	Lack of General Openness	Single item assessing presence of depressive episode in past 12 months	−0.18
Norcini Pala (2010)	Unpublished	104	2009–2010	Italy	40.3	9.7	100.0	38.1	–	No	No category	Patient Health Questionnaire-9; Positive and Negative Affect Scale	−0.12
Norcini Pala (2012a)	Unpublished	54	2012	Italy	36.6	7.9	100.0	38.9	0.0	No	No category	Patient Health Questionnaire-9	0.30
Norcini Pala (2012b, Female-identified participants) *c*	Unpublished	65	2012	Italy	27.3	5.1	0.0	38.8	–	No	Lack of Public Knowledge	Patient Health Questionnaire-9	0.36
Norcini Pala (2012b, Male-identified participants) *c*	Unpublished	54	2012	Italy	28.8	7.4	100.0	40.6	–	No	No category	Patient Health Questionnaire-9	0.21
Oetjen and Rothblum (2000)	Journal article	167	1992*	USA	33.0	20–60	0.0	75.0	8.0	No	Lack of Active Identity Disclosure	Center for Epidemiologic Studies Depression Scale	0.03
Oldenburg et al. (2014)	Journal article; Unpublished effect size	300	2010	Vietnam	22.4	5.0	100.0	–	100.0	No	Lack of Public Knowledge	Center for Epidemiologic Studies Depression Scale-10	−0.02
Orban (2003)	Dissertation	145	1995*	USA	17.3	13–21	63.0	15.9	93.2	No	Lack of General Openness	Mental Health Inventory	0.15
Owens, Riggle, and	Journal article	226	1999*	USA	37.6	11.5	32.0	67.0	16.0	No	Concealment from mental health service providers;	Center for Epidemiologic Studies Depression Scale; Depression	−0.11

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
Rostosky (2007)[e]											used in sensitivity analysis only	Anxiety and Stress Scale	
Pachankis (n.d.)	Unpublished	254	2017–2019	USA	26.6	4.2	98.4	90.9	43.7	No	Lack of General Openness	Alcohol Use Disorders Identification Test; Beck Anxiety Inventory; Brief Symptom Inventory; Hamilton Rating Scale for Depression; Mini International Neuropsychiatric Interview; Overall Anxiety Severity and Impairment Scale; Overall Depression Severity and Impairment Scale; Short Inventory of Problems-Alcohol and Drugs; Social Interaction Anxiety Scale	−0.01
Pachankis, McConocha, et al. (2019)	Unpublished	60	2018–2019	USA	25.6	3.3	0.0	100.0	30.0	No	Lack of General Openness	Alcohol Use Disorders Identification Test; Brief Symptom Inventory; Center for Epidemiologic Studies Depression Scale; Overall Anxiety Severity and Impairment Scale; Overall Depression Severity and Impairment Scale Short Inventory of Problems-Alcohol; Short Inventory of Problems-Drugs; Social Interaction Anxiety Scale; State-Trait Anxiety Inventory	0.16
Pachankis, Williams, et al. (2019)	Unpublished	108	2017–2018	USA	23.7	3.1	28.7	46.3	13.91	No	Lack of Open Behavior	Alcohol Use Disorders Identification Test; Beck Anxiety	0.13

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
												Inventory; Brief Symptom Inventory-18; Center for Epidemiologic Studies Depression Scale; Short Inventory of Problems-Modified for Drug Use	
Pachankis and Bernstein (2012)	Journal article	136	2004	USA	20.7	2.1	100.0	100.0	28.6	No	Lack of Open Behavior	Positive and Negative Affect Scale	0.28
Pachankis, Clark, et al. (2020)	Unpublished	937	2016	USA	30.8	9.8	100.0	83.6	32.2	No	Lack of General Openness	Alcohol Use Disorders Identification Test; Brief Symptom Inventory	−0.08
Pachankis and Goldfried (2006, Gay-identified sample)	Journal article	87	1998	USA	20.4	1.3	100.0	100.0	26.4	No	Lack of General Openness	Social Interaction Anxiety Scale; Social Phobia Scale	0.24
Pachankis, Sullivan, Feinstein, and Newcomb (2018)	Journal article	128	2009–2018	USA	20.7	2.1	100.0	100.0	28.1	No	Lack of General Openness	Center for Epidemiologic Studies Depression Scale; Social Interaction Anxiety Scale	0.24
Parker, Lõhmus, Mangine, and Rüütel (2016); Rüütel, Valk, and Lõhmus (2017)	Journal article; Unpublished effect size	265	2013	Estonia	32.3	9.7	100.0	43.0	–	No	Lack of Public Knowledge	Emotional State Questionnaire	−0.03
Paul, Smith, Mohr, and Ross (2014, CFA sample)[c]	Journal article	215	2006	USA	38.4	13.7	46.4	95.3	18.2	Yes	Lack of Open Behavior	Center for Epidemiologic Studies Depression Scale	−0.15

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
Paul et al. (2014, EFA sample)[c]	Journal article	207	2006	USA	38.4	13.7	46.4	95.3	18.2	Yes	Lack of Open Behavior	Center for Epidemiologic Studies Depression Scale	0.03
Persson, Pfaus, and Ryder (2015)	Journal article	200	2011–2014	Canada	24.4	6.4	0.0	93.0	–	No	Lack of General Openness	Beck Anxiety Inventory; Beck Depression Inventory-II	0.32
Pimentel (2015)	Dissertation; Unpublished effect size	406	2013	USA	38.3	14.7	99.3	84.0	35.9	No	Lack of Open Behavior	Center for Epidemiologic Studies Depression Scale	0.08
Prell and Traeen (2018, Bisexual-identified participants)[c]	Journal article	122	2016	Norway	–	18–73	0.0	53.8	–	Yes	Lack of Open Behavior	Common Mental Disorders Questionnaire	0.31
Prell and Traeen (2018, Lesbian-identified participants)[c]	Journal article	273	2016	Norway	–	18–73	0.0	61.9	–	No	Lack of Open Behavior	Common Mental Disorders Questionnaire	0.24
Puckett, Maroney, Levitt, and Horne (2016); Puckett, Surace, Levitt, and Horne (2016)	Journal article	383	2008*	USA	39.3	13.4	34.5	–	19.9	No	Lack of General Openness	5-item Symptom Checklist; Social Interaction Anxiety Scale-6	0.23
Puckett, Wolff, Gunn, Woodward, and Pantalone (2018)	Journal article; Unpublished effect size	217	2010*	USA	36.4	14.0	45.6	–	22.1	No	Lack of Open Behavior	Center for Epidemiologic Studies Depression Scale	0.19
Ragins, Singh, and	Journal article	534	1999*	USA	41.1	8.7	68.0	84.7	30.3	No	Lack of Active Identity Disclosure	Work-Related Anxiety Scale; Work-	−0.03

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
Cornwell (2007)												Related Depression Scale	
Ray (2016, Sample 1)[c]	Dissertation	341	2008*	USA	–	18–54	26.7	94.3	8.4	No	Lack of Open Behavior	Alcohol Use Disorders Identification Test; Drug Use Disorders Identification Test	−0.05
Ray (2016, Sample 2)[c]	Dissertation	180	2008*	USA	–	18–64	35.6	84.8	23.8	No	Lack of Open Behavior	Alcohol Use Disorders Identification Test; Drug Use Disorders Identification Test	−0.10
Rhoades et al. (2018)	Journal article; Unpublished effect size	365	2015–2017	USA	17.7	3.1	39.5	13.2	39.4	No	Lack of Public Knowledge	Studies Depression Scale-4	−0.04
Ribeiro Gonçalves (2019)	Unpublished	110	2017–2018	Portugal	63.5	3.4	100.0	52.7	–	No	Lack of Public Knowledge	Kessler Psychological Distress Scale	0.44
Riggle, Rostosky, Black, and Rosenkrantz (2017)	Journal article	373	2009*	USA	31.2	12.7	47.6	85.6	27.4	No	Lack of Active Identity Disclosure; Lack of Open Behavior	Center for Epidemiologic Studies Depression Scale-10	0.20
Robinson, Sanches, and MacLeod (2016); Ross et al. (2014)	Journal article; Unpublished effect size	367	2011–2012	Canada	31.6	–	27.7	82.0	35.8	Yes	Lack of Open Behavior	Overall Anxiety Severity and Impairment Scale; Patient Health Questionnaire-9	−0.04
Roper (1997)	Dissertation	141	1989*	USA	–	20–63	0.0	95.0	15.0	No	Lack of Public Knowledge	Brief Symptom Inventory	0.01
Rosario, Hunter, Maguen, Gwadz, and Smith (2001); Rosario, Schrimshaw, and Hunter (2006); Rosario, Schrimshaw, and Hunter (2009, Male-	Journal article	80	1993–1995	USA	18.3	1.7	100.0	31.0	77.0	No	Lack of Active Identity Disclosure	Brief Symptom Inventory; Diagnostic Interview Schedule for Children	0.00

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
identified participants)[c]													
Rosario et al. (2001); Rosario et al. (2009, Female identified participants)[c]	Journal article	76	1993–1995	USA	18.3	1.7	0.0	31.0	79.0	No	Lack of Active Identity Disclosure	Brief Symptom Inventory	0.01
Rosario-Hernández, Millán, Cruz, Neris, and Acevedo (2009)	Journal article	110	2001*	USA (Puerto Rico)	–	–	65.5	–	–	No	Lack of General Openness	Multiple Affect Adjective Checklist	0.09
Rosser et al. (2008)	Unpublished	1,579	2008	USA	33.2	10.5	100.0	88.8	22.3	No	Lack of General Openness	CAGE Questionnaire; Center for Epidemiologic Studies Depression Scale-10	0.01
Rosser et al. (2013)	Journal article; Unpublished effect size	1,265	2011	USA	–	–	100.0	89.9	47.0	No	Lack of General Openness	Positive and Negative Affect Scale	0.00
Rosser et al. (2019)	Unpublished	193	2015–2016	USA	63.4	8.2	99.5	96.4	10.9	No	Lack of General Openness	Mental Component Summary of the Short Form 36 Health Survey Questionnaire	0.01
Rostosky, Riggle, Horne, and Miller (2009)	Journal article	574	2006	USA	38.9	12.8	44.0	72.0	10.9	No	Lack of Active Identity Disclosure	Center for Epidemiologic Studies Depression Scale-10	0.15
Rubino, Case, and Anderson (2018)	Journal article	225	2010*	Australia	23.2	7.4	0.0	43.4	26.5	No	Lack of Active Identity Disclosure	Center for Epidemiologic Studies Depression Scale	0.26
Ryan (2017, Study 2); Ryan, Legate, Weinstein,	Dissertation; Journal article	156	2009*	UK	26.0	9.1	41.7	–	–	No	Lack of Open Behavior	Center for Epidemiologic Studies Depression Scale; General Health Questionnaire	0.17

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
and Rahman (2017)													
Salway et al. (2018)	Journal article; Unpublished effect size	7,872	2014–2015	Canada	–	–	–	43.7	16.8	No	Lack of Public Knowledge	Single item assessing for discussion with healthcare provider about self-defined past-12-month problems with depression and/or substance abuse	−0.14
Sandfort, Bos, Knox, and Reddy (2016)	Journal article	199	2008	South Africa	26.7	5.8	100.0	–	100.0	No	Lack of Public Knowledge	Depression Anxiety and Stress Scale	0.12
Sandil, Robinson, Brewster, Wong, and Geiger (2015)	Journal article	142	2006*	USA	32.5	7.5	67.0	98.0	99.0	No	Lack of Open Behavior	Hopkins Symptoms Checklist-21	0.10
Sattler, Wagner, and Christiansen (2016)	Journal article	1,188	2014	Germany	38.0	11.0	100.0	54.0	–	No	Lack of General Openness	Brief Symptom Inventory; Diagnostic Interview of Mental Disorders	0.13
Sattler, Zeyen, and Christiansen (2017)	Journal article; Unpublished effect size	787	2015	Germany	36.9	13.3	64.04	–	–	No	Lack of General Openness	Brief Symptom Inventory-18	0.04
Schope (2004)	Journal article	443[b]	1996*	USA	40.0	11.6	100.0	77.0	9.0	No	Lack of General Openness	Fear of Negative Evaluation Scale	0.11
Schrimshaw, Siegel, Downing, and Parsons (2013)	Journal article	203	2007–2010	USA	36.9	11.2	100.0	69.0	73.0	No	No category	Mental Health Inventory	0.03
Scott (2016, Partner 1)[c]	Dissertation	103	2008*	USA	33.7	9.0	0.0	–	26.7	No	Lack of Open Behavior	Alcohol Use Disorders Identification Test; Center for Epidemiologic Studies Depression Scale	−0.07
Scott (2016, Partner 2)[c]	Dissertation	103	2008*	USA	33.7	9.0	0.0	–	26.7	No	Lack of Open Behavior	Alcohol Use Disorders	0.03

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
												Identification Test; Center for Epidemiologic Studies Depression Scale	
Sedlovskaya (2011, Study 5); Sedlovskaya et al. (2013, Study 5)	Dissertation; Journal article	34	2011	USA	–	–	100.0	92.1	34.2	No	Lack of Open Behavior	Center for Epidemiologic Studies Depression Scale	0.37
Shilo, Antebi, and Mor (2015)	Journal article	890	2015	Israel	32.1	5.5	51.9	30.1	–	No	Lack of Active Identity Disclosure	Mental Health Inventory	0.14
Shilo and Mor (2015)	Journal article	445	2010	Israel	22.5	4.7	100.0	–	–	No	Lack of Active Identity Disclosure	Mental Health Inventory	0.12
Shilo and Savaya (2011); Shilo and Savaya (2012)	Journal article	461	2006	Israel	18.2	1.8	50.3	–	–	No	Lack of Open Behavior	Mental Health Inventory	0.16
Shilo, Yossef, and Savaya (2016)	Journal article	113	2012	Israel	28.4	8.3	100.0	64.5	–	No	Lack of Active Identity Disclosure	Mental Health Inventory	0.19
Smith (1996)	Dissertation	305	1996	USA	21.7	18–25	100.0	–	24.0	No	No category	Hopkins Symptoms Checklist-21	0.12
Smith et al. (2017)	Journal article	33	2009*	USA	21.9	2.2	100.0	–	45.4	No	Lack of Open Behavior	Center for Epidemiologic Studies Depression Scale; State-Trait Anxiety Inventory for Cognitive and Somatic Anxiety	0.37
Smith and Ingram (2004)	Journal article	97	1996*	USA	34.7	10.0	59.0	94.0	17.0	No	Lack of General Openness	Brief Symptom Inventory; Center for Epidemiologic Studies Depression Scale	0.24
Sun, Tobin, Spikes, and Latkin (2019)[e]	Journal article	226	2006–2009	USA	37.9	10.6	100.0	42.5	100.0	No	Concealment from main healthcare provider; used in sensitivity analysis only	Alcohol Use Disorders Identification Test	0.18

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
Swearingen (2006)	Dissertation	385	2005	USA	29.7	11.5	34.1	–	21.0	No	Lack of Open Behavior	The Eating Attitudes Test	0.15
Szymanski and Sung (2010)	Journal article	144	2002*	USA	30.7	8.6	39.0	87.0	100.0	No	Lack of Open Behavior	Hopkins Symptoms Checklist-21	0.17
Tabaac, Perrin, and Trujillo (2015)	Journal article; Unpublished effect size	150	2007*	USA	31.9	12.0	0.0	94.0	70.7	No	Lack of Open Behavior	Hopkins Symptoms Checklist-25	0.15
Tabb (2016)	Dissertation	95	2014–2015	USA	–	–	52.6	64.2	100.0	No	Lack of Open Behavior	Alcohol Use Disorders Identification Test; Generalized Anxiety Disorder-7; Patient Health Questionnaire-8	0.13
Talley and Bettencourt (2011)	Journal article	83	2003*	USA	19.1	1.6	65.1	100.0	9.6	No	Lack of Active Identity Disclosure	Center for Epidemiologic Studies Depression Scale	0.17
Thies (2015)	Dissertation	181	2007*	USA	31.8	11.3	53.6	–	32.0	No	Lack of Public Knowledge	Center for Epidemiologic Studies Depression Scale; Generalized Anxiety Disorder-7	0.04
Timmins, Rimes, and Rahman (2018)	Journal article	38	2009*	Global	29.2	19–50	34.2	–	5.3	No	Lack of General Openness; Lack of Open Behavior	Generalized Anxiety Disorder-7; Patient Health Questionnaire Anxiety and Depression Scale	0.43
Timmins, Rimes, and Rahman (2020)	Journal article	4,248	2011*	Global	29.9	16–82	57.1	–	10.8	No	Lack of General Openness; Lack of Open Behavior	Generalized Anxiety Disorder-7; Patient Health Questionnaire-9; Ruminative Responses Scale	−0.14
Tomori et al. (2016)	Journal article	363	2008*	India	–	–	100.0	–	100.0	No	Lack of Active Identity Disclosure	Patient Health Questionnaire-9	−0.25
Tornello and Patterson (2018)[e]	Journal article	79	2008–2009	USA	61.0	8.8	100.0	96.2	1.3	No	Concealment from children and grandchildren; used in sensitivity analysis only	Mental Component Summary of the Short Form 12 Health Survey Questionnaire	−0.02

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
Ullrich, Lutgendorf, and Stapleton (2003); Ullrich, Lutgendorf, Stapleton, and Horowitz (2004)	Journal article	73	1995 *	USA	37.0	23–56	100.0	64.0	11.0	No	Lack of General Openness	Beck Depression Inventory	0.36
van der Star, Pachankis, and Bränström (2019)	Journal article	80	2016	Sweden	33.5	13.2	41.3	47.5	–	No	Lack of General Openness	Patient Health Questionnaire-9	−0.09
Velez and Moradi (2016)	Journal article	514	2008 *	USA	31.5	13.0	47.0	95.0	23.0	No	Lack of Open Behavior	Hopkins Symptom Checklist-21	0.23
Velez, Moradi, and Brewster (2013)	Journal article	326	2012	North America	38.4	12.1	43.0	97.0	20.0	No	Lack of Open Behavior	Hopkins Symptom Checklist-21	0.31
Velez, Watson, Cox, and Flores (2017)	Journal article	813	2009 *	USA	23.7	6.7	22.0	79.0	39.0	No	Lack of Open Behavior	Hopkins Symptom Checklist-21	0.12
Vincke and van Heeringen (2002)	Journal article	197	1994 *	Belgium	19.9	2.5	61.4	–	–	No	Lack of Open Behavior	General Health Questionnaire	0.01
Walch, Ngamake, Bovornusvakool, and Walker (2016)	Journal article; Unpublished effect size	443	2010	USA	31.4	9.8	35.3	79.1	21.1	No	Lack of Open Behavior	Depression Anxiety and Stress Scale	−0.01
Waldo (1997); Waldo (1999)	Dissertation; Journal article	287	1989 *	USA	38.2	9.0	58.5	–	8.4	No	No category	Brief Symptom Inventory	0.10
Watson, Velez, Brownfield,	Journal article	353	2008 *	USA	27.1	7.9	0.0	94.3	23.2	No	Lack of Open Behavior	The Eating Attitudes Test-26	0.18

Study	Type of publication	Sample size	Actual or estimated year of data collection	Study location	Age (*M*)	Age (*SD*)[d]	Proportion cisgender male	Proportion completed some college	Proportion racial/ ethnic minority	Exclusive bisexual composition	Concealment operationalization	Mental health outcomes	Effect size (ES_r)[a]
and Flores (2016)													
White, Sandfort, Morgan, Carpenter, and Pierre (2016)	Journal article	106	2008*	Jamaica	–	18–56	100.0	45.2	–	No	Lack of General Openness	Zung Depression Inventory	−0.11
Wilkerson, Noor, Galos, and Rosser (2016)	Journal article	1,475	2011	USA	–	–	100.0	88.9	26.9	No	Lack of Genera Openness; Lack of Open Behavior	Center for Epidemiologic Studies Depression Scale	0.13
Williams, Mann, and Fredrick (2017)	Journal article	218	2009*	USA	27.5	12.1	42.4	–	15.1	No	Lack of Open Behavior	Kessler Psychological Distress Scale	0.15
Willoughby (2008)	Dissertation	81	2000*	USA	19.7	1.8	69.0	–	46.0	No	Lack of Open Behavior	Personal Experience Screening Questionnaire	0.07
Wolff, Himes, Soares, and Kwon (2016)	Journal article	401	2008*	USA	27.7	9.4	51.0	100.0	14.0	No	Lack of Open Behavior	Counseling Center Assessment of Psychological Symptoms	0.19
Woodford et al. (2018)	Journal article; Unpublished effect size	562	2013	USA	22.7	5.5	44.0	97.1	24.7	No	Lack of General Openness	Patient Health Questionnaire-9	−0.07
Xu, Zheng, Xu, and Zheng (2017)	Journal article; Unpublished effect size	435	2014–2015	China	–	–	100.0	70.3	100.0	No	Lack of Active Identity Disclosure	Kessler Psychological Distress Scale-6	0.03
Zuckerman (1998)	Dissertation	43	1990*	USA	38.3	8.3	100.0	90.0	43.0	No	Lack of Active Identity Disclosure	Beck Depression Inventory; Profile of Mood States; State-Trait Anxiety Inventory	0.12

Notes. CFA = confirmatory factor analysis; EFA = exploratory factor analysis.

[a]Positive effect sizes indicate a positive association between concealment and mental health problems; negative effect sizes indicate a negative association between concealment and mental health problems.

[b]Certain effects derived from these studies used a somewhat reduced *n*, typically due to missing data contained within the studies.

[c] These studies each contain two distinct subsamples, for which effects are presented separately. In some cases, demographics were only available for the overall sample and therefore could not be disaggregated by study subsample.

[d] The range of participants' ages, if available, is provided when the standard deviation for age is unavailable.

[e] Studies included in sensitivity analysis only.

[*] The year of data collection was unknown and was therefore estimated as the mean publication lag across studies included here (i.e., 8 years).

Table 3

Total Mean Association Between Sexual Orientation Concealment and Mental Health Problems (k = 193; n = 92,236)

Measure	*M* ES_r [a,b] based on study averages	95% confidence interval	*p* ES_r [b]	*M* ES_r [a,b] using robust variance estimation	95% confidence interval	*df*	Total number of ES	*p* ES_r [b]	Heterogeneity χ^2	*p* χ^2	τ^2	I^2
Any mental health problem (*k* = 193)	0.106	[0.079, 0.134]	<.001	0.116	[0.093, 0.141]	192	430	<.001	3763.84	<.001	0.0325	94.9%
Internalizing mental health problems	0.123	[0.103, 0.144]	<.001	0.126	[0.102, 0.151]	187	396	<.001	3165.36	<.001	0.0242	91.8%
Depression (*k* = 121)	0.101	[0.067, 0.133]	<.001	0.113	[0.076, 0.148]	120	179	<.001	1902.44	<.001	0.0296	93.7%
Anxiety (*k* = 67)	0.126	[0.092, 0.160]	<.001	0.134	[0.088, 0.180]	66	120	<.001	443.86	<.001	0.0153	85.1%
General psychological distress (*k* = 65)	0.155	[0.122, 0.189]	<.001	0.163	[0.122, 0.204]	64	84	<.001	504.89	<.001	0.0154	87.3%
Problematic eating (*k* = 7)	0.176	[0.083, 0.266]	<.001	0.168	[0.043, 0.288]	6	13	0.017	37.18	<.001	0.0134	83.9%
Substance use problems												
Substance use problems (*k* = 20)	−0.056	[−0.093, −0.020]	0.002	−0.061	[−0.096, −0.026]	19	34	0.002	61.24	<.001	0.0033	70.6%

Notes. ES = effect size.

[a]Positive effect sizes indicate a positive association between concealment and mental health problems; negative effect sizes indicate a negative association between concealment and mental health problems.

[b]Effect size based on average correlations across studies.

Table 4

Results From Bivariate Metaregression Analyses of Sexual Orientation Concealment and Mental Health Problems as a Function of Study and Sample Characteristics

	Bivariate analyses							
	Internalizing mental health problems				Substance use problems			
Measure	*B*	*SE*	95% CI	*p*	*B*	*SE*	95% CI	*p*
Study characteristics								
Type of sexual orientation concealment measure								
1. Lack of active disclosure	−0.075	0.030	[−0.133, −0.016]	0.012	—	—	—	—
2. Lack of open behavior	0.080	0.018	[0.044, 0.116]	<.001	0.016	0.028	[−0.040, 0.074]	.551
3. Lack of general openness	−0.004	0.020	[−0.043, 0.035]	0.853	0.002	0.028	[−0.061, 0.056]	.934
4. Lack of public knowledge	−0.089	0.025	[−0.138, −0.040]	<.001	−0.037	0.042	[−0.123, 0.048]	.383
Time period (year of data collection)	0.005	0.001	[0.002, 0.008]	<.001	−0.004	0.005	[−0.009, 0.009]	.932
Study location (North America vs. other regions)	−0.002	0.021	[−0.043, 0.039]	0.928	−0.046	0.589	[−0.166, 0.074]	.440
Studies using dichotomous measure of concealment	−0.218	0.055	[−0.326, −0.110]	<.001	—	—	—	—
Studies using dichotomous measure of mental health	−0.142	0.052	[−0.244, −0.039]	0.007	−0.065	0.030	[−0.126, −0.005]	.036
Sample characteristics								
Mean age of participants	−0.003	0.001	[−0.0045, −0.0006]	0.011	−0.0006	0.004	[−0.008, 0.007]	.879
Proportion male vs. female	0.0001	0.0003	[−0.0004, 0.0006]	0.732	0.0002	0.0003	[−0.0004, 0.0009]	.480
Proportion completed some college or above	0.0007	0.0005	[−0.0003, 0.002]	0.171	−0.0004	0.0008	[−0.0021, 0.0013]	.651
Proportion racial/ethnic minority	0.020	0.029	[−0.036, 0.077]	0.478	−0.132	0.118	[−0.109, 0.374]	.271
Samples of exclusive bisexual composition	−0.099	0.044	[−0.186, −0.011]	0.027	—	—	—	—

Table 5

Results From Multivariate Metaregression Analyses of Sexual Orientation Concealment and Internalizing Mental Health Problems

	Internalizing mental health problems			
Measure	***B***	***SE***	**95% CI**	***p***
Type of measure of sexual orientation concealment				
Lack of open behavior	0.062	0.020	[0.022, 0.102]	.003
Study characteristics				
Mean age of participants	−0.003	0.001	[−0.005, −0.001]	.007
Samples of exclusive bisexual composition	−0.169	0.044	[−0.256, −0.083]	<.001
Studies using dichotomous measure of concealment	−0.186	0.078	[−0.341, −0.032]	.018
Studies using dichotomous measure of mental health	−0.153	0.053	[−0.258, −0.048]	.005