For Better or for Worse? A Systematic Review of the Evidence on Social Media Use and Depression among Lesbian, Gay, and Bisexual Minorities

César G. Escobar-Viera, PhD, MD, Center for Research on Media, Technology, and Health, School of Medicine, Center for LGBT Health Research, University of Pittsburgh, PA, U.S.A.

Darren L. Whitfield, PhD, School of Social Work, Department of Psychiatry, Center for LGBT Health Research, University of Pittsburgh, PA, U.S.A.

Charles B. Wessel, MLS, Health Sciences Library, University of Pittsburgh, PA, U.S.A.

Ariel Shensa, MA, Center for Research on Media, Technology, and Health, School of Medicine, University of Pittsburgh, PA, U.S.A.

Jaime E. Sidani, PhD, Center for Research on Media, Technology, and Health, School of Medicine, University of Pittsburgh, PA, U.S.A.

Andre L. Brown Jr., PhD, Center for LGBT Health Research, Graduate School of Public Health, University of Pittsburgh, PA, U.S.A.

Cristian J. Chandler, MPH, Center for LGBT Health Research, Graduate School of Public Health, University of Pittsburgh, PA, U.S.A.

Beth L. Hoffman, BSc, Center for Research on Media, Technology, and Health, School of Medicine, University of Pittsburgh, PA, U.S.A.

Michael P. Marshal, PhD, Department of Psychiatry, School of Medicine, University of Pittsburgh, PA, U.S.A.

Brian A. Primack, MD, PhD, Center for Research on Media, Technology, and Health, School of Medicine, University of Pittsburgh, PA, U.S.A.
Corresponding author
César G. Escobar-Viera, PhD, MD
Center for Research on Media, Technology, and Health, School of Medicine
University of Pittsburgh, U.S.A.
Phone: +1 (412) 692-4297
Fax: +1 (412) 692-4838
Email: escobar-viera@pitt.edu
Abstract

Background
Over 90% of adults in the U.S. have at least one social media (SM) account and lesbian, gay, and bisexual (LGB) persons are more socially active on SM than heterosexuals. Rates of depression among LGB persons are between 1.5- and 2-fold higher than those of heterosexual counterparts. SM allows users to connect, interact, express ideas, emotions, feelings, and thoughts. Thus, social media use (SMU) might represent both a protective and risk factor for depression among LGB persons. Studying the nature of the relationship between SMU and depression among LGB individuals is a necessary step to inform public health interventions for this population.

Objectives
We conducted a systematic review to synthesize and critique the evidence on SMU and depression among LGB populations.

Search Methods
We conducted a literature search for quantitative and qualitative studies published between January 2003 and June 2017 using 3 electronic databases. Articles were included if they were peer-reviewed, in English language, assessed SMU either quantitatively or qualitatively, measured depression, and focused on LGB populations. A minimum of 2 authors independently extracted data from each study using an a priori developed abstraction form. We assessed appropriate reporting of studies using the Strengthening the Reporting of Observational Studies in Epidemiology and the Consolidated Criteria for Reporting Qualitative Research for quantitative and qualitative studies, respectively.

Main Results
Eleven articles were included in the review. Nine studies were quantitative and cross-sectional, two were qualitative. Appropriate reporting of results varied greatly. Across quantitative studies, we found heterogeneity in how SMU was defined and measured. Cyberbullying was the most studied SM experience, and was associated with depression and suicidality. Qualitative studies found that while SM provides a space to disclose minority experiences and share ways to cope and get support, constant surveillance of one’s SM profile can become a stressor, potentially leading to depression. In most studies, sexual minority participants were identified inconsistently.
**Conclusions**

This review supports the need for research on the role of SMU on depression outcomes among LBG persons. SMU may be both a protective and risk factor for depression among LGB individuals. Support gained via SM may buffer the impact of geographic isolation and loneliness. Negative SM experiences such as cyberbullying and other patterns of SMU may be associated with depression. Future research would benefit from more consistent definitions of both SMU and study populations. Moreover, use of larger samples and accounting for patterns of SMU and individuals’ experiences on SM may help to better understand the factors that impact LGB mental health disparities.
Keywords
Social media; Social networking sites; Sexual minorities; Lesbian; Gay; Bisexual; Depression;
Systematic review
Introduction
Despite growing acceptance and civil rights gains in recent years, Lesbian, gay, and bisexual (LGB) individuals in the United States still face stigma and disparities in mental health conditions [1]. LGB persons are a diverse population whose sexual attraction, behavior, or orientation differs from their heterosexual counterparts. Importantly, estimated rates of depression among LGB are between 1.5- and 2-fold higher than their heterosexual peers [2]. In 2015, 14.8% of LGB males and 20.4% of LGB females suffered at least one major depressive episode, totaling 1.9 million individuals, compared to 4.3% of heterosexual males and 8% of heterosexual females [1]. These findings are consistent with other developed countries, and disparities are greater among bisexual adults [3,4].

Social media (SM) includes a variety of websites and mobile applications that enable users to create content and/or participate in online social networking (e.g., YouTube, Tumblr, Facebook) [5]. It is estimated that well over 90% of adults in the U.S. have at least one SM account, with an average daily use of 2-4 hours [6,7]. SM is a communication space where users may express emotions, feelings, and thoughts. For LGB individuals, SM is a primary mode of socializing and LGB persons are more socially active on SM than heterosexuals [8,9] National data of LGB individuals found over 85% of participants had one SM account and used it at least weekly, and this rose to over 91% among LGB young adults [10].

Social media use (SMU) encompasses a series of measures that capture the experience of using SM. Although no clear consensus exists regarding which specific measures should be counted as SMU, common ones include time (time elapsed while using SM over 24 hours) [11], frequency (number of times people check their SM per day) [11], number of platforms (sites or apps) used [12], closeness to online friends, and activities performed (e.g., posting updates, sharing pictures, etc.) [13], as well as other SMU patterns (e.g., active vs passive use, negative experiences such as experiencing cyberbullying, problematic SMU, motivation to use SM) [14–19].

While some researchers have found an association between SMU and increased risk of depression [11,12,14,20], others have found an association between specific patterns of SMU
and improvement of psychological well-being [21]. Thus, it may be that SMU is both a risk and protective factor for depression and psychological well-being in the general population. In addition, SMU may add unique protective and risk factors for depression among LGB individuals. While minority stress theory helps to explain the effects of social stress due to marginalized social identities on mental health outcomes among sexual minorities [22], the virtual social environment of SM introduces new complexities to previously described social interactions. For example, SM may make it easier for LGB individuals to disclose their sexual orientation to others, by forming connections, providing education, and facilitating positive interactions and social support among LGB individuals. These virtual interactions may reduce the stress experienced by LGB individuals based on their sexual orientation and may protect sexual minorities from depression [23–25]. This may be particularly true for LGB individuals for whom it is too dangerous to be “out” or disclose their sexual minority identity in real-world settings such as in the workplace or in public social spaces. Conversely, SMU may be a vehicle for negative experiences, such as stigmatization and social comparison. These can lead to negative outcomes, including decreased self-esteem, and depressive symptoms [26,27].

The contradicting effects of SMU—associating SMU with both negative mental health outcomes and improvement of psychological well-being—are important because understanding this relationship is a necessary step to inform policies and design and implement interventions that leverage positive aspects of SMU and address potentially negative aspects as well. However, to date, no comprehensive synthesis of research on the impact of different patterns of SMU on depression among LGB populations has been conducted. Considering that LGB persons have consistently high rates of SMU and consistently higher rates of depression than do heterosexuals, this is a particularly important gap in the literature. For these reasons, we conducted a systematic review with four overarching goals: 1) identify all the peer-reviewed published papers that examined SMU and depression among LGB individuals; 2) describe the characteristics of these studies, including the study appropriate reporting and methodology (e.g., quantitative versus qualitative); 3) describe how SMU and depression constructs were operationalized across studies; and finally, 4) evaluate the nature of the relationship between SMU and depression among LGB individuals, in order to make recommendations for future studies that could leverage SM for improving depression outcomes in this population.
Methods
This systematic review is reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Statement (PRISMA) guidelines (Multimedia appendix 1) [28,29]. The research protocol was registered in the PROSPERO database (no. CRD42018088165) and is available as a supplement (Multimedia appendix 2).

Inclusion and exclusion criteria
We included quantitative and qualitative studies published in peer-reviewed journals, in the English language, during or after 2003 (when MySpace, the first modern SM site, started operating). We allowed manuscripts from conference proceedings only when full-research papers were required for submission and each submission went through a complete peer-review process. Included studies had to focus on SMU and depression among LGB minorities. We defined SMU as any usage measurement (e.g., time, frequency, motivation to use, experiences while using, etc.). Depression comprised: major depressive disorder, bipolar depression, dysthymia, depressive symptoms, and psychologic distress. LGB minorities were defined as lesbian, gay, bisexual, and men who have sex with men. Exclusion criteria included: theses or dissertations, opinion pieces or reviews, and articles that studied use of short message services (not included in our definition of SM). Research in which the sole focus was on gender minority populations (e.g., transgender and gender non-binary) were excluded to avoid conflating results of sexual minorities which may not be applicable to gender minorities. However, if gender minorities were a sub-population included in the study LGB sample these studies were included.

Search process
Literature searches were developed and executed by a health sciences librarian (C.W.) in PubMed/MEDLINE (1946-Present), PsycINFO, Ovid® (1806 – Present) and SocINDEX, EBSCOhost (1895-Present). Controlled vocabulary from MeSH, the Thesaurus of Psychological Index Terms® and SocINDEX Subject Terms along with keywords and phrases were used for the concepts of LGBTQI, SM and depression. The Boolean operator “AND” combined the three search components. Searches were limited to journal articles only with no language or publication year restrictions. Detailed search strategies can be found in the Appendix. Search results were downloaded and imported into an EndNote Library on June 5, 2017. A total of 1259 citations were found. Of these, 539 citations were from PubMed/MEDLINE, 404 citations from
PsychINFO and 316 citations from SocINDEX. There were 160 duplicates records leaving 1099 citations to screen. The entire search string is available as a supplement (Multimedia appendix 3).

**Study selection and data extraction**

Screening and data extraction were completed using DistillerSR [30]. Structured forms were uploaded to the software and used throughout the entire process. Six researchers (A.B., C.C., B.H., A.S., J.S., D.W.) independently screened all article titles and abstracts to generate a set of references for which there was any possibility for selection. Next, these six researchers were divided into three pairs and were randomly assigned equal number of references, assessing full text of these studies to determine eligibility. Interrater reliability was substantial (weighted Cohen’s K 0.70) [31]. To minimize risk of reviewer bias, consensus meetings between the first author and each pair of reviewers to resolve differences occurred, but only after independent screening of all articles. In one case, the first author adjudicated a reference for inclusion.

Extraction forms included six categories of information: (1) study logistics (setting, country, publication year, study design, funding source), (2) study population characteristics (number of subjects, age, gender, race/ethnicity, sexual minorities included, education level, and income), (3) SMU (number of social networking sites, time of usage and frequency, scales, contextual measures), (4) health outcomes measured (primary and secondary outcomes measured and scales), (5) main results and limitations, and (6) appropriateness of reporting. To ensure accuracy, we implemented a quality control mechanism in which one reviewer completed a first data extraction and the second reviewer validated or disagreed with it. Again, disagreements were resolved in consensus meetings with each pair and the first author.

**Appropriate study reporting**

We assessed appropriate reporting of included studies. For quantitative studies, we used the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement Checklist v4.0 [32,33]. The STROBE statement consists of a checklist list of 22 items related to all sections of research manuscripts; STROBE provides reporting recommendations for studies that investigate associations between exposures and health outcomes [32,33]. We assigned values of 0 – 1 to each check mark. Thus, total score for each manuscript could range from 0 – 22, in which 22 means the study fully met STROBE standards of appropriate reporting. For qualitative
manuscripts, we used the Consolidated Criteria for Reporting Qualitative Research (COREQ-32) [34], a checklist of 32 items aimed at improving the quality of reporting individual interviews– and focus groups–generated data. We used the same previously explained mechanism to score each manuscript from 0 – 32, in which 32 means the study fully met COREQ-32 standards of appropriate reporting. Each study was appraised by at least two reviewers, and the first author was consulted to resolve any disagreement. The assessments of appropriate reporting for all manuscripts are available as supplements (Multimedia appendix 4 and 5).
Results

Study identification
We reviewed 1099 unduplicated citations (Figure 1); 1035 were excluded after title and abstract screening. Of sixty-four full-text manuscripts that were assessed for eligibility, 53 were excluded for different reasons: 8 lacked a focus on sexual minorities, 15 did not specifically assess SMU, and 30 did not have depression as part of the outcomes under study. Eleven research articles were included in the final sample.
FIGURE 1. Flowchart of Studies Screened and Included in a 2017 Systematic Review of Social Media Use and Depression among Lesbian, Gay, and Bisexual Minority Populations
Study characteristics and appropriate reporting
Of the studies included, 72.7% consisted of cross-sectional surveys [35–42], 18.2% consisted of qualitative analyses (Table 1) [43,44], and 9.1% combined cross-sectional surveys with social network analysis [45]. For studies that captured age of participants [35–37,41–43,45], age ranged between 11 and 30 years old. Three studies (27.3%) did not report participants’ age range [38,39,44]. Seven studies included both male and female participants [35,37–42]. In these studies, the percentage of the samples that reported their sex as female ranged from 55 to 78.1%. Two studies included only female participants [43,44], and one study had an exclusively male sample [36]. Two studies included a sample of transgender participants with this group comprising 0.9% [40] and 0.8% [42] of the total. Additionally, two studies included a small sample of gender non-conforming participants. In these studies, the percentage of gender non-conforming participants ranged from 0.7% [39] to 1.6% [42]. One study did not report participants’ gender [45]. Finally, reporting of sexual minority participants varied across studies. Almost half (45.5%) of studies combined gay and lesbian identity [35,37,39,41,42] 18.2% reported predominantly/mostly heterosexual identity [41,42], and 9.1% combined gay, lesbian, and bisexual identity [40]. About one fifth of the studies (18.2%) reported their entire sample was comprised of LGB participants. However, participants’ sexual orientation was not broken down in specific categories [38,45].
<table>
<thead>
<tr>
<th>Author(s), Country, Year</th>
<th>Design</th>
<th>N</th>
<th>Sample Description</th>
<th>Age Range</th>
<th>Age Median</th>
<th>Race/Ethnicity (%)</th>
<th>Female (%)</th>
<th>Sexual Minorities (%)</th>
<th>Appropriate Reporting Score</th>
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<tbody>
<tr>
<td>Morelli et al. Italy, 2016</td>
<td>Cross-sectional survey</td>
<td>1334</td>
<td>Mid- and high-school students and young adults</td>
<td>13 – 30</td>
<td>20.8</td>
<td>Not reported</td>
<td>68</td>
<td>Lesbian/Gay</td>
<td>12.6</td>
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<td>Gibbs &amp; Rice USA, 2016</td>
<td>Cross-sectional survey</td>
<td>195</td>
<td>Male users of a hook-up mobile application</td>
<td>18 – 24</td>
<td>22.2</td>
<td>Black 41.0</td>
<td>White 0</td>
<td>Gay</td>
<td>86</td>
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<td>White 41.0</td>
<td>Latino 33.3</td>
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<td>Asian 8.7</td>
<td>Mixed 11.8</td>
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<td>Other 0.5</td>
<td>Not reported</td>
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<tr>
<td>Cenat et al. Canada, 2015</td>
<td>Cross-sectional survey</td>
<td>6540</td>
<td>Students from 34 participating high schools across Canada</td>
<td>14 – 20</td>
<td>15.4</td>
<td>Not reported</td>
<td>56.3</td>
<td>Lesbian/Gay</td>
<td>1.3</td>
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<td>Black 100</td>
<td>White 0</td>
<td>Bisexual</td>
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<td>Latino 37.5</td>
<td>Asian 25</td>
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<td>Mixed 11.8</td>
<td>Other 0.5</td>
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<tr>
<td>Rubin &amp; McClelland USA, 2015</td>
<td>Individual interviews</td>
<td>8</td>
<td>Female adolescent who reported being daily Facebook users</td>
<td>16 – 19</td>
<td>Not reported</td>
<td>Black 37.5</td>
<td>White 0</td>
<td>Lesbian</td>
<td>62.5</td>
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<td></td>
<td>Latino 37.5</td>
<td>Asian 25</td>
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<tr>
<td>Duong &amp; Bradshaw USA, 2014</td>
<td>Cross-sectional survey</td>
<td>951</td>
<td>Sexual minority students, grades 9-12 from 105 NYC schools</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Black 32.9</td>
<td>White 9.3</td>
<td>Not reported</td>
<td>17</td>
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<td></td>
<td>Latino 50.5</td>
<td>Asian 6.1</td>
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<tr>
<td>Homan et al. USA, 2014</td>
<td>Cross-sectional survey Social network analysis</td>
<td>195</td>
<td>Users of a LGBQ social networking site</td>
<td>18 – 24</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>Not reported</td>
<td>19</td>
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<tr>
<td>Laster USA, 2006</td>
<td>Cross-sectional survey</td>
<td>4700</td>
<td>Users of a body modification website</td>
<td>Not reported</td>
<td>21</td>
<td>Not reported</td>
<td>55</td>
<td>Lesbian/Gay</td>
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<td></td>
<td>Black 2.9</td>
<td>White 69.4</td>
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<tr>
<td>Cooper &amp; Blumenfeld USA, 2006</td>
<td>Cross-sectional survey</td>
<td>310</td>
<td>National sample of middle and high school students</td>
<td>11 – 18</td>
<td>Not reported</td>
<td>Black 2.9</td>
<td>White 69.4</td>
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<tr>
<td>Study</td>
<td>Methodology</td>
<td>Sample Size</td>
<td>Age Range</td>
<td>Percentage</td>
<td>Ethnicity</td>
<td>Sexual Orientation</td>
<td>Reporting Adequacy</td>
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<tr>
<td>USA, 2012</td>
<td>Identified as LGB, or with same-sex attraction or LGBT allied youth</td>
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<td></td>
<td></td>
<td>Latino 7.4</td>
<td>Asian 3.2</td>
<td>Indigenous 0.6</td>
<td>Multi-racial 7.4</td>
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<tr>
<td>Alang &amp; Fomotar USA, 2014</td>
<td>Observational netnography</td>
<td>Not reported</td>
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<tr>
<td>Ceglarek &amp; Ward USA, 2016</td>
<td>Cross-sectional survey</td>
<td>570</td>
<td>18 – 24</td>
<td>20.2</td>
<td>Black 2.5</td>
<td>White 57.7</td>
<td>Lesbian/Gay 6.8</td>
<td>Bisexual 5.4</td>
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<tr>
<td>Ramsey et al. USA, 2016</td>
<td>Cross-sectional survey</td>
<td>634</td>
<td>18 – 22</td>
<td>19.3</td>
<td>Black 5.8</td>
<td>White 79.0</td>
<td>Lesbian/Gay 7.6</td>
<td>Bisexual 4.4</td>
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</tbody>
</table>

*a Reporting adequacy was assessed using:
* the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE, range 0 - 22) for quantitative studies, and
# the Consolidated Criteria for Reporting Qualitative Research 32 (COREQ-32, range 0 - 32) for qualitative studies.
Overall, appropriate reporting of results was variable. Of nine quantitative studies, STROBE scores [32] ranged from 5 to 20 out of 22; 88.9% met report standards on their title, abstract and introduction sections, 66.7%, 22.2%, 66.7%, and 22.2% met standards on methods, results, discussion, and funding source reporting, respectively (Multimedia appendix 4). Among two qualitative studies, COREQ-32 scores [34] were 15 [43] and 17 [44] out of 32, respectively (Multimedia appendix 5).

**Exposure and outcome characteristics**

Operationalizing of SMU measurement varied across studies and these findings are summarized in Table 2. Of nine quantitative studies, SMU was assessed by measuring self-reported experience of cyberbullying (33.3%) [37,38,42], frequency of SMU (22.2%) [40,41], general use of SM (dichotomously) (22.2%) [36,39], and 11.1% of studies measured either sexting behavior [35], integration of social ties on SM [45], number of SM platforms used [41], or motivation to use SM [41]. Qualitative studies explored use of Facebook profile management [43] and experience of using an online support forum [44].
<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Country, Year</th>
<th>Exposure Assessment Tool</th>
<th>Outcome Assessment Tool</th>
<th>Main Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morelli et al.</td>
<td>Italy, 2016</td>
<td>Modified version of the Sexting Behaviors Scale</td>
<td>12-item General Health Questionnaire</td>
<td>1097 (82.2%) reported sexting at least once. Males were more likely to be moderate (6.1%) and high (14.1%) users of sexting than females (2% and 4.1%; x²=60.96, p=0.000). Non-heterosexual participants had higher rates of using sexting behaviors than heterosexual participants (12.5% versus 6.5%; x²=8.39, p=.01). High and low sexting groups did not have significant difference in psychological distress.</td>
</tr>
<tr>
<td>Gibbs &amp; Rice</td>
<td>USA, 2016</td>
<td>Overall use was not assessed</td>
<td>4-item Center for Epidemiological Studies Depression Scale (CES-D)</td>
<td>Moderate levels of depression symptoms (mean=7.1 on a scale 4-16, SD=3). Model including demographics, lifetime experience of homophobia, commitment to gay identity, social network composition, and enactment of identity commitment explains 29.5% of the variance in depression symptoms (F=3.2, p&lt;0.01)</td>
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<tr>
<td>Cenat et al.</td>
<td>Canada, 2015</td>
<td>Item “In the last 12 months, how many times someone has bullied you (rumors, intimidation, threatening, etc.) using the internet (Facebook, MySpace, MSN, email, text, etc.)”</td>
<td>10-item Kessler Psychological Distress Scale</td>
<td>Heterosexual and bisexual girls more likely than boys to report cyberbullying. Bisexual girls and boys more likely than heterosexuals to report cyberbullying (32.9% (CI 30-35.9) versus 21.4% (CI 20.0-22.7). 29.4% of gay and lesbian individuals reported homophobic bullying. Among sexual minority boys and girls, cyberbullying was significantly and independently associated with psychological distress, suicidal ideation, and low</td>
</tr>
</tbody>
</table>
self-esteem. Compared to heterosexual boys, bisexual and lesbian girls were more likely to report psychological distress ($\beta=1.45$, $p<0.001$; $\beta=0.74$, $p<0.05$).

All participants were daily Facebook users. Maintaining a Facebook profile is part of daily life, but also requires a lot of effort. Felt that Facebook profile was under constant surveillance by family and peers, so there was a need to monitor social interactions carefully, as they worried about being outed online. Individuals chose to remain "closeted" on Facebook, and spent a great deal of time ruminating about profile content. Participants described feelings of depression, shame, and anxiety when monitoring Facebook content due to fears of social exclusion and unintentional "outing."

Item from Youth Risk Behavior Survey (YRBS) asking "During the past 12 months, have you ever been electronically bullied, such as through e-mail, chat rooms, instant messaging, Web sites, or text messaging?"

Item asking “During the past 12 months, how many times did you actually attempted suicide?”

Item asking “During the past 12 months, how many times were you in a physical fight?”

Adjusted odd ratio of attempting suicide in the past 12 months was 3.07 (1.39-6.79) for youth who were cyberbullied only, 3.01 (1.09-8.33) school bullied only, and 5.10 (1.90-13.71) if bullied both cyber and school. Adjusted odds of engaging in one or more physical fight in the past 12 months was 4.34 (95% CI: 1.80-10.50) times greater among LGB youth who experienced both types of bullying compared to youth who were not bullied.
<table>
<thead>
<tr>
<th>Authors</th>
<th>Methodology</th>
<th>Questionnaire/Item</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homan et al. USA, 2014</td>
<td>Social network structure graph</td>
<td>9-item Patient Healthcare Questionnaire (PHQ-9)</td>
<td>Social network analyses showed that participants with lower PHQ-9 scores were more tightly integrated into the social network than those with higher PHQ-9 scores ($p=0.05$), indicating that non-depressed individuals have more friends who know each other than depressed persons do.</td>
</tr>
<tr>
<td>Lester USA, 2006</td>
<td>Overall use was not assessed</td>
<td>Item asking “How many times have you attempted suicide?”</td>
<td>Heterosexuals reported less suicidality than bisexual or homosexual group. Compared to heterosexual women, lesbians, bisexual, bisexual (heterosexual leaning), and bisexual (homosexual leaning) reported significantly higher rates of suicidality ($\chi^2=54.04$, $p&lt;0.001$).</td>
</tr>
<tr>
<td>Cooper &amp; Blumenfeld USA, 2012</td>
<td>Not provided</td>
<td>Item asking “How often in an average week do you use communication technologies (e.g., blogging, chat rooms, discussion boards)”</td>
<td>39% of LGBT and 32% of allied youth received angry, rude or vulgar messages at least 1-2 times per week, 8% of LGBT receiving messages 3 or more times a week; 56% of LGBT and 33% of allied participants felt depressed after being victims of cyberbullying; 35% of LGBT and 19% of allied youth had suicidal thoughts post being victims of cyberbullying.</td>
</tr>
<tr>
<td>Alang &amp; Fomotar USA, 2014</td>
<td>—</td>
<td>—</td>
<td>Sexual minority mothers may have a higher prevalence of Postpartum depression (PPD) than other men related to elevated risks of mental health problems in sexual minority women. Online forum served as a space where lesbian mothers with post-partum depression disclosed their</td>
</tr>
</tbody>
</table>
experiences with the condition and fought feelings of loneliness and isolation. Forum was also used by these women to share successful ways of coping with post-partum depression. By participating in online groups, these lesbian mothers struggling with post-partum depression built a virtual community that provided sense of belonging, and emotional, instrumental, and informational support.

**Item asking “How often do you use social networking sites?”**

**Item asking “Which social networking sites do you use?”**

**Item asking “How much these statements apply to you?”**

Example statement: “I use social networking sites to seek groups of people similar to myself”

Sexual minority youth reported higher rates of motives for using social media than heterosexuals, as well as higher number social media sites used. Most frequent motives for social media use were social communication (M=3.40) and identity expression (2.57). Sexual minority reported overall higher levels of depression, anxiety, hostility, sensitivity, and loneliness than heterosexuals. Overall, social media use for identity exploration was significantly associated with greater reported depression symptoms (0.13) and loneliness (0.21), and greater levels of perceived social support were associated with fewer reported symptoms of depression and anxiety. Among sexual minorities, higher levels of perceived social support were associated with lower levels of loneliness (-0.027) and paranoia (-0.21); using social media to discuss issues around LGBT identity was negatively associated with anxiety (-0.35), hostility (-0.32) and paranoia (-0.43).

**Ramsey et al. USA, 2016**

Cyberbullying Victimization Scale of the Cyberbullying and Online Aggression Survey

Center for Epidemiological Studies Depression Scale-Revised (CESD-R)

Sexual minorities reported significantly higher levels of cyberbullying compared to heterosexuals. ANCOVA results showed that those with greater access to technology reported more cyberbullying F (1,590)=4.84, p=0.028 and this was more frequent among sexual minorities than heterosexuals F (4,590)=6.44, p=0.000. Sexual minorities reported increased levels of depression and recent cyberbullying or bullying at high school predicted current depression F(8,570)=30.45, p=0.000.
Similarly, assessment of depression varied across quantitative studies. Depression was operationalized as depressive symptoms in 44.4% of studies [36,40–42,45], psychological distress (i.e., depression and anxiety) in 22.2% [35,37], suicidality in 33.3% [37–39], and 11.1% of studies assessed either engagement in physical fights [38], or emotional responses to cyberbullying (including feelings of depression) [40]. Qualitative studies analyzed depression-related themes including social, emotional, and health consequences caused by the stress from managing participants’ Facebook profile [43] and the emotional experience derived from using an online support forum [44].

Main findings
Exposure to cyberbullying on SM among LGB individuals was frequent and the majority of those who experienced it reported feelings of depression [40]. Compared to heterosexual youth, bisexual boys and girls were more likely to report cyberbullying [37,42]. Among LGB boys and girls, cyberbullying was directly and independently associated with psychological distress [37], depression [42], engaging in physical fights [38], and suicidal thoughts or attempts [37,38]. Compared to heterosexuals, sexual minority users of an online forum group also had higher rates of suicidality [39].

Association between SMU and depression differed depending on which characteristic or pattern of SMU was under study. One study found lesbian/gay participants had higher rates of sexting behavior than their heterosexual peers, however psychological distress was no different across three levels of sexting [35]. Another study found moderate levels of depression among all male users of a gay hook-up mobile application [36]. Yet another study found that SM users who had more friends that know each other (tightly integrated social network) predicted lower depression scores than those who did not [45]. When compared with their heterosexual peers, sexual minority youth reported higher rates of both SM sites used and motives to use them [41]. Furthermore, perceived social support on SM among sexual minority youth was negatively associated with loneliness, and using SM to discuss LGB issues was negatively associated with anxiety and hostility [41].
Qualitative explorations about SMU and mental health among sexual minorities found both risk and benefits of SMU. Maintaining a Facebook profile was deemed part of everyday life among lesbian and bisexual females [43]. However, it also requires constant surveillance and monitoring of one’s social interactions, which in turn can be a stressor, leading to rumination of ideas, shame, and depression if one is excluded or outed [43]. On the other hand, among LGB mothers dealing with post-partum depression, an online forum served as a space where they could disclose their experiences with the condition while sharing ways to cope with it, building a community that provided different forms of social support [44].
Discussion

Principal Results
The four overarching goals of this review were to: 1) identify all the peer-reviewed published papers that examined SMU among LGB individuals; 2) describe the characteristics of these studies, including appropriate reporting and methodology; 3) describe how SMU and depression constructs were operationalized across studies; and finally, 4) evaluate the nature of the relationship between SMU and depression among LGB individuals. This is important given both the higher SMU and risk of depression among sexual minorities, compared to the general population. Because of the mode and content of interactions occurring within it, SM may be both a risk and protective factor for these minority populations. Indeed, while some studies found mental health risk factors, others (and sometimes even the same study) reported potential benefits and protective factors associated with SMU among sexual minority individuals.

Despite our comprehensive inclusion criteria and systematic online search approach (e.g. we included articles that measured depressive symptoms using a psychologic distress scale), there were a low number of studies that examined the relationship between SMU and depression among LGB individuals; nine studies were cross-sectional, and only two examined qualitative data. Appropriate reporting of results was variable across included studies. For quantitative studies, most of the variability was due to incomplete reporting of study results, such as demographics, clinical and social characteristics of participants and reasons for non-participation, incomplete report of estimates, and non-reporting of ad-hoc analyses (e.g., interactions, sensitivity analysis). On the other hand, most of the variation across the two qualitative studies was due to inadequate reporting of sample size, non-participant characteristics, sample description, development of interview guides, or data saturation.

There was considerable variation in how SMU was operationalized and measured among the included studies, which speaks to the complexity of SMU. In some studies, use was operationalized in terms of frequency of SMU, the number of platforms used and for how long the individual used them. In other studies, use was measured in terms of characteristics of SMU, such as experiences with cyberbullying and use of SMU to find camaraderie online. These
findings are consistent with other studies linking SMU to mental health outcomes within the general population. For example, while some studies have found frequency or volume of SMU to be associated with depression [11,46], these studies do not take into consideration the specific activities undertaken on SM (e.g., engaging contentious interactions or comparing one’s self to others) that could be associated with depression. For example, it is possible that behaviors such as scrolling through newsfeeds with little interaction could also be a problematic behavior. Any of these actions—which vary greatly but may all yield differing levels of importance to mental health outcomes—may be categorized as SMU. While studies using various measures of SMU add to the richness and understanding of SMU, they may lead to false comparisons and mixed results. It may be valuable for future research to conduct scale development studies that focus on SMU as a construct. Additionally, use of clear and transparent language that more accurately defines measurements of SMU may be beneficial.

Results of this review echo the findings of a body of research that found elevated prevalence of depression and psychological distress among LGB individuals compared to heterosexual counterparts [47–50]. Our findings point to the variability in experiencing depression and psychological distress in association with SMU for bisexually identified individuals. These findings might be explained by the minority stress model, which posits individuals with marginalized identities experience stress from their social environment due to social status [22,51]. The higher rates of depression and psychological distress among LGB persons may be attributed in part to experiencing discrimination, harassment, and victimization because of their sexual orientation. The findings that SMU may be a protective factor articulates the argument of sense of LGBTQ community, which suggests that belonging to a larger community may buffer effects of marginalization [52,53]. In terms of SM, being connected to other LGBTQ individuals may reduce the psychological effects of discrimination, harassment, and victimization these persons experience in the social environment. Nevertheless, the small samples of LGB individuals in these studies limit the ability to determine if any subgroup differences exist in protective nature of community connectedness.

Importantly, we found methodological concerns across included studies, such as variability in measurement of SMU, definition of sexual minority individuals, as well as conflating of results from men and women in the sample, making it difficult to interpret to whom said results would
apply to. Conversely, there were no study participants older than 30 years of age, potentially hampering findings of cohort effects related to age. These combined study characteristics limit our ability to analyze the literature and disentangle associations between SMU and depression among LGB individuals, let alone potential directionality or needed interventions.

One of the major limitations we found is the lack of clearly defined LGB samples in this area of research. Of the 1,099 studies originally identified, only 11 were included based on the inclusion criteria and of these, only about half of the studies assessed sexual orientation. When assessing sexual orientation, several studies grouped gay men and lesbian women into one group. This reduction limits the ability to understand how SMU may be associated with psychological distress and depression on each group separately. Upon further analysis, studies that included both sexual orientation and gender identity often conflated these two groups, making it hard to determine the differences in experiences of depression based on sexual orientation or gender identity. The collapsing of groups complicated our ability to understand the nuanced differences experienced by individuals based on sexual orientation and gender identity [54]. These findings suggest the need for research that includes larger samples of LGB participants and studies that distinguish sexual orientation from gender identity. The lack of representativeness extends to subpopulation differences. In many of these studies, the racial composition of the samples are predominantly White, however research suggests that LGB racial/ethnic minorities have different experiences with mental health compared to their White counterparts [55,56]. In addition, considerations should be taken to ensure these samples include adequate percentages of LGB racial/ethnic minorities.

None of the studies included in this review had participants older than 30 years of age. While young adults are the group with highest levels of SMU, around 70% of adults age 30-64 and over 35% of those 65 years and older have at least one SM account [57]. Given the higher risk of depression among the LGB population and the potential dual role of SM, the lack of data from older individuals is concerning. Usage of, interaction with, and experiences on SM may be different by age group, and these variations could have differential effects on mental health outcomes. Future research focused on improving sampling of sexual minority populations should also consider improving sampling across different age groups.
Implications and Future Directions
It is important to interpret the current findings in light of Meyer's (2003) minority stress hypothesis [22], which is the predominant framework for understanding depression and other mental health disparities among LGB individuals. There are at least three fundamental tenets of Meyer's model. First, exposure to LGB-related stressors such as discrimination, social rejection, and sometimes violent victimization is a central cause of mental health problems among LGB individuals. Second, exposure to these "distal" stressors is associated with "proximal" stressors such as internalized homonegativity, and expectations of rejection. Third, social support from within the LGB communities can help offset or buffer the impact of these stressors on mental health outcomes. Elements of this theory can be applied to LGB-related experiences in the SM environment. Meyer's model was published in 2003, at a time when many of the modern SM sites that are used today did not exist. For example, MySpace started in 2003, the same year that Meyer’s model was published, and Facebook started the following year; since then there has been a proliferation of various SM sites and platforms which have changed dramatically the social interaction landscape of LGB individuals. As SM continues to grow and SMU research progresses, we need empirical test of the minority stress theory to gain a better understanding of how SM impacts the mental health and wellness of LGB communities. Understanding how virtual and non-virtual social platforms influence mental health, both independently of each other, and interacting with each other, will be critical to gaining a full understanding of the role of the social environment on LGB mental health disparities.
Conclusions
There is a growing concern about the impact of SMU on mental health outcomes. LGB individuals are a well-suited population to study the nature of the relationship between SMU and depression due to the disproportionately high prevalence of both in this group. This systematic review supports the need for research that addresses the role of SMU in the pathway of depression and other mental health outcomes among sexual minority populations. Our findings suggest SMU may be both a protective and risk factor for these outcomes among LGB individuals. Connections and support gained via SM may buffer the impact of geographic isolation, discrimination, loneliness some LGB persons go through in their daily lives. However, the pressure of maintaining a desirable SM presence, negative experiences on SM, such as cyberbullying, and certain patterns of SMU may associate with increased depressive symptoms in this population. Our findings also indicate the need for future research in this field to recruit larger samples, have more consistent definitions of study populations, better define the social media use construct, and to incorporate the SM experience into the conceptualization of psychosocial factors that impact sexual minorities mental health disparities.
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Authors’ contributions
César G. Escobar-Viera conceptualized the review, developed inclusion and exclusion criteria, guided the screening, eligibility, and data extraction process, summarized the data and wrote the first manuscript draft.

Darren L. Whitfield, Ariel Shensa, Jaime E. Sidani, , and Beth L. Hoffman, contributed to the screening, eligibility, and data extraction process, figures and tables of this manuscript, and the discussion section of the manuscript.

Andre L. Brown Jr. and Cristian J. Chandler, contributed to the screening, eligibility, and data extraction process and constructed the tables included in the Appendix.

Charles B. Wessel conducted the online search and contributed to the search methods section.

Michael P. Marshal and Brian A. Primack contributed in developing inclusion and exclusion criteria and contributed in all sections of the manuscript.

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Conflicts of Interest
The authors declared that they have no conflict of interest.
Abbreviations
SM: Social Media
SMU: Social Media Use
LGB: Lesbian, Gay and Bisexual
Multimedia Appendix 1
PRISMA Checklist

Multimedia Appendix 2
Research Protocol registered at PROSPERO

Multimedia Appendix 3
Search strategy

Multimedia Appendix 4
STROBE evaluation of included quantitative manuscripts

Multimedia Appendix 5
COREQ-32 evaluation of included qualitative manuscripts
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