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# A Systematic Review of the Epidemiology of Nonfatal Strangulation, a Human Rights and Health Concern

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## **Abstract**

We reviewed the literature on the epidemiology of nonfatal strangulation (also, albeit incorrectly, called choking) by an intimate partner.

We searched 6 electronic databases to identify cross-sectional, primary research studies from 1960 to 2014 that reported national prevalence estimates of nonfatal strangulation by an intimate partner among community-residing adults. Of 7260 identified references, 23 articles based on 11 self-reported surveys in 9 countries met the inclusion criteria. The percentage of women who reported ever having been strangled by an intimate partner ranged from 3.0% to 9.7%; past-year prevalence ranged from 0.4% to 2.4%, with 1.0% being typical.

Although many epidemiological surveys inquire about strangulation, evidence regarding its prevalence is scarce. Modifying or adding a question to ongoing national surveys, particularly the Demographic and Health Surveys, would remedy the lack of data for low- and middle-income countries. In addition, when questions about strangulation are asked, findings should be reported rather than only combined with other questions to form broader categories (e.g., severe violence). Such action is merited because of the multiple negative short- and long-term sequelae of strangulation.

## **Disciplines**

Domestic and Intimate Partner Violence | Epidemiology

## **Comments**

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# A Systematic Review of the Epidemiology of Nonfatal Strangulation, a Human Rights and Health Concern

Susan B. Sorenson, PhD, Manisha Joshi, PhD, and Elizabeth Sivitz, BA

We reviewed the literature on the epidemiology of non-fatal strangulation (also, albeit incorrectly, called choking) by an intimate partner.

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## INTIMATE PARTNERS HURT

one another in many ways. Few specific acts of nonfatal abuse, however, are associated with as wide of a range of health problems or are as difficult to detect as strangulation.

Strangulation is defined by reduced blood flow to or from the brain via the external compression of blood vessels in the neck. Manual strangulation (i.e., gripping the throat with one's hands) appears to be the most common method of strangulation in intimate partner violence (IPV), although ligatures (e.g., belts, scarves) are sometimes used. The application of 4 pounds of pressure is required to occlude jugular veins, and 5 to 11 pounds (roughly the pressure required to can vegetables or the recommended pressure for very light polishing of a motor vehicle) are required to occlude carotid arteries.<sup>1</sup> Consciousness is lost in 10 to 15 seconds, and death can occur within 3 to 5 minutes.<sup>1</sup>

Being strangled is extremely painful,<sup>2</sup> and not being able to breathe is frightening even in controlled laboratory experiments.<sup>3</sup> In addition to the psychological implications of such intimidation, a uniquely wide range of neurological and physical outcomes are associated with strangulation. Nonfatal intentional strangulation causes immediate symptoms (e.g., loss of consciousness, which recedes quickly; loss of sphincter control; a raspy voice, which sometimes becomes chronic), symptoms that appear a few hours later (e.g., petechiae on the face and

eyes), symptoms that appear a few days afterward (e.g., ear bleeding; bruises, the immediate lack of which decreases acknowledgment of the injury event by police and others), and sometimes mental and physical health problems (e.g., stroke) that are manifested months later. In addition, strangulation with a loss of consciousness can result in mild brain injury. Multiple strangulations are reported among one third to as many as three fourths of women in domestic violence emergency shelters.<sup>4,5</sup>

Strangulation is a relatively common cause of homicide death, particularly for women. We compiled data available through the World Health Organization<sup>6</sup> to document the risk of homicide by asphyxiation among women around the globe and to illustrate gender differences in the risk of homicide by asphyxiation. As shown in Figure 1, rates vary widely, and many countries, particularly low-income countries, report no cases or have no data. Figure 2 documents that asphyxiation accounts for a higher percentage of homicides of women than of men. These mortality data are, as will be seen, paralleled by self-reported data. Moreover, as was found in a recent systematic review of intimate partner homicide in 66 countries, 6 times as many homicides of women (vs men) are by an intimate partner.<sup>7</sup> Unfortunately, most mortality data, regardless of country, do not routinely include both means of death and the victim–suspect relationship.

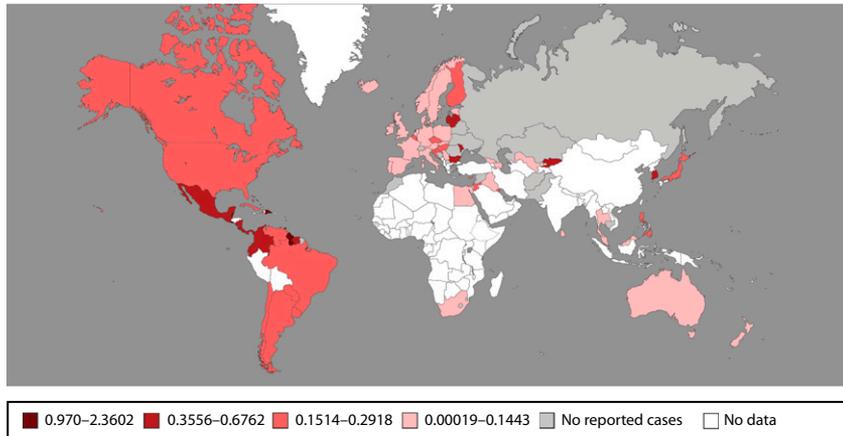
The unique nature of and the wide-ranging health outcomes following strangulation are broadly acknowledged. Such acknowledgment has extended to policy in some locales. For example, as of May 2012, approximately 30 US states had enacted separate statutes regarding strangulation.<sup>8</sup> The federal government's funding of the recently established National Strangulation Training Institute<sup>9</sup> is further evidence of the growing acknowledgment of the importance of strangulation in IPV.

We conducted the present systematic review to estimate the scope of nonfatal strangulation in intimate relationships, to describe key findings, and to offer suggestions for future research.

## METHODS

We undertook a systematic review of the published English-language, peer-reviewed literature in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines<sup>10</sup> to identify research that reported the prevalence of strangulation victimization by an intimate partner. We chose to draw a rather tight boundary in service of methodological clarity and, as such, limited ourselves to cross-sectional studies with national probability samples of community-residing adults. By doing so, our review focused on populations of broad interest that were subject to some type of governance structure that had the authority to intervene.

We searched the electronic databases of PubMed, ISI Science



Note. Rates shown are the average of up to five of the most recent years of data available for each country. Data were obtained from the World Health Organization’s Detailed Mortality Database. Mortality, ICD 10. Available at: [http://www.who.int/healthinfo/statistics/mortality\\_rawdata/en/index.html](http://www.who.int/healthinfo/statistics/mortality_rawdata/en/index.html). Accessed February 14, 2013.

**FIGURE 1—Homicide by asphyxiation, per 100 000 women aged ≥15 years old.**

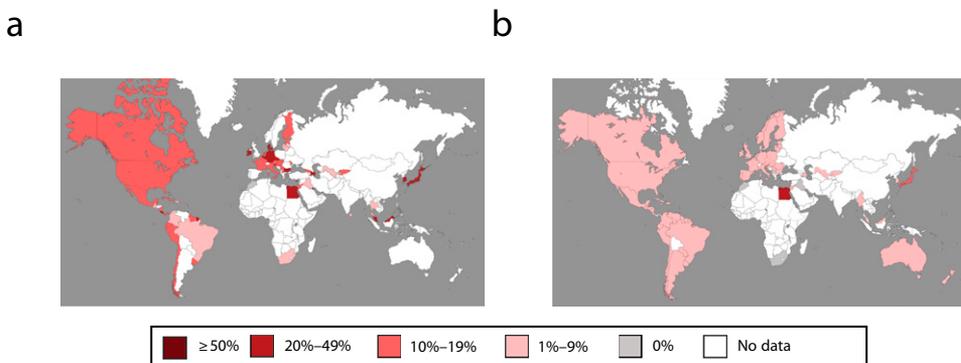
Citation Index, PsycInfo, Social Service Abstracts, Sociological Abstracts, and the (US) National Criminal Justice Research Service for publications from 1960 to June 30, 2014, that contained the following words anywhere in the text: strangulation and domestic violence; strangled and domestic violence; strangle and domestic violence; choke and domestic violence; choked and domestic violence; and choking and domestic

violence. The search strategy was repeated, substituting the term “intimate partner violence” for “domestic violence” and again substituting “dating violence” for “domestic violence.” A final search was conducted using the term “Conflict Tactics Scale” (CTS) by itself. The CTS, purportedly the most widely used instrument to assess IPV,<sup>11</sup> added a question about “choking” perpetration in its 1985 revision<sup>12</sup> and was

modified by some researchers to assess victimization. When the option was available in a database, case studies, commentaries, and other such publications were excluded. Many article indexes have a search field option of “anywhere” that searches specific fields (e.g., article title, abstract) rather than the entire text. Previous research has documented incomplete index terms for research on injury prevention and safety

promotion<sup>13</sup>; therefore, we used text word searches when that option was available. Although cumbersome to conduct and yielding a substantial percentage of irrelevant articles, serial text word searches are the most comprehensive and “. . . are recognised as the search method with the greatest sensitivity.”<sup>13(p261)</sup>

As shown in Figure 3, the 3590 unduplicated articles were screened to exclude those not about adults or not relevant to an epidemiological review. The resulting 1416 articles were considered potentially relevant, and after a copy of each was obtained, a full text search for “chok” and “strang” of all articles was performed. We eliminated those that did not meet the design and sampling criteria. We reviewed the measurement of strangulation in the remaining articles, and 160 were removed from consideration. Although many studies used the CTS, which has a separate question about “choked,” about one third (35.0%; n = 56) did not report the prevalence of choking or combined it with other questions (e.g., “beat up”) to create a “severe violence” category when analyzing the data. Another one third (33.8%; n = 54) of the nationally representative sample studies used questions that were written in a manner that precluded estimates of strangulation prevalence. For example, a study in Greece asked about “Punched, cut, burnt, tried to strangle, used a weapon,”<sup>14</sup> a US survey asked about, “choked or tried to drown,”<sup>15</sup> and studies in the Democratic Republic of Congo, Kenya, Liberia, Mali, and Zimbabwe<sup>16</sup> and other studies using the Demographic and Health Survey (DHS) domestic violence module asked about “choked or burnt” in the same question. We removed other articles from consideration that (1)



Note. Rates shown are the average of up to five of the most recent years of data available for each country. Data were obtained from the World Health Organization’s Detailed Mortality Database. Mortality, ICD 10. Available at: [http://www.who.int/healthinfo/statistics/mortality\\_rawdata/en/index.html](http://www.who.int/healthinfo/statistics/mortality_rawdata/en/index.html). Accessed February 14, 2013.

**FIGURE 2—Percentage of homicides by asphyxiation among those aged ≥15 years old by (a) women and (b) men: Systematic Review of the Epidemiology of Nonfatal Strangulation, 1960–2014.**

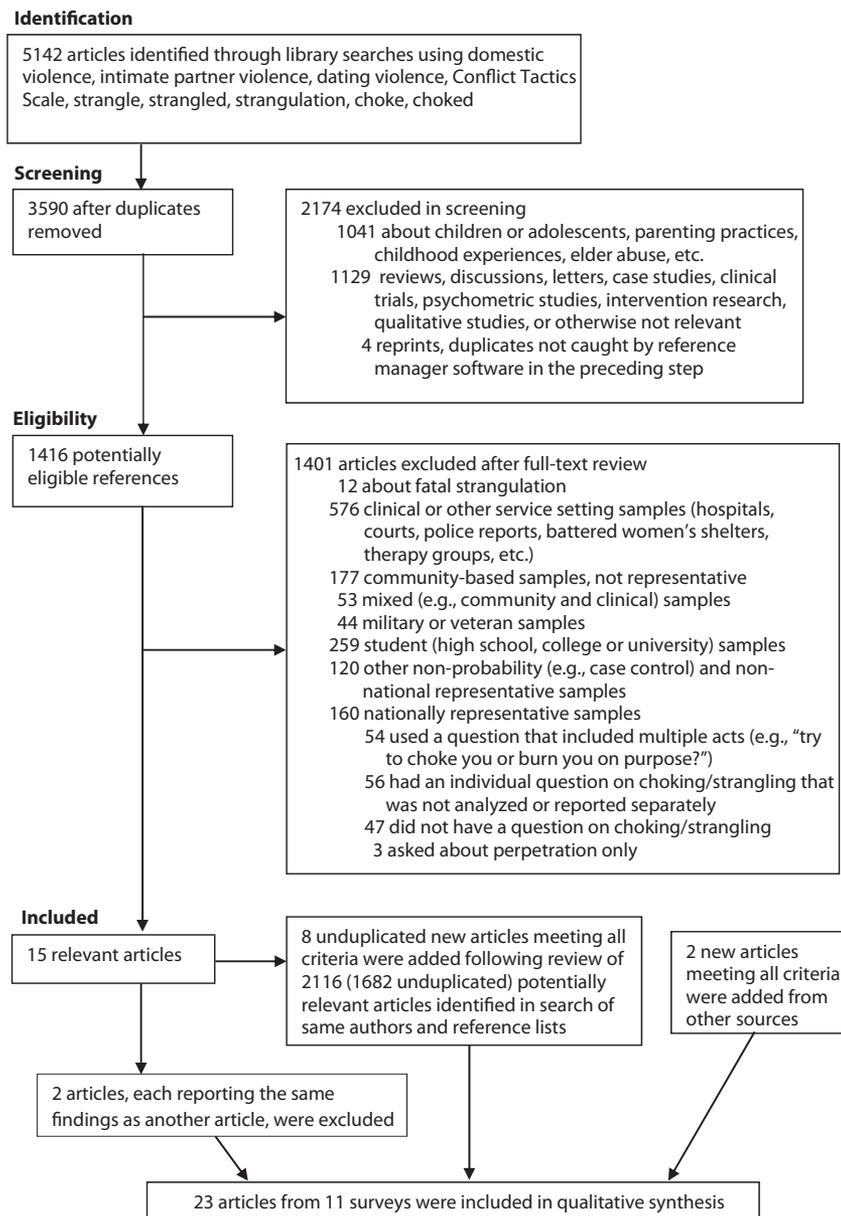


FIGURE 3—Phases of the systematic review.

and a study that was published while we conducted the searches but that was not identified through the search process.<sup>38</sup> Three articles appeared to report the same data for strangulation<sup>26,29,30</sup>; we included the one that was published first.<sup>29</sup>

The resulting 23 articles, which were based on 11 cross-sectional nationally representative surveys of community-residing adults, constituted the focus of our review.<sup>17–25,27–29,31–41</sup> We reviewed the fundamental methodological characteristics of each article (e.g., data collection method, response rate, the context in which the questions were asked, the questions themselves) in detail; we noted the patterns and tabled the information along with the prevalence rates. For the few articles that did not report key methodological information, we reviewed the technical reports or other publications to which the reader was referred and, absent that, contacted the study authors. An author of each such study responded, and author-obtained information was noted in the table.

Meta-analysis of observational studies has become commonplace despite the acknowledged limits of applying to observational studies a technique that is intended for summarizing the effect size in randomized control trials. We took a conservative approach and did not conduct a meta-analysis because the data were quite sparse (geographically adjacent extrapolations were not possible with the existing studies). In addition, the few countries that had comparable data (11 reported past-year estimates) were not a random sample of countries; thus, the population to which the meta-estimate could be generalized was unclear. In addition, although a lower bound N for valid meta-analyses has

were based on studies that did not contain a question about strangulation (the search on “strang” identified articles containing the words “stranger” and “estrangement”), and (2) reported perpetration only. When these articles were excluded, 15 articles remained.<sup>17–31</sup>

We next examined the references cited in the 15 articles, and using the ISI Web of Knowledge, identified 2116 (1682 unduplicated) other potentially relevant articles. The references cited search yielded 581 articles and 2 unduplicated new articles, the

author name search yielded 1060 articles and 5 new articles, and the cited by search yielded 475 articles and 1 unduplicated new article.<sup>32–39</sup> Finally, we added 2 publications from other sources, a 2011 report by the US Centers for Disease Control and Prevention<sup>40</sup>

not been established, statistical analysis on an N of 11 is generally ill-advised. Moreover, none of the studies reported SDs for their prevalence estimates, which precluded weight estimation. Likewise, estimates of publication bias specific to nonfatal strangulation were not possible and perhaps were not appropriate because all of the reviewed studies were about much broader topics; none of the reviewed studies were solely about strangulation. To place reasonable confidence in analyses such as these, additional point estimates are needed, and fortunately might be possible because of ongoing programmatic surveys.

## RESULTS

The 23 articles meeting inclusion criteria were based on 11 surveys of 75 875 individuals (64.6% of whom were women) in 9 countries. Regions represented included the Americas (3 countries), Eastern Mediterranean (1), Europe (4), and Western Pacific (1). Eight of the 23 articles were published in or since 2010; 7 of the 11 studies were based on data collected a decade or more ago.

The quality of the studies was high in that, consistent with quality indicators used in a previous systematic review,<sup>42</sup> each had clear study aims, an adequate sample size, a representative sample, clear inclusion criteria, a valid measure of strangulation, an acceptable response rate, and appropriate data analysis. A notable shortcoming, however, was that none of the studies reported SDs or confidence intervals for their prevalence estimates. Table 1 lists the key methodological features and the findings of each survey.

Data were collected via multiple methods: telephone (n = 4), mailed

questionnaire (n = 3), in-person interview (n = 3), and computer-assisted self-interview (n = 1). Response and completion rates were consistent with other surveys that used the same data collection methods, although the obtained return rates for the mailed questionnaires were higher than usual. Six of the surveys were specifically about violence or violence against women; the remaining 5 asked questions about strangulation in the context of crime, safety, household relationship dynamics, alcohol use, and a general social survey. Victimization of women was the most common area of inquiry, although some surveys included men, and some asked about perpetration. (Heterosexual pairings were largely assumed; some studies excluded same-sex couples from analysis.) Surveys typically asked a single question about “choking.”

Past-year strangulation victimization rates ranged from 0.4% to 2.4% for women (mean = 1.1%; median = 0.9%; Figure 4). Lifetime victimization rates ranged from 3.0% to 9.7% (mean = 5.7%; median = 5.5%). The 4 studies that assessed past-year victimization of men<sup>29,31,40,41</sup> found that women were 2 to 4 times as likely as men to report having been strangled by an intimate partner; the lifetime discrepancy increased to 4- to 11-fold.<sup>38,40,41</sup>

Several publications based on Canadian surveys reported bivariate data identifying differential risk by multiple other demographic characteristics. Among women, 5-year strangulation victimization was higher if they were cohabiting (0.8% vs 0.3%, if married),<sup>34,35</sup> in a step-family (1.5% vs 0.5%, if biological family),<sup>19</sup> disabled (0.6% vs 0.3%, if nondisabled),<sup>20</sup> a renter (0.7% vs 0.3%, if home owner),<sup>19</sup> or lived outside of Quebec

(0.4% vs 0.3%, if in Quebec).<sup>32</sup> Five-year victimization rates were higher for aboriginal women (2.2% vs 0.3%, if nonaboriginal)<sup>33</sup> and for aboriginal men (1.0% vs 0.1%, if nonaboriginal).<sup>36</sup>

The prevalence of strangulation appeared to decrease in Canada, the only country with multiple cross-sectional surveys that measured strangulation. Five-year victimization rates for women who lived with, but were not married to, a partner were 1.7% in 1993, 0.8% in 1999, and 0.7% in 2004.<sup>35</sup> Rates for married women showed a similar downward trend during the same years (0.7%, 0.3%, and 0.2%, respectively).<sup>35</sup> Five-year rates also decreased for non-Aboriginal women (0.3% in 1999 and 0.2% in 2004), but increased for Aboriginal women (2.2% in 1999 and 3.9% in 2004).<sup>21</sup>

As could be expected, strangulation was substantially higher among ever (vs never) abused women in the general population.<sup>17,39</sup> Of the 8461 women who participated in the 1993 administration of the Canadian survey, 260 were classified as victims of nonsystematic abuse and 114 were classified as victims of systematic abuse. Compared with a lifetime prevalence of 1.0% overall, 10.3% of the nonsystematic abuse victims and 50.7% of the systematic abuse victims reported having been strangled by an intimate partner.<sup>39</sup> In addition, the prevalence of strangulation was higher among women if their partner had abused them during pregnancy (28.7% vs 15.2%, if not abused during pregnancy).<sup>22</sup>

## DISCUSSION

Substantial percentages of women around the globe report being physically assaulted by an intimate male partner at some point in their

lives.<sup>43,44</sup> These numbers have, in some quarters, lost their impact, despite the life, health, economic, and other costs to individuals and societies. Gruskin et al. asserted that “attention to human rights can be a way to enhance the value and effects of health work.”<sup>45(p453)</sup> A focus on specific acts, such as strangulation and acid burnings, as well as parallels to other rights violations (e.g., water boarding) may help convey to policymakers and others the risk to and terror experienced by those being abused.

Nonfatal strangulation might well be the domestic violence equivalent of water boarding. Water boarding, which involves water being poured into the mouth and nasal passages of an immobilized captive to simulate drowning, is widely considered to constitute torture. (One US-based study of IPV, perhaps acknowledging the psychological similarity, asked about “choked or tried to drown.”<sup>12</sup>) Both leave few marks immediately afterward, both can result in the loss of consciousness, both are used to assert the actor’s dominance and authority over the life of the other, both create intense fear and potentially result in death, and both can be used repeatedly, often with impunity.

In this first, to our knowledge, systematic review of the epidemiology of strangulation, we found that women are more likely than men to report that they were strangled by an intimate partner. This finding is consistent with a meta-analytical review of gender differences in physically aggressive acts against a heterosexual partner, which concluded “. . . ‘choke or strangle’ is very clearly a male act, whether based on self- or partner reports.”<sup>46(p327)</sup> Strangulation by an intimate partner is more common among those who

**TABLE 1—National, General-Population Surveys of the Prevalence of Women's Strangulation by an Intimate Partner**

| Location and Data Collection Year                             | Author                             | Survey Name or Topic   | Sampling Strategy  | Sample  | Age, Years         | Data Collection Method   | Response Rate, %                           | No.                      | Operational Definition                 | Prevalence, %                   |
|---|------------------------------------|--|--|---|--------------------|--|--|--------------------------|--|---------------------------------|
| Canada, 1999  | Romans et al. <sup>28</sup>        | General Social Survey  | Random digit dial  | English- and French-speaking adults who had contact with a current or ex-partner in the past 5 y                    | ≥ 15               | Telephone interview  | 81.3                                       | 17 005; 9178 women       | Choked                                 | 5 yrs: 1.8                      |
| England, 2008   | Khalifeh et al. <sup>41</sup>      | British Crime Survey   | Not specified; partially clustered per technical report                | Persons living in private residential households in England   | 16-59              | Computer-assisted self-interviewing                                    | 76.8 completion rate among eligibles       | 21 226; 11 503 women     | Choked or tried to strangle            | Lifetime: 5.5<br>Past-year: 0.4 |
| Finland, 1997   | Heiskanen and Piispa <sup>37</sup> | Women's Safety Survey 1997   | Systematic sample from national population register                    | Finnish- and Swedish-speaking women drawn from Central Population Register  | 18-74              | Mailed questionnaire   | 70.3                                       | 4955 women               | Strangling or attempts at strangling   | Lifetime: 3.0<br>Past-year: 0.9 |
| Mexico, 2003  | Frias and Angel <sup>23</sup>      | National Survey of Household Relationship Dynamics (ENDIREH)       | Nationally representative; probabilistic stratified cluster per author | Women in lowest one third SES   | ≥ 15               | In-person interview conducted in private by trained women interviewers | Not reported; 98 per author                | 5567 women               | Tried to suffocate or choke            | Past year: 1.51                 |
| Norway: not specified; Nov 2003-Jan 2004 per technical report | Nerøien and Schei <sup>27</sup>    | Violence against women survey                                      | National random; from national population register                     | Women who were ever partnered   | 20-55              | Mailed questionnaire   | 63.3                                       | 2143 women               | Strangling                             | Lifetime: 5.9<br>Past-year: 0.5 |
| Palestine, <sup>a</sup> Dec 2005-Jan 2006                     | Haj-Yahia and Clark <sup>24</sup>  | Bureau of Statistics' Family Violence Survey                       | Multistage, systematic random  | Ever-married women who responded to all variables of interest   | 15-64              | In-home in-person interview  | 98.0                                       | 3500 women               | Strangled or attempted to strangle you | Past-year: 2.0                  |
| South Korea, Oct 1999-Mar 2000                                | Kim et al. <sup>25</sup>           | Study of effects of violence against women                         | Stratified random digit dial   | Women living with their husbands  | ≥ 20; mean = 42.2  | Telephone interview  | Not reported, and per author, not recorded | 1079 women               | Choked me                              | Past year: 0.7                  |
| Sweden, Jan 2009  | Lövestad and Krantz <sup>38</sup>  | Study of exposure to and perpetration of intimate partner violence | Random; simple random drawn from national population register          | 18-65-y-old women and men   | 18-65; mean = 42.8 | Mailed questionnaire   | 49.6                                       | 424; 251 women           | Choked                                 | Lifetime: 4.4<br>Past-year: 1.2 |
| United States, Oct-Dec 1989                                   | Stets and Henderson <sup>31</sup>  | Study on dating violence   | Random digit dial  | Never-married, 18- to 30-y-old adults, who had dated ≥ 2 months in the past year and had ≥ 6 dates with same person | 18-30              | Telephone interview  | 76.0 completion rate among eligibles       | 271; 125 women           | Choked                                 | Past-year: 2.4                  |
| United States, Apr 1995-Mar 1996                              | Schafer et al. <sup>29,b</sup>     | Supplement to the ninth National Alcohol Survey (48 US states)     | Multistage area probability with oversample of Blacks and Hispanics    | Married or cohabiting adult opposite-sex couples  | ≥ 18; median = 42  | In-home in-person interview  | 85 completion rate among eligibles         | 1599 couples; 1599 women | Choked                                 | Past-year: 0.6                  |

Continued

TABLE 1—Continued

|                               |                            |  |                   |   |      |                     |   |                       |   |                                 |
|-------------------------------|----------------------------|--|-------------------|---|------|---------------------|---|-----------------------|---|---------------------------------|
| United States<br>Jan-Dec 2010 | Black et al. <sup>40</sup> | National Intimate<br>Partner and Sexual<br>Violence Survey | Random digit dial | Noninstitutionalized English- or<br>Spanish-speaking adults | ≥ 18 | Telephone interview | 27.5-33.6; 81.3<br>completion rate<br>among eligibles | 16 507;<br>9086 women | Tried to hurt<br>by choking or<br>suffocating | Lifetime: 9.7<br>Past-year: 0.9 |
|-------------------------------|----------------------------|--|-------------------|---|------|---------------------|---|-----------------------|---|---------------------------------|

Note. SES = socioeconomic status.

<sup>a</sup>In November 2012, Palestine was granted nonmember observer state status by the United Nations, which implies that many acknowledge it as a governmental entity.

<sup>b</sup>To ensure comparability of estimates, study findings were used to construct a prevalence estimate based on victim-only reports.

are structurally or socially vulnerable. Minority group members, disabled persons, renters, and persons who were cohabiting—as well as women—report higher rates of strangulation. In addition, as could be expected, community-residing women with a history of abuse by an intimate partner report higher rates of strangulation. As noted previously, although patterns of social differential and time trends are generally consistent, the lack of confidence intervals for the prevalence estimates preclude assessment of the statistical difference of the findings.

Strangulation does not require access to a particular weapon, and its use is not restricted to a specific geographic region. Research from North America and Europe predominated in our review; estimates were missing for most other regions of the world, particularly low- and middle-income countries. This fundamental gap needs to be addressed because these countries report higher rates of IPV; are more likely to experience political violence, which is associated with increased risk of IPV<sup>47</sup>; and have fewer resources

by which to address the problem than do high-income countries.

**Study Limitations**

We relied on the accuracy of the search mechanisms that were available in the electronic databases we utilized. The degree to which they were incomplete affected our ability to identify all available articles. In addition, despite indicating that a user could search the text of an individual article electronically, some electronic full text word searches were compromised because some article retrieval mechanisms appeared not to do so. We avoided using such retrieval mechanisms, and when necessary to use them, visually inspected the retrieved articles, which increased the risk of human error. We acknowledge that we might have inadvertently overlooked an article that met criteria in this labor-intensive process, although we endeavored to be as thorough as possible.

Our review was subject to the limitations of the studies themselves, individually and as a group; differences in definition, data collection method, the lack of

confidence intervals, etc., precluded direct comparisons across time and locale. In addition, in strangulation research, the usual problems associated with self-report are compounded by the possible influence of retrograde amnesia resulting from strangulation; thus, the obtained estimates might be underestimates.

**Recommendations for Future Research**

It is important for surveys about violence against women to have a separate question about strangulation and to report the findings. In several studies, questions were asked or the data were analyzed in a manner that precluded the calculation of the prevalence of strangulation. Of particular note is the DHS, which asks respondents whether they were “choked or burnt.” Although not the only survey to ask a double-barreled question, DHS is among the few ongoing surveys in developing countries to include a module about the experience of IPV. DHS has a remarkable reach,<sup>48</sup> and the use of a separate question would provide information about strangulation in world regions, notably Africa and Southeast Asia, for which estimates currently are lacking. Likewise, many studies used or were patterned after the CTS, which asks a separate question about choking. Nonetheless, most of these studies combined it with other questions (e.g., kicked or hit, threatened with a gun or knife) to form a “severe violence” category when the data were analyzed. Such questions and analyses are reasonable from the perspective of trying to assess experiences that could have dire consequences, but these questions cannot be used to estimate the prevalence of strangulation, which is a unique form of violence.

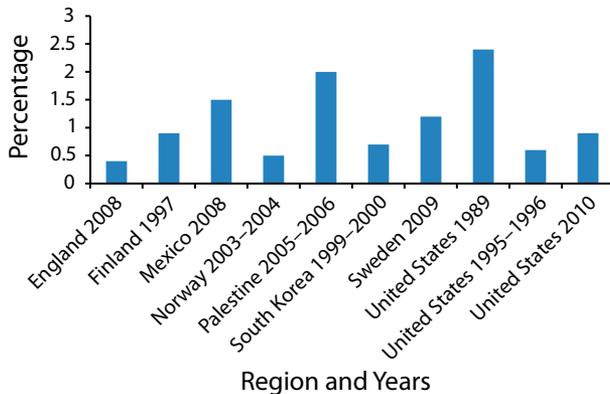


FIGURE 4—Strangulation by an intimate partner, 1-year prevalence, women (%).

Although clearly not the same phenomenon, strangulation often is referred to as choking (i.e., when a foreign object becomes lodged in the trachea and blocks airflow) by victims, practitioners, and researchers alike. In other research, we found that abused women use “choked” when referring to an incident in which the partner used his hands to strangle her and “strangled” when he used a ligature.<sup>5</sup> Thus, questions that ask about having been “choked or strangled” might yield a more complete and accurate assessment of the phenomenon. Behaviorally specific questions (e.g., “Tried to choke you or placed his arms around your neck in an attempt to harm you?”<sup>49(p648)</sup>) might reduce subjective interpretations by respondents and enhance comparability of estimates across sites. Including ligature-related behaviors in a survey question might result in more complete estimates of strangulation. Furthermore, asking more than 1 question would allow for differentiation between types of strangulation.

Research on fatalities also would advance our understanding of the use of strangulation. A review of asphyxiation homicides of 59 women in Norway and Denmark documented that a majority of the women were manually strangled and then strangled with a ligature during the fatal incident.<sup>50</sup> Case files of 106 men who murdered a female intimate in England, Wales, or Scotland indicated that 29% of the women died as a direct result of the strangulation, and another 8% were strangled during the assault, but died of another cause.<sup>51</sup> Thus, external cause-of-death numbers do not necessarily reflect the nature or scope of the use of strangulation in homicide.

In addition, few nations have crime or other databases that

document both the method of death and the victim–perpetrator relationship, so individual research studies are necessary to understand the nature and scope of such mortality. A large case–control study in the United States found previous strangulation to be a substantial and unique predictor of attempted and completed homicide of women by a male intimate partner,<sup>52</sup> the most common assailant in the homicide of women in South Africa, the United States, selected European countries, and elsewhere.<sup>53–55</sup> However, when the perpetrator’s access to a gun and other firearm-related variables were taken into consideration, strangulation was no longer related to the risk of intimate partner homicide.<sup>56</sup> Such findings might be most relevant to the United States, where civilian handgun ownership is high. Strangulation, by contrast, does not require access to a particular weapon, and as seen in our review, was not restricted to a specific geographic region.

Perpetration of strangulation might be important to study, but we would encourage researchers to give priority to victimization surveys. Perpetration of violence is routinely underreported in self-report surveys; therefore, if limited resources are to be invested, studying victimization is likely to yield more complete data.

### Conclusions

Although limited to a few national surveys and to particular regions and countries, the current body of knowledge suggests that strangulation in IPV is sufficiently common to warrant the attention of researchers and practitioners. To better understand the global epidemiology of strangulation, more work is needed to assess the magnitude, risk factors for

victimization and perpetration, mechanisms, and consequences of strangulation across gender and within understudied communities (e.g., racial and ethnic minorities, same-sex couples), and regions within countries. Doing so will highlight priority groups for policy, programs, and clinical intervention, and help identify possible impediments to such interventions. Finally, when possible, using ongoing surveys, such as the DHS, to ask about strangulation can help highlight serious forms of IPV from a human rights and public health perspective. ■

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### Contributors

S.B. Sorenson conceptualized the study, conducted the preliminary and final searches, reviewed abstracts and articles, and wrote the article. M. Joshi conducted the searches, reviewed abstracts and articles, and edited the article. E. Sivitz conducted preliminary searches, reviewed abstracts and articles, created the maps, and edited the article.

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The research was deemed exempt from institutional review board review because there was no direct human participation in the study.

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