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

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Abstract
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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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INTIMATE PARTNERS HURT one another in many ways. Few specific acts of nonfatal abuse, however, are associated with as wide 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.1 Consciousness is lost in 10 to 15 seconds, and death can occur within 3 to 5 minutes.1

Being strangled is extremely painful,2 and not being able to breathe is frightening even in controlled laboratory experiments.3 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.4,5

Strangulation is a relatively common cause of homicide death, particularly for women. We compiled data available through the World Health Organization6 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.7

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.8 The federal government’s funding of the recently established National Strangulation Training Institute9 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) guidelines10 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
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; 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, added a question about “chooking” perpetration in its 1985 revision 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; 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.”

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,” a US survey asked about “choked or tried to drown,” and studies in the Democratic Republic of Congo, Kenya, Liberia, Mali, and Zimbabwe 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)
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.17–31

We next examined the references cited in the 15 articles, and using the ISI Web of Knowledge, identified 2116 (1682 unduplicated) potentially relevant articles identified in search of same authors and reference lists.

FIGURE 3—Phases of the systematic review.
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, 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 “choke.”

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 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.

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). In a step-family (1.5% vs 0.5%, if biological family), disabled (0.6% vs 0.3%, if nondisabled), a renter (0.7% vs 0.3%, if home owner), or lived outside of Quebec (0.4% vs 0.3%, if in Quebec). Five-year victimization rates were higher for aboriginal women (2.2% vs 0.3%, if nonaboriginal) and for aboriginal men (1.0% vs 0.1%, if nonaboriginal).

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. Rates for married women showed a similar downward trend during the same years (0.7%, 0.3%, and 0.2%, respectively). Five-year rates also decreased for nonaboriginal women (0.3% in 1999 and 0.2% in 2004), but increased for Aboriginal women (2.2% in 1999 and 3.9% in 2004).

As could be expected, strangulation was substantially higher among ever (vs never) abused women in the general population. 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. 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).

DISCUSSION

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

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 “choke or tried to drown.”) 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 heterostructural partner, which concluded “...choke or strangle’ is very clearly a male act, whether based on self- or partner reports.” Strangulation by an intimate partner is more common among those who


Sorenson et al. | Peer Reviewed | Systematic Review | e57
| 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.              | 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.            | 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 or attempts at strangling | Lifetime: 5.5; Past-year: 0.4 |
| Finland, 1997                     | Heiskanen and Piispa        | 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             | 49 553 women         | Strangling or attempts at strangling or Suffocation | Lifetime: 3.0; Past-year: 0.9 |
| Mexico, 2003                      | Frias and Angel            | 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 | 55 673 women       | Tried to suffocate or choke                      | Past-year: 1.51 |
| Norway; not specified; Nov 2003-Jan 2004 per technical report | Nerøien and Schei | Violence against women survey                              | National random; from national population register                               | Women who were ever partnered                                          | 20-55      | Mailed questionnaire    | 63.3             | 21 433 women         | Strangling                                | Lifetime: 5.9; Past-year: 0.5 |
| Palestine, Dec 2005-Jan 2006       | Haj-Yahia and Clark        | Palestinian Central 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             | 35 000 women         | Strangled or attempted to strangle              | Past-year: 2.0 |
| South Korea, Oct 1999-Mar 2000    | Kim et al.                 | Study of effects of violence against women                | Stratified random digit dial                                                     | Women living with their husbands ≥ 20; mean = 42.2                      | ≥ 20; mean = 42.2 | Telephone interview Not reported, and per author, not recorded | 49.6; 424; 251 women | 1079 women         | Choked me                                      | Past-year: 0.7 |
| Sweden, Jan 2009                  | Lövestad and Krantz        | Study of exposure to and perpetuation of intimate partner violence | Random; simple random drawn from national population register                    | 18-65-y-old women and men 18-65; mean = 42.8                         | 18-65; mean = 42.8 | Mailed questionnaire | 49.6             | 424; 251 women         | Choked                                      | Lifetime: 4.4; Past-year: 1.2 |
| United States, Oct-Dec 1989       | Stets and Henderson        | 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.             | 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     | ≥ 18; median = 42 | In-home in-person interview | 85 completion rate among eligibles | 15 999 couples; 15 999 women | Choked                                      | Past-year: 0.6 |

Continued
TABLE 1—Continued

<table>
<thead>
<tr>
<th>Region</th>
<th>Method</th>
<th>Completion Rate among Eligibles</th>
<th>Year</th>
<th>Women (%age)</th>
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<td>United States</td>
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<td>27.5–33.6; 81.3</td>
<td>2010</td>
<td>15607</td>
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<tr>
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<td>≥ 18</td>
<td>2010</td>
<td>9086 women</td>
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<td>Black et al.⁴⁰</td>
<td>Telephone interview</td>
<td>1.5</td>
<td>2010</td>
<td>33.6</td>
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<tr>
<td>England</td>
<td>Telephone interview</td>
<td>27.5–33.6; 81.3</td>
<td>2010</td>
<td>181.3</td>
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<tr>
<td>United Kingdom</td>
<td>Telephone interview</td>
<td>18</td>
<td>2010</td>
<td>27.5–33.6; 81.3</td>
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<td>1.5</td>
<td>2010</td>
<td>33.6</td>
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<td>Telephone interview</td>
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<td>2010</td>
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<td>Finland</td>
<td>Telephone interview</td>
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<td>2010</td>
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<td>2010</td>
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</tr>
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</table>

Note. SES = socioeconomic status.

It is not always possible to estimate the prevalence of strangulation from the data. Studies have noted that the prevalence of strangulation is lower than that of other forms of violence, such as domestic violence. However, the use of a separate question about strangulation in surveys such as the DHS may provide information about the prevalence of this form of violence. The prevalence of strangulation is higher in some regions, such as the Middle East and Africa, than in others, such as Europe and North America.

FIGURE 4—Strangulation by an intimate partner, 1-year prevalence.

Percentage

Region and Years

- England 2008
- Finland 1997
- Mexico 2008
- Norway 2003–2004
- Palestine 2005–2006
- South Korea 1999–2000
- Sweden 2009
- United States 1985–1986
- United States 2010

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 about strangulation, but the data were not analyzed for the prevalence of this form of violence. Moreover, group members, disabled persons, renters, and persons who were cohabiting—plus as well as those who were not—were reported. The prevalence of strangulation is higher among high-income countries than among low-income countries.

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Recommendations for Future Research

The prevalence of strangulation is higher in some regions, such as the Middle East and Africa, than in others, such as Europe and North America.

Study Limitations

We relied on the accuracy of the data from the surveys. In addition, the surveys might have inadvertently over- or underestimated the prevalence of strangulation, which is a unique form of violence. Although not the only method, the use of a separate question about strangulation is important for surveys about violence against women. The prevalence of strangulation is higher in some regions, such as the Middle East and Africa, than in others, such as Europe and North America.


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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. 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?”) 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. 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. 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, the most common assailant in the homicide of women in South Africa, the United States, selected European countries, and elsewhere. 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. 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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