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The Relationship Between Abortion and Suicide: A Systematic Review /
La relation entre l'avortement et le suicide : Une recension systématique

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Abstract

The Relationship Between Abortion and Suicide: A Systematic Review

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Since 1988, there have been an increasing number of abortions and suicides among Canadian women. Given the controversy on the mental health outcomes for women who procure elective abortions, a systematic review was conducted to determine the relationship between abortion and suicide. After the application of methodologically based selection criteria and extraction rules to minimise bias, the sample of 19 studies was selected for further review.

The sample consisted of 2,842,655 female participants, 7 measures of effect from 10 countries; all were observational studies published in English. Nine studies examined abortion, seven considered suicide and three had other focal points (rape, substance use and risks specific to orphaned and abused youth). Studies included females of reproductive age who had an abortion or were preparing to do so. Elective abortion was the only intervention investigated; the outcome variables were completed suicide, attempted suicidal and suicidal ideation. Quality assessment was effected for measures of attempted suicide and suicidal ideation.

The results suggested that women who had undergone an abortion experienced a statistically significant increased risk of completed or attempted suicide. The findings concerning suicidal ideation remained tentative due to variability in measurement. The strongest estimates of increased risk occurred when abortion was compared with term pregnancy and when the outcomes involved substance use and experiences of violence.

This review offered the only qualitative estimate of suicide risks associated with abortion available in the current literature. Results revealed a moderate to highly increased risk of suicidal behaviours correlated with elective abortion. Evidence-based findings should inform the delivery of abortion and suicide prevention services.

Key words: completed suicide, attempted suicide, suicidal ideation, elective abortion, pregnancy termination

Résumé

La relation entre l'avortement et le suicide : Une recension systématique

Geneviève Bloch-Torrico

Depuis 1988, il y a eu un nombre croissant d'avortements et de suicides chez les femmes canadiennes. Compte tenu de la controverse entourant les conséquences possibles sur la santé mentale des femmes qui optent pour une interruption volontaire de leur grossesse, une recension systématique de la recherche disponible a été menée afin de déterminer la relation entre l'avortement et le suicide.

Après l'application des critères méthodologiques de sélection et des règles d'extraction pour minimiser les biais, un échantillon de 19 études a été sélectionné pour un examen plus approfondi; il se composait de 2.842.655 participantes féminines, 7 mesures d'effet provenant de 10 pays, toutes des études observationnelles publiées en anglais. Neuf études ont porté spécifiquement sur l'avortement, sept sur le suicide et trois sur d'autres sujets connexes (le viol, la toxicomanie et les risques spécifiques aux jeunes orphelins et maltraités). Les études portaient sur des femmes en âge de procréer qui ont eu recours à un avortement ou s'apprêtaient à le faire. L'avortement était la seule intervention étudiée, les variables de mesure étant : suicide complété, tentative de suicide et pensées suicidaires. Un des contrôles de qualité a porté sur les mesures de tentatives de suicide et idées suicidaires.

Les résultats suggèrent que les femmes qui avaient eu recours à un avortement ont connu un risque statistiquement significatif accru de suicide et de tentative. Les résultats concernant les idées suicidaires sont restés provisoires en raison de la variabilité de la mesure. Les probabilités les plus fortes de risque accru sont apparues alors que l'avortement a été

comparé avec des grossesses menées à terme, et en lien avec l'utilisation de substance et l'expérience de violence.

Cette analyse a donné la seule indication qualitative des risques accrus de suicide liés à l'avortement selon la littérature actuellement disponible. Les résultats ont révélé un risque modéré à très accru de comportements suicidaires en corrélation avec l'avortement. Les services d'assistance à l'interruption de grossesse et les services de prévention du suicide devraient tenir compte de ces conclusions.

Mots clés : suicide, tentative de suicide, idées suicidaires, avortement volontaire, interruption de grossesse

Table of Contents

RUNNING HEAD: THE RELATIONSHIP BETWEEN ABORTION AND SUICIDE: A SYSTEMATIC REVIEW

	Page
Introduction.....	1
Rationale.....	1
Objectives.....	1
Methods.....	2
Eligibility Criteria.....	2
Search Methods for Identification of Studies.....	4
Data Collection and Analysis.....	5
Study selection.....	5
Data items.....	6
Data extraction and management.....	7
Quality assessment.....	7
Assessment of risk of bias in included studies.....	8
Summary measures.....	9
Missing data.....	10
Data synthesis.....	10
Summary of findings table.....	11

Results.....	11
Description of Studies.....	11
Results of the search.....	11
Included studies.....	12
Excluded studies.....	13
Risk of bias in included studies.....	14
Effects of Interventions and Evaluation of the Evidence.....	15
Completed suicide.....	16
Attempted suicide.....	22
Attempted suicide and suicidal ideation.....	25
Suicidal ideation.....	32
Discussion.....	41
Author’s Conclusions.....	45
Studies and References.....	47
References to Included Studies.....	47
References to Excluded Studies.....	50
Other References.....	55
Figures.....	59
Figure 1 – Study Flow Diagramme.....	59
Figure 2 – Risk of Bias Summary.....	60
Tables.....	61
Table A – Common Hierarchy of Evidence.....	61
Table B – Review Hierarchy of Evidence.....	62

Table C - Study Design Hierarchy.....	63
Table D - Summary Measures.....	64
Table E - Summary of Findings Tables.....	65
Table F - Characteristics of Included Studs.....	69
Table G - Risk of Bias.....	75
Appendices.....	78
Appendix A – Electronic Search Strategies.....	78
Appendix B – Data Collection Form.....	79
Appendix C - Reporting of Bias Tool.....	82
Appendix D - Quality Assessment Checklists.....	84

Introduction

Rationale

Over the last 20 years, elective abortion has been associated with a plethora of mental health issues among women and girls, including completed suicide and attempted suicide. The possibility of a relationship between abortion and suicidal behaviours is increasingly recognized as important for public health policy and practice in Canada. Since the complete decriminalization of abortion in 1988, elective abortion rates have risen steadily to affect close to one-fourth of all pregnancies (Statistics Canada, 2007). The number of completed suicides in Canada's childbearing population has also seen an increase as of 1988 (Statistics Canada, 2001 and 2007).

Objectives

The objectives of this essay are twofold: (1) to provide a review of current knowledge regarding the relationship between elective abortion and suicidal behaviour; and, (2) to pinpoint which population subgroups may be at increased risk either for suicidal actions following an abortion, or at increased risk of procuring an elective abortion following suicidal behaviour. To examine whether elective abortion correlates with increases in suicidal behaviour, I reviewed cohort, cross-sectional and epidemiological studies that assessed the relationship between elective abortion and suicidal behaviours compared with other pregnancy outcomes, such as delivery.

Methods

Eligibility Criteria

A protocol was devised in advance to guide this systematic review. The types of studies found for this review included prospective, longitudinal and historical cohort studies, as well as cross-sectional studies and epidemiological prevalence studies investigating suicidal behaviour in relation to elective abortion. To ensure relevance and accessibility, retained research articles were published peer-reviewed research in English, French or Spanish between 1990 and 2013. Participants were primarily women and girls in their childbearing years, whose ages ranged from 12 through 54 years.

The only intervention of interest for this review was elective, induced abortion, the deliberate termination of a human pregnancy. Abortion is a term widely used to designate both pregnancy loss and pregnancy termination. However, spontaneous abortion, or miscarriage, refers specifically to involuntary pregnancy loss due to natural physiological processes. Elective, induced pregnancy termination is a voluntary, non-spontaneous abortion that results from a surgical or medical intervention in a pregnancy for the purpose of causing the death of and removing the embryo or foetus (Oxford English Dictionary, 2009). The definition of abortion can be further refined based on the necessity of the procedure for the health of the pregnant woman. A therapeutic abortion is a medically necessary procedure to ensure the health of the female (Roche, 2004), whereas an elective abortion is voluntarily procured for non-medical reasons (Oxford English Dictionary, 2009). The studies included in this review measured the relationship only between legal, elective abortion and suicidal behaviour and ideation. Studies investigating elective abortion at any stage of pregnancy as the type of intervention were retained. Studies of therapeutic, medically necessary abortion and

spontaneous abortion were excluded on the basis that my interest is in the element of choice, and how the choice to terminate a pregnancy is related to suicidal phenomena. Other pregnancy outcomes used in comparison to elective abortion included birth and miscarriage; however, no other interventions were assessed.

The primary outcome measures in this review fall under the heading of suicidal behaviour, and include completed suicide and attempted suicide. The secondary outcome variable used was suicidal ideation. The definitions of suicide phenomena used to guide this review are from O'Carroll, Berman, Maris, Moscicki, Tanney, & Silverman (1996), whose definition and terminology for suicide and suicidal behaviours has been expanded into a nomenclature (De Leo, Burgis, Bertolote, Kerkhof, & Bille-Brahe, 2006) and applied as a standard by the World Health Organization. Completed suicide was defined as death from injury, poisoning or suffocation where there is evidence (either explicit or implicit) that the injury was self-inflicted and that the deceased intended to die. Attempted suicide was defined as a potentially self-injurious behaviour with a non-fatal outcome, for which there is evidence (either explicit or implicit) that the person intended at some (non-zero) level to kill himself or herself; may or not result in injuries. Suicidal ideation was defined as any self-reported thoughts of engaging in suicide-related behaviour (O'Carroll et al., 1996). This review retained only studies that explored self-harm with clear suicidal intent, as distinguished from studies of non-suicidal self-harm, and of self-destructive behaviours, such as pathological gambling and dangerous driving, as well as studies on assisted suicide or euthanasia.

The inclusion of suicidal ideation as a secondary outcome measure was based on the fact that several studies reviewed represented suicidal behaviour with suicidal ideation, while others included both behaviours and ideation in their outcome measures. Although certain

researchers reject the use of equivalent measures for suicidal phenomena, others have found that various instruments measuring suicidal ideation are acceptable indices of risk of suicidal behaviours. According to Kutcher & Szumilas (2010), suicidal ideation is a proxy measure which “cannot accurately reflect the complex interplay among the different variables associated with suicide death,” (p. 269). On the other hand, Brown, Beck, Steer, & Grisham (2000), found that suicidal ideation can provide an independent estimate of the risk for suicide. Certain measures of suicidal ideation have been demonstrated to have established concurrent validity with various measures of suicidal behaviours, as well as predictive validity (see Brown, 2002, for a review).

The presumption of equivalence between measures of suicidal ideation and of suicidal behaviours allows for the use of one measure as a proxy variable for another measure. Suicidal ideation as a proxy measure for suicidal behaviour can be accepted on the basis that suicidal behaviours and ideation are highly positively correlated (Brown, 2002). However, as suicidal ideation is not a type of behaviour and does not lead directly to death or self-injury, this reviewer opted to assign suicidal ideation a non-equivalent position in relation to completed and attempted suicide, and thus to weigh it at a secondary level of importance in terms of outcome measures. While the use of ideation may be more convenient in research on suicide, and although it may often be found to be statistically related, ideation remains a cognitive process that may or may not be preliminary to acting on suicidal impulses.

Search Methods for Identification of Studies

Studies were identified by searching electronic databases and scanning reference lists of articles. No limits were applied for language, however only papers in English, French and Spanish were assessed. This search was applied to OvidSP Psycinfo (1990-2013), MedLine –

OVID (1990–Present), CINAHL Plus with full text (1990-2012), EMBASE (1990-2012), Web of Science (ISI) (1990-2012), and All Embase Reviews. The initial search was performed on 5 July 2012. An updated search was run on 25 January 2013 applying all the same keywords and search limits as the initial strategy (see Appendix A – Electronic Search Strategies). In addition to database searches, a hand-search on-line using major search engines, and searched reference lists of articles retained on the basis of relevancy was conducted.

Data Collection and Analysis

Study selection. Eligibility assessment was performed in a non-blind, standardized manner. All references were imported from databases one through seven into Endnote, a software programme for reference management. Two forms of search were conducted to find studies, a multiple database search and a reference search. The search strategy was based on the intention to cull the highest number of articles including both abortion and suicide available. This was done using the fewest filters and limitations possible, as research in the area was expected to be scarce due to the highly precise nature of the research question. Following the identification of several hundred articles, a screening process was applied to remove duplicates and rank articles in terms of relevance. The aim of this process was to be as inclusive as possible in the search and as precise as possible in the screening of abortion-suicide research to ensure a proper coverage of the existing literature.

Each search level included three stages of screening: for duplicates, for general relevance and for adherence to inclusion and exclusion criteria. During the database search, all articles located in the seven databases using the outlined search strategies were imported directly into EndNote. Included studies investigated elective abortion in relation to suicide; excluded studies examined therapeutic or spontaneous abortion or investigated non-suicidal

self-harm, dangerous behaviours, euthanasia or assisted suicide. Eleven studies were retained following this stage of screening.

The second level of search was a manual search conducted of references from articles retained at the first level; this produced an additional nine articles. Following the three levels of screening, seven articles were retained. At the end of the searching and screening process, a total of 18 articles were retained based on relevance and adherence to inclusion/exclusion criteria. The updated search produced one new article, which following screening was retained for review, bringing the total number of articles included in this review to 19. Seven articles retained for review used suicidal ideation as a proxy variable to represent suicidal behaviour, and five studies included suicidal ideation and attempted suicide measures. The review protocol excluded suicidal ideation on the basis that suicidal cognitions (ideations) are not equivalent to suicidal behaviours (attempted or completed). However, as over a third of the research articles retained apply ideation *en lieu* of suicidal behaviours, it was more representative of current research in the field to include the seven articles, which met all additional criteria.

Data items. Information was extracted from each study concerning: (1) characteristics of subjects (age, marital status, socio-economic status, stage of pregnancy, intervention sought or performed), and the study's inclusion and exclusion criteria; (2) type of intervention (elective abortion versus birth, miscarriage or other pregnancy results); (3) type of outcome measure (completed and attempted suicide, and suicidal ideation); and (4) timing of outcome assessment (including frequency and length of follow-up for each outcome). Other variables of interest include: first pregnancy, circumstances of pregnancy, desirability of pregnancy, other children and previous abortions.

Data extraction and management. A data collection form (see Appendix B – Data Collection Form) was used to extract data from published reports. The form was used to collect standard and descriptive data about each study, such as citation and contact details, the country in which the study was conducted, as well as information on eligibility for the review, methods, participants, interventions, outcomes and results. Data were extracted independently by two researchers. These were then reviewed and disagreements were resolved by discussion.

Quality assessment. In addition to general inclusion and exclusion criteria, assessing the “quality” of primary studies is vital. The quality assessment process refers to assessing the extent to which each study minimises the risk of various forms of bias. Quality assessment is also a means of weighting the importance of individual studies when results are being synthesised, and guiding the interpretation of findings, as well as the recommendations for further research. A minimum level of quality can be assured based on an assessment of study design (Kitchenham, 2004). In general, the ranking of primary studies based on strengths and weaknesses of study designs can be understood to form a hierarchy of evidence. Commonly accepted hierarchies of evidence suggest five levels of study design quality (see Table A – Common Hierarchy of Evidence). However, according to Higgins & Altman (2008), it is essential to judge a study based on its unique features and not on its study design label. Studies of similar design differ in many ways and a common design label does not differentiate at the features level between strengths and weaknesses of individual studies. As studies cannot be properly assessed solely based on design, a risk assessment based on study design features is indispensable. In addition to a checklist for different study designs, Higgins & Altman also recommend a bias assessment tool that can apply to all designs.

Assessment of risk of bias in included studies. The methodological quality assessment for this review was conducted with a quality assessment instrument that integrated these three levels of risk assessment: a design hierarchy was elaborated to rate studies based on design; a quality assessment checklist was used to gauge differences in the executions of studies within design categories; and an existing measure of risk of bias was applied to each study in the review (see Appendix C – Reporting of Bias Tool).

In the present review, study design was considered during the evaluation of evidence and not at the appraisal and selection stage. The hierarchy of evidence applied to the studies retained (see Table B – Review Hierarchy of Evidence) is composed uniquely of observational studies, those in which uncontrolled variation in treatment or exposure among study participants is investigated. A design hierarchy (see Table C – Study Design Hierarchy) was used to order the studies in terms of quality prior to assessment.

In order to assess differences in the executions of studies within design categories, as well as to facilitate data synthesis and interpretation of results, a detailed quality assessment based on checklists of factors founded on study bias potential, was used to evaluate each study (see Appendix D – Quality Assessment Checklists). The checklists considered forms of bias including selection, measurement and attrition biases, and were based on criteria such as, how participants were selected, whether samples were sufficiently large, and whether there was adequate control for demographic characteristics and other potential confounding variables in the design or analysis.

Selection bias refers to the systematic difference between comparison groups with respect to treatment. Specifically, the concern is that subjects have a different probability of being selected according to exposures or outcomes of interest, creating thus a biased measure

of association. Measurement bias refers to the systematic difference between the groups in how outcomes are ascertained. Attrition or Exclusion bias is the systematic differences between comparison groups in terms of withdrawals or exclusions of participants from the study sample. In addition to both the design hierarchy used to order the studies in terms of quality prior to assessment and the quality assessment checklists, The Cochrane Collaboration's tool for assessing risk of bias (Appendix C) was used to gather data on various types of bias that were not included in the checklists. The instruments were derived from existing sources (Higgins & Altman, 2008) in order to maintain reliability and usability as validated instruments are not available for observational study designs. Risk of bias was assessed and the results were weighted based on the study design hierarchy, specific intra-study features and risk of bias, and incorporated into the interpretation of the results.

Summary measures. The principal summary measures of effect used in the studies retained are risk ratio, odds ratio and incidence ratio. Other measures include those for regression analyses, multivariate multiple regression analyses, prevalence ratios and distribution rates. Risk ratio, or Relative risk, refers to the risk of an event relative to exposure and is a ratio of the probability of the event occurring in the exposed group versus a non-exposed group; the risk of the event in one group divided by the risk of the event in the other group (The Cochrane Collaboration, 2002; Siström & Garvan, 2004). When the Risk Ratio is equal to 1, there is no difference in risk between the two groups; when it is greater than 1, the event is considered more likely to occur in the experimental group than in the control group; and when it is lesser than 1, the event is less likely to occur in the experimental than in the control group.

Odds ratios are used to compare the relative odds of the occurrence of the outcome of interest (e.g. disease or disorder), given exposure to the variable of interest (e.g. health characteristic). This measure refers to the multiplication of the odds of the outcome that occur with use of the intervention (Deeks, Higgins, & Altman, 2011; Grimes & Schulz, 2008; Szumilas, 2010). Odds ratios can also be used to determine whether a particular exposure is a risk factor for a particular outcome, and to compare the magnitude of various risk factors for that outcome. When the Odds Ratio is equal to 1, the exposure is considered to not affect the odds of outcomes; when greater than 1, exposure is associated with higher odds of outcome; and when lesser than 1, exposure is associated with lower odds of outcome.

Incidence rate ratio is the relative difference measure used to compare the incidence rates of events occurring at any given point in time (Sedgwick, 2010). Incidence rate refers to the occurrence of an event over person-time, which is the number of events divided by person-time, number of at-risk persons in the population under study multiplied by the amount of time period during which the events are observed.

Missing data. Only the available information on individuals, interventions, outcome and summary data were considered. For instance, the number of participants who completed the study, loss to follow-up, attrition during the study and exclusions from the analysis were considered for missing data on individuals. The potential impact on risk of bias engendered by missing data on the findings of the review also is addressed in the Results section.

Data synthesis. The results of the included primary studies were collated and summarised. A descriptive synthesis with a quantitative summary was produced where applicable. Extracted information about the studies (i.e., intervention, population, context, sample sizes, outcomes, and study quality) was tabulated in a manner consistent with the

review question. Tables were structured to highlight similarities and difference between study outcomes. The level of consistency between study results was identified and the results were tabulated to display the impact of potential sources of heterogeneity, e.g. study type, study quality, and sample size.

Summary of findings table. A format for the ‘Summary of Findings’ table developed by The Cochrane Group (Schünemann, Oxman, Higgins, Vist, Glasziou, & Guyatt, Ch. 11, 2011) was used in a modified form with the aim of ensuring that the data pertinent to this review were tabulated in a way that was comprehensive and straightforward. The table is subdivided by outcomes and lists each study by its identifier (e.g., Cagnacci Volpe 01) produced at the data collection stage. It lists the results of relevant outcomes (e.g., completed suicide); the magnitude of effect; the number of participants; a grade of the overall quality of the body of evidence for each outcome; and includes space for comments (see Table E - Summary of Findings).

Results

Description of Studies

Results of the search. The total number of papers identified in the initial search was 606. Following the removal of 123 duplicates, the remaining 483 articles were verified for relevance; 429 articles were excluded. The texts of the 54 remaining articles were assessed for eligibility when possible and 11 were retained. A further search of the references of the 11 retained papers produced an additional seven articles. An updated database search produced one new article, bringing the total number of research papers included in this review to 19 (see Figure 1 – Study Flow Diagramme).

Included studies. For this review, a total of 19 papers were identified which examined the relationship between abortion and suicidal behaviour and ideation. All studies were observational; among the studies retained, experimental designs varied widely and included two prospective cohort studies, three longitudinal cohort studies, six retrospective cohort studies, two epidemiological prevalence studies, and six cross-sectional studies. Nine of the studies examined abortion, seven examined suicide and three had other focal points, such as the psychological consequences of rape on women during war (Lončar, Medved, Jovanović, & Hotujac, 2006), substance use disorders among adolescents with bipolar spectrum disorders (Goldstein et al., 2008), and risks specific to orphaned and abused youth (Zapata et al., 2013). Study sample size varied between 2,639,257 (Cagnacci & Volpe, 2001) and 68 (Lončar et al., 2006) across studies, with the majority of studies (14 of 18) counting over 500 participants. The total number of study participants was 2,843,829. However, some studies included male populations not targeted by this review (Lauzon, Roger-Achim, Achim, & Boyer, 2000; Goldstein et al., 2008; Zapata et al., 2013). The total number of female participants drawn from the studies was 2,633,779. One mortality study did not include a specific number of participants and instead used demographic percentages (Dzurova, Ruzicka, & Dragomireckà, 2006), which excluded this study from the calculation of the total number of participants.

In 11 studies, women were seen in clinical settings, two were household-based surveys, and one was in a school setting. The remaining five studies were of records of deceased women. The 19 retained articles include studies based on North American and international samples. All research selected for the review were observational studies published in English. Study samples came from ten countries: Canada (1), USA (6), United

Kingdom (1), New Zealand (3), Russia (1), Croatia (1), Czech Republic (1), Brazil (2), Finland (2) and Italy (1).

The main inclusion criteria entailed women and girls of reproductive age who had procured an abortion or were in the process of procuring one. Six studies compared women and girls who had an abortion to those who had a different reproductive history (e.g., delivery, miscarriage, no pregnancy). Two of these studies were based on USA samples, and the remaining four studies were based on samples from Finland (2), United Kingdom (1) and Italy (1). One Canadian study compared participants procuring an abortion with a matched control group. Twelve studies had no comparison group and were based on samples from six countries: USA (4), New Zealand (3), Brazil (2), Czech Republic (1), Croatia (1) and Russia (1). Elective abortion was the only intervention of interest. In all studies, the primary outcomes assessed were mental health correlates or correlates of suicidal behaviours and ideation. The timing of outcome measures was variable and included single, monthly and yearly investigations. See Table F - Characteristics of Included Studies, for a description of key characteristics of retained studies: citation, study methods, participants, interventions, comparisons, outcome measures, important differences among studies, and funding.

Excluded studies. Several studies that appeared to meet the eligibility criteria were excluded further into the screening process. Of the 54 articles that met relevance criteria, 43 were excluded for a variety of reasons. Of the 43 excluded papers, full-text was accessed for 41, which were considered in detail. The decision to exclude was based on a variety of criteria: 15 were not peer reviewed primary studies, but systematic reviews, narrative literature reviews, letters, maternal mortality surveys, dissertations and descriptions of case rounds; nine studies included ineligible interventions; another nine studies examined suicidal behaviour

among pregnant women, not among women who had procured or were seeking an abortion although abortion was mentioned; an additional seven articles were not empirical studies but rather bioethical discussions or outlines of best practices; one study looked at suicide attempts and negative life events, but provided inadequate data on abortion; the full-text version of two reports could not be located.

Risk of Bias in Included Studies

Risk of bias was inconsistent across studies included in this review due to design variability, confounding factors, the inclusion of control or comparison groups and rates of attrition. The Cochrane Collaboration's tool for assessing risk of bias (Higgins & Altman, 2008) was used to assess risk. Overall, retained studies had weaknesses in the areas of incomplete outcome data, selective reporting and other varied sources of bias. The risks of bias unique to individual studies are tabulated in Table G – Risk of Bias. The global risk of bias among studies by source of bias is summarized in Figure 2 - Risk of Bias Summary. Selection bias refers to biased allocation to interventions as measured by random sequence generation and allocation concealment. The observational nature of the studies reviewed precluded the assessment of this type of bias. This is also true for Performance bias, which is due to knowledge of the allocated interventions by participants and personnel during a study. Detection bias refers to the breaches in blinding of outcome assessment and occurs due to knowledge of the allocated interventions by outcome assessors. In Figure 2, the low global risk for potential bias is indicated in green and 100 percent of studies fell into the low-risk category for Selection, Performance and Detection biases. Several other measures of risk of bias were evaluated in this review. Completeness of outcome data to address concerns about excessive rates of attrition or over-exclusion of participants, and the selective availability of

data were examined. Other sources of bias assessed included quality of outcome measures, sufficiency of data on participants, intervention or comparisons, and potentially confounding variables. Attrition bias based on incomplete outcome data was assessed at a low risk level (green) in 20% of studies, an unclear risk level (yellow) in 60% of studies and at high risk (red) in 20% of studies. Reporting bias was evaluated at low risk in 20% of overall studies, at unclear level of risk in 45%, and at high risk in the remaining 35%. Other sources of bias were combined and assessed to affect 20% of studies in the low risk range, 65% in the unclear risk range and 15% of studies in the high range. The global risk assessment indicates that studies examined were subject to substantial levels of unclear risk, especially in terms of combined forms of bias, but also to considerable levels of high risk, specifically for reporting bias.

Effects of Interventions and Evaluation of the Evidence

The following section includes a summary of the main findings concerning the effects of elective abortion on suicidal behaviour and ideation among women and adolescents. This section examines the objectives of the review rather than the findings of individual studies. The results of the individual studies, and any statistical summary of these studies, are included in The Summary of Findings (Table E). In addition to a description of the main findings, an attempt was made to provide a systematically organized evaluation of the evidence offered by each study and a global assessment of the evidence for each outcome measure, completed suicide, attempted suicide and suicidal ideation. Assessments were based on the following criteria: sample and comparison group selection; attrition; adequacy of control for demographic characteristics and potential confounding variables; quality of outcome measures and clinical relevance of results; and appropriateness of statistical analyses (see Appendix D).

The primary outcomes of interest to this review were suicidal behaviours, which included completed and attempted suicide. The secondary outcome measure was suicidal ideation. Of the 18 studies fully analyzed, four included the outcome measure of completed suicide, two of attempted suicide, five of both attempted suicide and suicidal ideation, and seven of suicidal ideation alone.

Completed suicide. The gravity of findings which indicate any relationship between induced elective abortion and completed suicide, but especially a positive relationship wherein abortion and suicide rates increase in magnitude in tandem, should not be ignored. A positive association between the two requires further research into preventive and educational measures. The present review was concerned with clarifying two areas in this field of research: (1) whether a relationship of any sort exists between abortion and suicide; and, (2) who is most likely to be impacted by any such relationship. What follows is an assessment of the available research that targets the relationship between abortion and completed suicide. All four studies included in the present review utilized medical and death records, but one applied the data on rates of abortion and rates of suicide to explore the possibility of seasonal rhythms for abortion rates and to compare these with seasonal rhythms for suicide rates (Cagnacci & Volpe, 2001).

Cagnacci and Volpe (2001) conducted a retrospective study with a four-year analysis. The researchers used data from The National Institute of Statistics and the Institute of Obstetrics and Gynaecology, to which all pregnancies are expected to be referred as it is the only local reference centre. The purpose of their study was to determine whether a seasonal rhythm existed in rates of abortion similar to that of suicide. This study included over 5,000 women who had procured an abortion, over 2 million who had delivered, and 3,481 female

suicides. Abortions were all conducted in the first trimester for reasons other than foetal malformation. The data on national and institutional abortions were controlled for age, education, marital status and previous abortion, and for all these variables except previous abortion in the female suicide group; no ethnicity data was provided. They compared female rates to male rates of suicide and to female suicide rates that pre-dated the legalization of abortion in Italy to verify the consistency of the seasonal rhythm of suicide: males for the same time period (over 10,000) and females from another time period (close to 3,000). The ratio of elective abortion to pregnancies at the third month of gestation was evaluated using the periodogram method. The rate of elective abortion showed a seasonal rhythm with amplitude of 6.1 to 6.7%, and peaked in the month of May (± 38 days). The national frequency of female suicides also showed a seasonal rhythm with amplitude of 11.1%, which peaked in June (± 37 days). The authors suggested that the nearly identical seasonal rhythms of abortion and suicide likely indicate common mechanisms between the two death-centered phenomena. This idea was based on their analyses of rhythm of suicide in two other groups, women prior to the legalization of abortion in Italy, and men, which suggest that the seasonal rate of suicide was not a consequence of the seasonal rate of abortion. They offered neurotransmitter fluctuations resulting in depressive mood as a possible explanation for the noted overlap, and proposed that preventive initiatives applied to the problem of suicide may also be applicable to women post-abortion. The study provided evidence for a seasonal rhythm-based relationship between abortion and suicide, as well as an indication that co-occurring risk factors between these two phenomena might explain the association.

Among the record-linkage studies, one specifically examined completed suicide in relation to pregnancy. In a 1996 linkage study of suicide after pregnancy in Finland, Gissler &

Hemminki et al. examined death register records for 1,347 suicides linked to pregnancy, specifically deaths occurring within a year of birth or pregnancy termination. These researchers used health data collected on the entire population, eliminating sampling errors. They obtained data on all women who committed suicide within one year of abortion or birth. The authors controlled for marital status and social-economic status in the abortion group, but were unable to control for these variables in the other groups. The majority of abortions were in the first trimester, and 80% of abortions were performed for reasons other than foetal abnormality, referred to as social reasons, but it was not specified if 'social reasons' are the equivalent of 'unwanted pregnancy'. The authors found that the suicide rate associated with abortion was significantly higher than in the general population, and when compared to women who gave birth or who miscarried; this finding held across all age groups, including females aged 15 to 49. They reported the suicide rate associated with abortion (34.7 suicides per 100,000 abortions) to be significantly higher than in the general population (11.3 per 100,000) and higher than the suicide rate for births (5.9 suicides per 100,000 births). The odds ratio for suicide following abortion compared to birth was 5.9 (OR: 5.9; 95% CI: 3.6-9.9). They also found a statistically significant difference in suicide rate between women who had abortions and women in the general population (OR: 3.08; 95% CI: 1.57-6.03). The suicide rate after an abortion (34.7) was three times the general suicide rate (11.3) and six times that associated with birth (5.9). The authors suggested common risk factors for abortion and suicide or harmful effects of abortion to explain the higher rates of suicide among women who procured an abortion. They noted that the number of suicides associated with pregnancy may have been underestimated as they restricted the study to the use of official cause of death,

excluding cases of unclear cause and accidents that may have been suicides. Possible confounds were ethnicity, psychiatric comorbidity and previous psychiatric history.

The two remaining record-linkage studies were of pregnancy-associated death and sought to evaluate the risk of completed suicide following abortion, among other causes of mortality. Another Finnish study by Gissler & Berg et al. (2005), examined the relationship between pregnancy and deaths from injury, suicide and homicide. This research included data on 156,789 women who had induced abortions and on 865,988 women who delivered. When compared with non-pregnant women, all mortality rates from external causes were higher after an induced abortion, but highest for suicide (33.8 per 100,000 pregnancies for suicide; 8.0 per 100,000 for homicides; and 16.3 for unintentional injuries, $p < 0.001$); this result held across all age groups, from ages 15 to 49, indicating that women who had procured an abortion were more likely to die from violent causes (60.0 vs. 9.6 per 100,000; $p < .001$). For the 5,299 females reported to have committed suicide, the mortality risk ratio for death by suicide following abortion was found to be 0.84 (Age-adjusted RR: 0.84; 95% CI: 0.69-1.01). Compared with pregnancy or birth, the pregnancy-associated mortality per 100,000 pregnancies for death by suicide among women who had an abortion was significantly higher (5.0 pregnancy or birth vs. abortion 31.9, $p < 0.001$). For younger women aged 15 to 24, Gissler, Berg and colleagues (2005) noted a higher overall pregnancy-associated suicide rate (RR: 1.47; 95% CI: 1.00–2.17) when compared with older age groups. These researchers found support for a protective effect of childbirth, and for an increased risk of suicide following abortion. Ethnicity data was limited to the categorization of citizens and residents, and with the exception of age, demographic variables were not analyzed. Psychiatric comorbidity and history were possible confounding factors.

The second study to look at pregnancy-associated deaths was conducted in The United States by Reardon et al. (2002). Using data from large databases of California state Medicaid records, Reardon et al. conducted a record linkage study of deaths associated with pregnancy in low income women who had procured an abortion or had delivered at full term. These researchers compared over 72,000 low-income women who had procured an abortion with over 100,000 women who delivered, and the general population. In the first and second years following abortion or delivery, the relative risk of suicide mortality rate was higher in the abortion group than in the delivery group (RR: 2.54; 95% CI: 1.14-5.67, $p < 0.0001$), as well as numerous other causes, such as accidents and disease. After controlling for age and psychiatric history in the previous year, the risk of death for women who at first pregnancy procured an abortion was three times higher compared with women who delivered (RR: 3.12; 95% CI: 1.25-7.78, $p < 0.0001$). The annual suicide rate for women with a history of abortion was found to be 7.8% versus 3% for women with a history of delivery in the study's sample. The researchers also found a significant difference in death rates over time, over the eight-year period of the study, mortality rates were 728.2 in the abortion group versus 585.5 in the delivery group per 100,000 (RR, 1.30; 95% CI, 1.13–1.49; $p < .0002$). Rates of violent death, including accidents, suicide and homicide, were also higher in the abortion group: 356.1 vs. 247.3 per 100,000, respectively (RR, 1.43; 95% CI, 1.17–1.74; $p < .001$). Reardon and colleagues concluded that higher suicide rates are associated with abortion and persevere over time. They proposed self-destructive tendencies, depression and unhealthy behaviours as pre-existing conditions that may be aggravated by abortion to explain the higher death rates associated with abortion and the persistence of the risk of mortality across socio-economic backgrounds. Their findings cannot be generalized for several reasons, which include but are

not limited to the exclusion of women only from the delivery group if they later had an abortion, as well as the measure of first pregnancy including only first pregnancy events occurring during the study and not to actual first pregnancies in women's lives. Ethnicity, marital status, socio-economic status, parity and reproductive history were unknown, and control for psychiatric history was limited to the year preceding pregnancy termination or delivery. The researchers excluded over 30,000 women from their study with insufficient explanation, and were limited to cases of state-funded abortion and hospital deliveries.

In the research using completed suicide as the outcome variable of interest, the seasonal rhythm study linked abortion and suicide through highly similar peak amplitudes in the seasonal rates of both phenomena, while the three record-linkage studies pointed to an increased likelihood of suicide in women who had terminated their pregnancy voluntarily. The authors of these four studies of abortion and completed suicide have offered co-occurring or pre-existing factors to explain the positive relationship between abortion and suicide. In two studies, (Gissler & Hemminki et al., 1996; Reardon et al. 2002), the authors indicated that the possibility of a harmful effect of abortion which could cause suicide should be considered.

Three of the four studies described have relatively few methodological problems and have met the criteria for strength of evidence to a satisfactory degree. The study by Reardon and colleagues (2002) was found to have several serious flaws in the areas of sampling and group selection, and control and confounding variables. Current research indicates that suicide is under-reported by as much as 10 to 30% (Gotsens, et al. 2011; Timmermans, 2005; see Tøllefsen, Hem, & Ekeberg, 2012 for a review). Overall, the quality of the evidence for the completed suicide outcome category is moderate-high in terms of the evaluation criteria

stipulated. The following section summarizes the results and provides an evaluation of studies which included the second behavioural outcome investigated in this review, attempted suicide.

Attempted suicide. As a behavioural variable that can be measured in various ways using any number of definitions, attempted suicide research contends with issues of quality for outcome measures. For completed suicide, the principal measurement issues are related to differences in classification systems for external causes of death and the under-reporting of suicide. For attempted suicide, outcome measures are evaluated based on how they correspond to a given definition of attempted suicide. Certain features are desirable in assessment measures of suicidal behaviour and ideation (see review by Brown, 2002). In order to properly reflect the definition of attempted suicide afforded by O'Carroll, et al. (1996), the presence or absence of attempts should be considered separately from details of occurrences, such as degree of certainty, intent, or lethality. Intent to kill oneself must be clearly assessed in order to avoid including intentional non-suicidal self-harming. In addition, measure items should detect suicide attempts regardless of the level of injury inflicted and whether medical attention was received. The retained studies met the criteria for the definition of potentially self-injurious behaviour with a non-fatal outcome guided by an intention to kill oneself (O'Carroll, et al. 1996), and were further assessed for the consistency of the outcome measures of attempted suicide with this definition.

In a prospective cohort study of abortion and psychiatric morbidity, Gilchrist et al. (1995) investigated deliberate self-harm among women who procured an elective abortion and other pregnancy outcomes in circumstances of unwanted pregnancy. This large, longitudinal study had a sample of 13,261 women with unplanned pregnancies, and compared those who had an abortion, those who requested but were refused an abortion, those who requested an

abortion but changed their minds, and those who did not request an abortion. Their analyses were controlled for age, marital status, education, parity, smoking, history of psychiatric illness and abortion history, but not for ethnicity. The researchers measured attempted suicide with International Classification of Diseases, Revision 8 (ICD-8; World Health Organization, 1967) coding for episodes of deliberate self-harm, defined as “self-inflicted” external cause of injury. The diagnostic criteria applied did not make the distinction between attempted suicide *per se* and parasuicide (non-suicidal intent), both of which are included in the ICD-8 general category of self-harm. However, the authors specified coding for episodes of *deliberate* acts of self-harm that provided intent and differentiated between attempted suicide and the non-suicidal self-harm of parasuicide. They found that deliberate self-harm was more common among women who obtained an abortion, with a relative risk estimate of 1.7 (RR: 1.7; 95% CI: 1.1-2.6), as well as among women who sought an abortion, but were refused (RR 2.9; 95% CI: 1.3-6.3). The rate of attempted suicide was found to be inversely related to age, with fewer episodes occurring in older women. This study underlines the importance of abortion intention to the understanding of women’s experience of unwanted pregnancy, and points to cognitive processes and additional negative life events (being refused an abortion) as elements of interest for clarifying pathways to suicidal behaviour. Information available on outcome measures for deliberate self-harm included presence versus absence, intent and method of injury. The data came from physician diagnoses. Incomplete outcome data, however, was problematic. By the end of the study, only 34.4% of the abortion group (2,122) and 42.4% of those who did not request an abortion (3,000) were still under observation. Attrition rates well exceeded established norms of acceptability of 20% (Stinner & Tennent, 2012), and were

attributed mainly to patients leaving the practice of the recruiting doctor. In addition to missing data, the authors noted possible under-reporting of suicide attempts (p. 248).

Goldstein et al. (2008), sampled 249 adolescents with a diagnosed bipolar disorder, and those with a substance use disorder were compared to adolescents without. Analyses controlled for age, socio-economic status, sex, race, family status, pubertal status, history of sexual and physical abuse, psychiatric comorbidity and life events (including pregnancy and abortion history). Suicide attempt was measured with other clinical characteristics, and was defined as self-injurious behaviour that met a seriousness or lethality score on a measure of depression or a measure of clinically significant suicide attempt; all assessment measures were of level of injury. Data was self-reported during interviews with diagnosticians. Compared to female, bipolar youth without substance use disorders, those with substance use disorders had a significantly higher prevalence of suicide attempts, and of past year pregnancy and abortion. Goldstein and colleagues (2008) reported significantly greater 12-month prevalence of pregnancy and abortion ($\chi^2 = 7.2, p \leq 0.001$). They also found that a significant predictor of substance use disorders in a logistic regression model was an increased prevalence of suicide attempts ($\chi^2 = 7.2, p < 0.007$). They suggested that suicide attempts, pregnancy and abortion are associated with substance abuse among adolescents with bipolar spectrum disorders.

Of the two studies using attempted suicide as the outcome variable, both found a relationship between abortion and suicide: procuring or being denied an abortion for an unwanted pregnancy was associated with higher probability of deliberately self-inflicted harm; and a higher prevalence of abortion and suicide attempts were associated with substance use disorder in a population of female adolescents with a bipolar spectrum disorder. Goldstein et al. (2008) suggested that as substance use disorder is a putative risk factor for increased

prevalence of suicide and risky sexual behaviour in youth, substance use disorder can also be assumed to act as risk factor for these behaviours in youth with bipolar spectrum disorders. Overall, the strength of evidence these studies provided was considered to be moderate following an assessment based on the evaluative criteria described above.

The next section of this essay reviews the findings from five studies that examined both attempted suicide and suicidal ideation. According to a classification scheme of suicidal behaviour developed by a National Institute of Mental Health task force (Beck, et al. 1973), suicidal phenomena are described as completed suicides and suicide attempts, which are behavioural aspects of suicidal phenomena, and suicidal ideation, a cognitive aspect.

Attempted suicide and suicidal ideation. The following studies included two indices of suicide, one behavioural and one cognitive. As discussed earlier, outcome measures of attempted suicide and ideation can be effectively evaluated based on their closeness to the definition applied to the phenomenon. An additional criterion to those listed for assessing suicide attempts relates to the evaluation of suicidal ideation, defined as “any self-reported thoughts of engaging in suicide-related behavior,” (O’Carroll, et al. 1996). Specific thoughts of killing oneself are necessary to qualify thoughts of death as suicidal ideation. Thoughts of death or wanting to die without specific thoughts of killing oneself are not (see Brown, 2002).

In a Canadian prospective cohort study on emotional distress in relation to first-trimester abortion, Lauzon et al. (2000) measured distress levels before and after the elective abortion procedure in a sample of 197 women. Women receiving an abortion were compared with a control group of 728 women. The attrition rate at follow-up was of 36%. All abortions were conducted in the first trimester, and the researchers controlled for previous pregnancies, abortions and children, as well as basic demographics, including age, marital status, education

level and occupation. It was unknown whether women in the control group were seeking an abortion at the time of the study. The presence or absence of suicidal gestures and ideation were surveyed for past year and whole life; however, it is unknown whether details of occurrences for suicidal gestures were included or whether suicidal ideation measured specific thoughts of killing oneself. Their findings indicate that women in the abortion group were more likely to have engaged in suicidal behaviours and ideation than controls in general, prior to obtaining an abortion. When compared to the female control group, women who procured an abortion ($n = 197$) reported more lifetime suicide attempts and more past year attempts than controls ($\chi^2 (1) = 16.90, P = 0.00004$). A significantly higher number of women who terminated their pregnancy reported suicidal ideation at some time in their lives ($\chi^2 (1) = 8.58, P = 0.0034$) and in the last year ($\chi^2 (1) = 10.04, P = 0.0015$). The generalizability of these results is limited as the researchers excluded all non-French speaking people from the study, and recruited women from urban medical clinics. Level of distress prior to the unwanted pregnancy in the study group was not controlled and the samples differed in terms of relevant demographic factors.

Lončar et al. (2006) investigated the psychological sequelae in 68 women raped in the early 1990s during the war in Croatia, Bosnia and Herzegovina. Demographic characteristics included age, nationality, place of residence, marital status, number of children, and education. Other variables were pregnancy, nature of sexual torture, duration of captivity and characteristics of the rapist. Psychological and physical symptoms, as well as psychiatric comorbidity at time of rape and of study were assessed. Suicide attempts and ideation were measured using a series of conceptually based questions on acute stress reaction symptoms described in the Diagnostic and Statistical Manual of Mental Disorders, Third Edition. The

two suicide variables were combined in the analyses, but it was unclear whether details of occurrences for attempts and thought specifically of killing oneself were assessed in regards to ideation. The researchers found that suicide attempts and ideation immediately following the rape were significant predictors of the decision to have an abortion in 29 women (42.6%) who became pregnant as a result of rape (OR: 25.8; 95% CI: 2.5-263.2), with suicidal phenomena explaining 48% of variance (Nagelkerke $R^2 = 0.0488$). Strong predictors of suicide attempts and ideation were physical injuries suffered during the trauma (OR: 7.2; 95% CI: 1.4-36.7), not knowing the rapist (OR, 8.18; 95% CI, 1.7-39.1), and vomiting after the rape (OR: 5.2; 95% CI: 1.3-21.4). Being of younger age was a weaker predictor of suicidal phenomena (OR: 0.95; 95% CI: 0.9-1.0), suggesting the possibility of increased resilience in youth. Together these predictors accounted for 33% of variance (Nagelkerke $R^2 = 0.327$). In this study, the decision to procure an abortion followed suicidal impulses and thoughts that occurred as a result of rape; the authors did not discuss suicidal behaviour or ideation following the abortion. A potential confound in this study was the baseline mental state of the sample due to the effects of war, although there was a self-report measure of previous psychiatric diagnoses.

Mota and colleagues (2010) examined the relation between abortion, mental disorders, and suicidal behaviour and ideation in a nationally representative sample of The United States. The authors investigated the associations between abortion and lifetime suicide attempts and ideation. Of the 3,310 women in the sample, 3,291 women were pregnant, 452 had a history of abortion and 2,839 had no history of abortion. Data were collected once by trained interviewers in the households of respondents. The overall response rate was 70.9%. Records on abortion were limited to presence or absence of the procedure and age at first abortion. The measures of lifetime suicide attempts and suicidal ideation were 'yes' or 'no' responses to

written questions regarding presence or absence of attempts and ideation along with age at first time for each if respondents answered 'yes.' Demographic variables included age, education, marital status, household income, and ethno-racial background and ancestry. After adjusting for socio-demographics, the results indicated that abortion was associated with an increased likelihood of suicide attempts and suicidal ideation. However, after controlling for violence, only the adjusted odds ratio for suicidal ideation remained significant (adjusted OR: 1.97; 95% CI: 1.46-2.66; adjusted OR Violence: 1.59; 95% CI: 1.20-2.11, $p < 0.002$). Twenty-three percent of women reported suicide attempts after the age of their first abortion (OR: 23.1; 95% CI: 13.6-36.2), and close to 30% reported suicidal ideation (OR: 29.9; 95% CI: 21.7-39.6) after their first abortion. The authors concluded that while suicidal phenomena are associated with a history of abortion, the relation is inconsistent. Certain problematic areas of this research are the reliability of data for age of abortion or onset of mental illness due to recall, potential for under-reporting of abortion and suicidal phenomena due to stigma; and important confounds such as pregnancy intention, trimester of pregnancy at abortion and abortion for genetic versus other reasons.

In a cross-sectional study, Pinheiro and colleagues (2012) assessed suicidal behaviour and psychiatric disorders in pregnant Brazilian youth. The sample consisted of 828 out of 871 possible subjects aged 13 to 19 years. For 603 adolescents, the current pregnancy was unplanned, and for 26 it was an undesired pregnancy; 115 youth intended to have an abortion for the current pregnancy and 18 had already attempted an abortion of the current pregnancy; 87 girls had had a previous abortion. The majority of pregnancies were in their sixth week. Data was gathered by the researchers in the household of respondents, and included socio-demographic characteristics, obstetric history, alcohol or illicit drug use, stressful life events,

social support, physical and sexual abuse, psychiatric disorders, and suicide attempts and suicidal ideation. Socio-demographic information consisted of age, marital status, education, family income, occupation and socioeconomic status. The obstetric history included gestational age, abortion intention or abortion attempt in the current pregnancy, parity and previous abortions. Suicide attempts and ideation were assessed on the basis of presence or absence (past month and lifetime), and severity. These researchers found suicidal behaviour in 13.3% of the sample; 8.6% were considered at low risk, 1.3% at moderate risk and 3.4% at high risk for suicide attempts. Lifetime suicide attempts were reported by 7.4% of girls, with 1.3% admitting to having attempted suicide in the past month. Suicidal ideation was present in another 18.7% of the sample, who had thoughts about planning their suicide, self-harming, and being dead. The adjusted prevalence ratio was more than three times higher for suicidal behaviour among those with the intent to procure an abortion in the current pregnancy (PR: 3.15; 95% CI: 1.86–5.37, $p < 0.001$), and two and a half times as high in young people with a history of previous abortion (PR: 2.60; 95% CI: 1.44–4.69, $p < 0.002$). For girls with an undesired pregnancy, the prevalence ratio for suicidal behaviour was two and a half times higher than their peers (PR: 2.49; 95% CI: 0.96–6.51, $p < 0.062$). Lower education and higher age among adolescents was also associated with a significantly higher prevalence of suicidal behaviour among pregnant girls. The results reported by Pinheiro et al. support the view that suicidal behaviour and ideation are fairly common experiences for pregnant girls, with rates resembling those of major depressive disorder, and that high levels of social support may have a protective effect for pregnant youth. Potential issues of under-reporting of abortion and suicidal phenomena due to stigma, as well as cognitive bias, in this sample of pregnant girls, should be noted.

Zapata et al. (2013) sought to estimate the frequency of childhood abuse and examine its association with lifetime pregnancy involvement and past year suicide ideation among 293 orphaned youth in Russia in a cross-sectional study. There were 133 young women aged 16 to 23 years in the sample recruited from three technical schools in St. Petersburg. Questionnaires were administered by trained local interviewers. Demographic information was limited to age and gender; other factors included in the analyses were childhood physical and sexual abuse, social vulnerability, sexual/reproductive health and substance use. Only one item measured the presence or absence of past year suicidal ideation. Those who indicated the presence of past year suicidal ideation also reported on three additional items: having lived with someone during childhood who was depressed, mentally ill or had attempted suicide; having made a plan to attempt suicide; and having attempted suicide. These researchers found that female gender was a significant risk factor for both pregnancy (20.63%) and suicidal behaviour (14.96%). They also found that for the young women in this study, childhood physical abuse was related to a significantly higher prevalence ($p < 0.05$) of lifetime pregnancy events (33.33%) and of past-year suicide ideation (30%). Over 60% of pregnancies ended in abortion (61.76%). Childhood sexual abuse also significantly increased the prevalence of pregnancy and suicidal ideation in females (47.83% and 38.46%, respectively). Significantly higher prevalence rates of pregnancy events and suicidal ideation was found among youth who had lived alone, with friends (17.65% and 17.09%, respectively), or who were socially isolated (24% and 32%, respectively). A history of pregnancy was found among youth with past year suicidal ideation significantly more often than among those without a previous pregnancy event (22.86%). Zapata and colleagues found that almost 45% of orphaned youth with past year suicidal ideation had also attempted suicide, and 41.4% had planned a suicide. Overall,

the data was subject to recall and social desirability bias and the potential for the under-reporting of issues connected to stigma, such as childhood abuse, abortion and suicide.

The five studies above included the primary outcome of attempted suicide and the secondary outcome of suicidal ideation. Participants in three of the studies were recruited from medical clinics prior to procuring an abortion (Lauzon et al. 2000; Loncar, et al. 2006; Pinheiro et al. 2012); in one study, they were recruited from technical schools (Zapata et al. 2013) and in another study, sampled from a national survey (Mota et al. 2010). The generalizability of results to the general population is limited due to sampling from clinical and academic settings. It remains unknown whether and in what ways girls and women who actively seek out medical care differ from women who do not seek out abortion or counselling during unwanted or unexpected pregnancy, especially in early stages of pregnancy. With the exception of the study by Pinheiro et al., in which adolescent girls were pregnant during the study, the women sampled for the other studies had procured an abortion before or during the study. Only the prospective cohort study by Lauzon and colleagues included a control group; three of the studies were cross-sectional and one was a retrospective cohort study. The outcome measures for suicidal phenomena were restricted in to presence/absence, and past year/lifetime. Only one study assessed the severity of suicidal gestures (Pinheiro et al.), otherwise information concerning details of occurrences for suicidal gestures or whether suicidal ideation specifically measured thoughts of killing oneself was not provided. Overall, the limited generalizability of results and the restricted scope of the outcome measures must be weighed against the comprehensive collection of demographic information and the adjustment in most studies for potential confounds, such as abortion history, parity, pregnancy intention

and violence. The next series of studies to be reviewed exclusively used suicidal ideation, a cognitive variable, to examine the relationship between suicide and abortion.

Suicidal ideation. In this section, seven studies with suicidal ideation as the outcome variable were assessed. As noted earlier, measures of ideation can be evaluated using the definition of suicidal ideation as a guideline, and should go beyond the inclusion of thoughts of death to consist of thoughts of wanting to kill oneself in order to ascertain the intention to kill oneself and be considered appropriate measures of suicidal ideation.

Fergusson, Horwood and Ridder (2006) examined the relationship between abortion and mental health in a longitudinal cohort study using a sample of 506 women aged 15 to 25 years in New Zealand. The sample included 205 pregnant women (41%) of whom 74 (15%) who had procured an abortion. Analyses were adjusted for a large number of covariant factors, e.g., mental health, family socio-demographic background, family functioning, childhood conduct problems, child educational achievement, child personality, adolescent adjustment, and adult lifestyle factors. However, pregnancy intention and violence were not controlled. The authors refer in the abstract to suicidal behaviours, but describe only measures and outcomes for suicidal ideation. This may be an instance of applying the proxy variable of suicidal ideation to represent the outcome of attempted suicide; however, elsewhere the authors mention the use of unspecified measures of self-reported suicidal ideation and attempts. This uncertainty leaves both the adequacy of the measures up for debate, as well as the question of whether data on attempted suicide was simply left unreported. Significant associations were found between abortion and mental problems including, suicidal behaviours (ideation; $p < .05$). Planned comparisons of the rate of suicidal ideation across three groups, Not Pregnant, Pregnant No Abortion and Pregnant Abortion, showed that there was a

significant difference between the Pregnant Abortion group (pooled RR: 1; 95% CI, $p < 0.001$), and the other two groups, Not Pregnant (pooled RR: 0.25; 95% CI: 0.13-0.50), and Pregnant No Abortion (pooled RR: 95% CI: 0.31; 0.14-0.69), but no difference between the latter two groups. The risk ratio of suicidal ideation by pregnancy/abortion status after covariate adjustment significantly differed for the Pregnant Abortion group when compared to the other two groups ($p < 0.004$) as did the adjusted rates of disorder for the Pregnant Abortion group ($p < .008$). The authors suggested that as associations persisted after extensive control for a range of confounding factors, abortion in young women may be linked with mental health problems. They noted that compared with reported rates of abortion in the population, lower rates of abortion in the cohort were suggestive of under-reporting of abortion.

Using the same cohort data as the 2006 study, Fergusson, Boden and Horwood (2008) examined the relationship between pregnancy outcomes and mental health in 534 women aged 15 to 30 years in New Zealand. The pregnancy sample consisted of 284 women (53%) who reported a total of 686 pregnancies before age 30. These pregnancies included 153 abortions (procured by 117 women), 138 pregnancy losses ($n=95$), 66 live births ($n=52$) resulting from an unwanted pregnancy or one that provoked an adverse reaction, and 329 live births ($n=197$) resulting from a wanted pregnancy. The attrition rate of 17 to 20% was acceptable. Mental health and multiple covariates were adjusted for, including childhood socio-economic circumstances, parental adjustment/family functioning, sexual and physical childhood abuse, individual characteristics and educational achievement. Suicidal ideation was assessed via questioning about the frequency of suicidal thoughts in the previous 12 months, but it was unspecified whether the measure included items pertaining to intent to kill oneself. The estimated risk ratio for suicidal ide abortion was 2.07 (RR: 2.07; 95% CI: 1.19–3.57) in the

concurrent model, and 2.26 in the five-year lagged model (RR: 2.26; 95% CI: 1.17–4.38). The estimated risk ratio between measures of pregnancy history and suicidal ideation after adjustment for covariates in the study's concurrent model was 1.35 (RR: 1.35; 95% CI: 0.77–2.38) and 1.61 in the five-year lagged model (RR: 1.61; 95% CI: 0.82–3.18). In an attempt to argue for a causal relationship between abortion and mental health problems, the authors cite the consistency of associations, as opposed to a correlational relationship, resiliency to control for confounding variables, temporal sequence, availability of comparison groups, and robustness of the results. The inclusion of wanted/unwanted pregnancy and control for violence were an improvement over the 2006 study. However, the paucity of the outcome measure for suicidal ideation is unfavourable to the overall assessment of the study in terms of its contribution to the understanding of the link between abortion and suicidal ideation.

In another study of the cohort and sample described above (see Fergusson, Boden, & Horwood, 2008), Fergusson, Horwood and Boden (2009) examined the relationship between reactions to abortion and subsequent mental health. The sample of 104 women represented 89% of the 117 women originally in the abortion group. As in the two previous studies, analyses included mental health variables and controls for various factors, including but not limited to childhood socioeconomic circumstances, parental adjustment/family functioning, childhood abuse, adolescent adjustment, and lifestyle. The measures of self-reported suicidal ideation were not described; however, a search of the references produced a citation for a structured diagnostic instrument, created by the National Institute of Mental Health Diagnostic Interview Schedule for Children (DISC; Costello, Edelbrock, Kalas, et al. 1982). Information pertaining to whether and how this instrument was applied to the sample of 15 to 30 year olds was not provided. Distress was found to be a moderating factor in the relationship between

abortion and post-abortion mental health. Pooled rate of suicidal ideation for women ages 15 to 30 years was measured by extent of abortion-related distress (n = 104). The concurrent model, in which exposure to abortion was assessed up to and concurrently with the assessment of mental health problems, yielded the following rates: 13.7% for 0 negative reactions to abortion, 22.2% for 1 to 3 negative reactions, and 29.2% for 4 to 6 negative reactions. In the five-year lagged model, in which exposure to abortion was assessed in the five years prior to the beginning of the assessment period for outcomes, rates were 14.7% for 0 negative reactions, 23.1% for 1 to 3 negative reactions, and 38.9% for 4 to 6 negative reactions. The authors found a relationship between the degree of abortion distress and rates of mental health problems and determined that extent of distress associated with abortion modifies the risks of subsequent mental health problems.

Steinberg et al. (2011) conducted a prevalence study of the risk of depression, suicidal ideation, and lower self-esteem following abortion or delivery of first pregnancy. Using data from the National Comorbidity Survey conducted in the United States, their sample consisted of 1,765 women aged 15 to 54 years. The 218 women who had procured an abortion at first pregnancy were compared to the 1,547 women who delivered their first pregnancy. The researchers controlled for race, age at first pregnancy, and marital status, education and income, as well as for experiences of violence, and previous mental health, including depressive episodes, suicidal ideation, and alcohol and drug dependence prior to the first pregnancy. Wanted versus unwanted pregnancy status was not controlled, neither was pregnancy intention. Furthermore, there was no indication that genetic anomalies were distinguished from other reasons for abortion in the sample. Suicidal ideation was assessed with three questions pertaining to lifetime occurrence of thoughts on intention and plan to

commit suicide, and attempted suicide. Any positive answer to any of the items was coded as suicidal ideation. Timing of suicide thoughts, plans or attempts was used to determine when the ideation occurred relative to the first pregnancy event. Suicidal ideation was considered to have occurred subsequent to the first pregnancy outcome when suicidal ideation occurred at the same age as or after a first pregnancy outcome. As attempted suicide was subsumed by the ideation measure, it was not possible to assess the strength of this behavioural component of suicide beyond presence/absence of the behaviour and its timing in relation to the first pregnancy. After controlling for all risk factors, these researchers found that women who terminated their first pregnancy were only marginally more likely to have pre-pregnancy suicidal ideation than women who gave birth ($p < .07$). Of the 218 women who procured an abortion, 203 were found to have had suicidal ideation (which included attempts) after or at the same age as the first pregnancy outcome. Women who experienced suicidal ideation had a higher prevalence of pre-pregnancy sexual violence (OR: 1.81, $p < .006$) or other violence (OR: 2.38, $p < .008$), and a higher prevalence of pre-pregnancy suicidal ideation (OR: 8.0, $p < .0005$). Being younger at first pregnancy (OR: 0.90, $p < .0005$) was significantly related to post-pregnancy suicidal ideation, as was being unmarried (OR: 2.72, $p < .0005$), and being depressed prior to the pregnancy ($p < .0005$). However, in the fully adjusted analyses, no significant relationship was found between abortion and suicidal ideation (OR: 1.19; 95% CI: 0.70 – 2.02, $p = .52$).

In 2012, da Silva and colleagues conducted a cross-sectional study of 1,334 pregnant young women in Brazil. Participants who were unable to understand or answer the questionnaire were excluded from the study. The mean age of the sample was 25 years (SD=6.51) Data concerning socioeconomic status, education, marital status, whether the

pregnancy was planned, and thoughts of abortion were also collected. Depression and anxiety were assessed, and suicidal ideation was evaluated using a single item from a measure of post-natal depression that asked about thoughts of harming oneself. The presence of suicidal ideation was measured with a response of 'sometimes/many times,' whereas its absence was determined with a response of 'rarely/never.' The outcome measure was found to be lacking in terms of its ability to assess self-harming with versus without the intent to kill oneself. This was considered an important methodological limitation and the results should be considered with some caution. Suicidal ideation was reported by 8.1% of the sample with 3.5% of women having had suicidal thoughts many times in the week previous to the interview. Among pregnant women with a high rate of suicidal ideation, 26.4% ($p = 0.000$) had thoughts of abortion. Suicidal ideation was found to be significantly related to thoughts of abortion (OR: 4.48; 95% CI: 2.72-7.38, $p = 0.000$). Women who were depressed while pregnant were also more likely to present with suicidal ideation (OR: 3.83; 95% CI: 2.24-6.56). This is not surprising given that depression is a major risk factor for suicide. The absence of an appropriate control group prevents us from knowing whether depressed women who had an abortion were more suicidal than depressed women who delivered. Suicidal ideation was more likely among pregnant women with symptoms of anxiety than among those without (OR: 10.05; 95% CI: 4.93-20.50). For depressed women in the sample, risk factors for suicidal ideation included thoughts of abortion (OR: 1.71; 95% CI: 1.17-2.50, $p = 0.012$). This was also true for non-depressed pregnant women (OR: 6.40; 95% CI: 2.79-14.71, $p = 0.000$). The authors noted that suicidal ideation was a common feature in their sample of pregnant women.

Ely, Nugent, and Flaherty (2009), investigated suicidal ideation in relation to dating violence in a sample of 120 unmarried adolescent girls aged 14 to 21. All were seeking an

abortion for an unwanted pregnancy. Participants presenting excessive emotional distress concerning their pending abortion were excluded from the study, although it remains unclear as to why this was the case. Demographic variables included age and race/ethnicity. Other variables were conflict in adolescent dating relationships, and psychosocial problems including mental health issues. Suicidal ideation was measured using 11 items from the Multidimensional Adolescent Assessment Scale (MAAS; Nugent, Sieppert, & Hudson, 2001). Missing data for the suicidal thinking subscale was at 20%. Dating violence was found to be correlated with subscale score for suicidal ideation ($r = 0.28, p < .01$). The results of the multivariate multiple-regression analysis showed that after controlling for age, race/ethnicity, aggression, and problems with friends, there was a statistically significant relationship between dating violence and suicidal ideation, $t(66) = 2.35, p < .02$ (one-tailed). Ely, Nugent, & Flaherty (2009), suggested a relationship between level of dating violence and several psychosocial problems, including suicidal ideation, in their sample of pregnant teenagers seeking abortion.

In a second study using the same cohort described above, Ely, Nugent, & Cerel et al. (2011), continued to focus on the relationship between dating violence and severity of suicidal thinking. The severity of suicidal thinking was measured using the 11-item subscale from the MAAS, and was used as the dependent variable. Demographic data consisted of age, ethnicity and education. Independent variables were various psychological and social problems, and dating violence levels. Of the original 120 participants, 96 (80%) completed the suicidal thoughts questions. The researchers found a positive correlation which indicated that as severity of dating violence increased, severity of suicidal thinking increased (estimated zero-order correlation with dating violence, $0.28, p < .01$). A significant positive correlation was

also found between the abuse variable and severity of suicidal thinking (0.20, $p < .05$, one-tailed). The authors concluded that aggression moderated the relationship between dating violence and severity of suicidal thinking. As aggression augmented, the relation between dating violence and suicidal ideation increased. The generalizability of the results from both of these studies was considered limited by the context in which the study was conducted and the single, urban sample consisting of primarily Caucasian adolescents with unwanted pregnancies seeking abortion.

The seven studies with suicidal ideation as the sole outcome of interest had several overall weaknesses, with the most problematic one being the measures of suicidal ideation. With the exception of the studies by Ely, Nugent, & Flaherty (2009) and Ely, Nugent, & Cerel et al. (2011) that used 11-item suicidal ideation subscales of a validated multi-dimensional assessment instrument for psycho-social problems, the studies of suicidal ideation had stark deficiencies in the quality of their outcome measures. Steinberg et al. (2011) assessed ideation, but included attempted suicide, an act of suicide as opposed to a thought of suicide, in their three questions. Despite this coalescing of cognitive and behavioural aspects of suicidal phenomena, various aspects were noted, such as timing of event and intention. Details concerning frequency, degree of certainty and lethality were missing, however. For clarity, the behavioural and cognitive components could have been separated. The three studies by Fergusson and colleagues (2006; 2008; 2009) used unspecified measures of self-reported suicidal ideation; in one of those studies (2006), the authors alluded to an unidentified measure of attempted suicide. It is unclear if these measures were the same across studies which sampled from the same cohort or whether the measures differed from one study to the next. da Silva, et al. (2012) used a single item taken from a post-partum depression measure to assess

suicidal ideation, and the item was limited to a presence or absence level quality, and did not distinguish between non-suicidal and suicidal self-harm. In addition, their measure coded absence of ideation with a response category of ‘rarely/never,’ which is contradictory to the extent that ‘rarely’ is not equivalent in sense to the quality of absence of a phenomenon, but in fact is inherently equivalent to its presence.

It is interesting to note that even though the seven studies of suicidal ideation differed in outcome measure used, country of study, and demographic characteristics, many had certain aspects in common. The first similarity pertains to the findings: each study reviewed in this category found a statistically significant correlation between abortion and suicidal ideation, indicating a relationship. Another parallel relates to the use of important control variables, including violence either in the form of childhood abuse or partner violence. Five of the seven studies controlled for violence. While violence was not adjusted for in Fergusson, Horwood and Ridder (2006), this oversight was corrected in the two later studies conducted with the same cohort (Fergusson, Boden, & Horwood, 2008 and Fergusson, Horwood, & Boden, 2009). The study by da Silva et al. did not include violence as a control variable.

In relation to the appropriateness of analyses, five of the studies adjusted for wanted versus unwanted pregnancy status (Fergusson, Boden, & Horwood, 2008 and Fergusson, Horwood, & Boden, 2009; Ely, Nugent, & Flaherty, 2009; Ely, Nugent, & Cerel et al., 2011) or planned versus unplanned pregnancy status (da Silva et al.). Controlling for wanted versus unwanted pregnancy is crucial to reduce the potential of this confound; however, it is important to note that *wanted versus unwanted* is not equivalent to *intended versus unintended* pregnancy. Pregnancy intention does not determine pregnancy desirability. Pregnancy intention may predate wanted or unwanted pregnancy status. *Wanted-ness* is another construct

that requires careful consideration as the status of wanted or unwanted is not a unique factor in the decision to procure an abortion or maintain a pregnancy. Any number of other factors may contribute to the decision to procure an abortion or not. For instance changes in other important areas of life, such as familial support, romantic relationships, health or revenue, can influence the decision to have an abortion even when a pregnancy is wanted. Finally, although certain researchers considered their studies indicative of a causal relationship between abortion and mental health problems (Fergusson, Horwood, & Ridder, 2006 and Fergusson, Boden, & Horwood, 2008), it is clear that the methods used in these observational studies do not allow for the determination of causality in a relationship between abortion and suicide, a comment that applies to all the studies reviewed. The strength of the evidence provided by this series of studies was evaluated at a moderate-low level because despite their various strengths, weaknesses found in regards to outcome measures limited the clarity of an essential element of the research, that is to say, of what was truly being measured.

Discussion

The four studies of completed suicide included 2,819,182 subjects and revealed that women who complete suicide were more likely to have had an abortion in the 12 months previous to death than their counterparts. In the two studies of attempted suicide, which included 13,510 women, findings indicated that deliberate self-harm was significantly more common among women who had an abortion but had no history of psychiatric illness, and that higher rates of abortion and of suicide attempts were associated with substance misuse among adolescents with bipolar disorder. The five studies of both suicide attempts and suicidal ideation involved 6,201 women. Their respective findings indicated that women who obtained an abortion had a higher lifetime incidence of suicide attempts and ideation; that post-rape

attempts and ideation were significant predictors of abortion in a group of women who had been raped; ideation occurred significantly more often in women who had an abortion even after adjusting for violence; that the prevalence ratio for suicidal behaviour was more than two-fold higher in teenagers with a history of abortion; and that childhood sexual and physical abuse were associated with a higher prevalence of abortion and of suicidal ideation and attempts. Finally, in the seven studies of suicidal ideation, which included 3,753 women, the results also pointed to a relationship between abortion and suicidality. Three studies by the same group of researchers showed that abortion in women was associated with increased risk of mental health problems, including suicidal ideation; and that women aborting their first pregnancy were more likely to have experienced pre-pregnancy violence, suicidal ideation and substance abuse. The other studies' findings indicated that suicidal ideation among pregnant women was associated with increased thoughts of abortion, especially for women reporting anxiety symptoms, or who had a history of dating violence or problems with aggression. (See Table E-Summary of Findings.)

What remained uncertain was the importance the role of violence and other potential confounds may have in the relationship between abortion and suicide. Ten of the 18 studies assessed controlled for or investigated violence directly. However, studies that did attempt to shed light on how violence may impact suicidality and the decision to have an abortion, did not include numerous types of violent experiences, but were restricted to one or two forms of violence. Other essential control variables included background (age, marital status, education, occupation) and economic factors (income), pre-pregnancy violence experience, and pre-pregnancy mental health. Controlling for variables such as violence type, history and current experience of violence; history of suicidal behaviour; history of abortion; children; protective

factors for suicide; social support; negative life events; and legal difficulties, could contribute to a clearer understanding of the question reviewed.

The number of studies reviewed was limited, yet considered sufficient to address the objectives of this analysis. The evidence is relevant to the review question in terms of the types of participants and outcomes that have been examined. The first objective of this review was to examine current knowledge on the relationship between elective abortion and suicide. The 18 articles assessed were selected via a systematic search which involved numerous databases and hand searches for current, published, peer-reviewed research. Together, the studies represented a large number of participants who covered a wide age range which comprised primarily adolescents through women in midlife. Studies were drawn from multiple countries with populations from diverse backgrounds and varying economic status. However, women from African and Asian countries were not represented. Descriptions of the intervention, how the induced abortion procedure was carried out, were not provided in any of the research. The control and comparison groups were adequate in range. The various outcomes available for consideration were deemed relevant to the objectives outlines.

The review's second objective was to determine which subgroups of women may be at an increased risk of engaging in suicidal behaviour following an abortion or more likely to obtain an abortion when there is a history of suicidal behaviour. The research is mixed in terms of particular demographic groups who may be more vulnerable to suicide following abortion (e.g., age, economic status), but is more consistent regarding the likelihood of pre-existing and co-existing risk factors for both pregnancy termination and suicide. Certain studies also indicate that an increased likelihood of abortion is associated with suicidal ideation and a history of suicidal behaviour and ideation. (See Table E-Summary of Findings.)

Eleven articles were found that directly assessed the relationship between abortion and suicidal behaviour, including five that looked at both attempted suicide and suicidal ideation. Seven others were located that addressed abortion and suicidal ideation alone. The overall number of participants in the 18 studies reviewed is 2,842,655. The key methodological limitations of the studies are varying definitions of what constitutes suicidal behaviour, poor measures of suicidal phenomena, especially of suicidal ideation, and the lack of control of important confounds. The likelihood of under-reporting both of abortion and of suicidal behaviour and ideation are also limiting. However, the high level of consistency across results of the 18 studies reviewed underscores the existence of a statistically significant relationship between abortion and completed suicide, attempted suicide and suicidal ideation. While studies differed in terms of the magnitude of effect, all indicated some degree of correlation between abortion and suicidal behaviours; the association between abortion and suicidal ideation, however, remains tentative.

The quality of the evidence was globally assessed in terms of sample and comparison group; attrition; adequacy of control for demographic and confounding variables; quality of outcome measures; and appropriateness of statistical analyses. With the exception of one study (Reardon et al. 2002), strength of evidence for studies of completed suicide and of attempted suicide was satisfactory and their results were generalizable. The studies of both attempted suicide and suicidal ideation were assessed at a moderate-low level, determined by the limited generalizability of results and restricted scope of the outcome measures. The overall applicability of the findings from the studies of only suicidal ideation was considered to be at a moderate-low level, due primarily to issues related to the quality of outcome measures. The body of evidence identified does not allow a robust conclusion to be drawn regarding the

objectives of this review. Despite the consistency of the findings across the three categories of outcomes, the methodological issues, the fluctuations in the magnitude of findings, the confounding variables, and the issue of under-reporting undercut the strengths of the research.

A search of the literature did not reveal any previous systematic reviews assessing abortion in terms only of suicide outcomes. However, the results of a recent meta-analysis, which provided a large quantitative estimate of mental health risks associated with abortion that included suicide outcome measures (Coleman, 2011), revealed a moderate to highly increased risk of mental health problems after abortion. Other less recent reviews concluded that the relative risks of mental health problems among women who procure an abortion are no greater than the risks among women who deliver (APA, 2008; Robinson, Stotland, Russo, Lang, & Occhiogrosso, 2009). Six to eight of the studies contained in this review were published after these three reports. In order to reduce reporting biases, a comprehensive database search was conducted for a period covering 22 years. Publication bias, the selective publication of research findings depending on the nature and direction of results (Sterne, Egger, & Moher, 2011) may have affected the cumulative evidence of this review as all searches were for peer-reviewed journal articles, and unpublished studies were not retained.

Author's Conclusions

After considering evidence from the 18 studies assessed, the findings of this systematic review support the view that the correlational relationship between elective abortion and suicidal behaviours and ideation is mediated by co-occurring factors. Given the methodological issues detailed above and the range of confounds in the studies available, the reviewer concludes that current research does not provide evidence sufficient to resolve the question of the existence of a clear relationship between suicidal phenomena and abortion.

The practical implications of these findings for women and care providers include the provision of an evidence-based, semi-structured assessment of common risk factors for abortion and suicide. Pre-abortion counselling with a discussion of the risks associated with abortion, followed by a plan for post-abortion care should be designed to improve preventive care for women who are considered particularly at risk. Specifically for practitioners of psychotherapy, implications include addressing abortion history and history and current experience of various forms of violence during preliminary diagnosis or evaluation of women in their childbearing years with the goal of improving suicide prevention and awareness.

There are also several implications for future research based on the findings of this review. It is vital that researchers increase the precision of measurement in terms of outcome measure specification and psychometric adequacy of the measurements. Another goal of future research should be to apply multiple forms of data acquisition to reduce the under-reporting of abortion, attempted suicide and suicidal ideation, as well as to improve the strength of research so often reliant on self-reported data. Finally, as causality in the relationship between abortion and suicide cannot be determined due to the constraints of observational studies, continuing research should seek to conduct longitudinal or prospective studies with multiple controls to improve the strength of any emerging indirect evidence for a causal connection between abortion and suicide.

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Figure 1 – Study Flow Diagramme

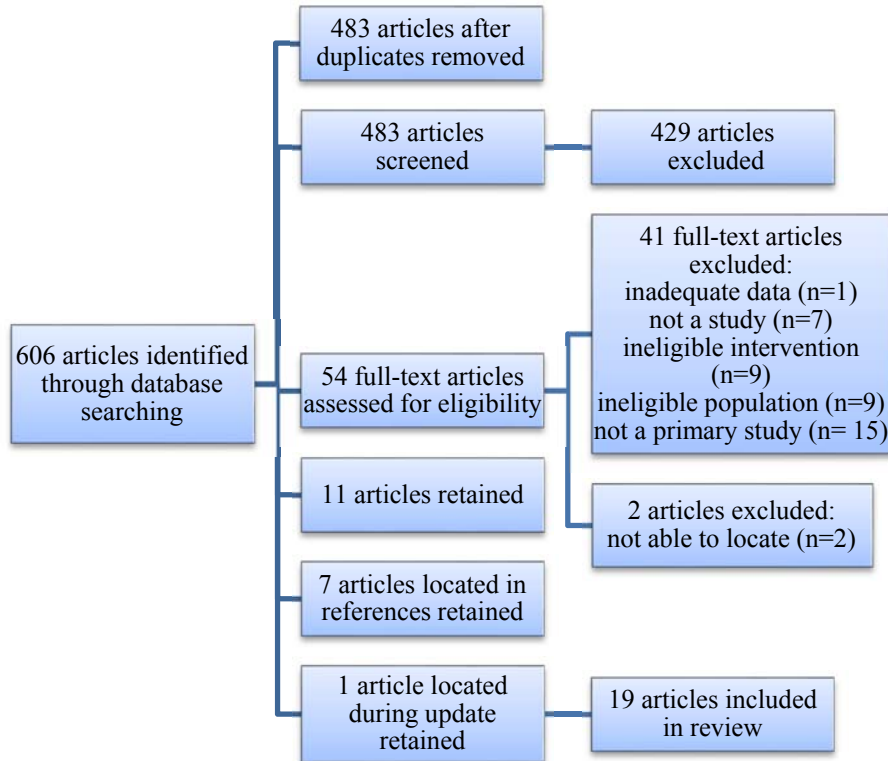


Figure 2 - Risk of Bias Summary

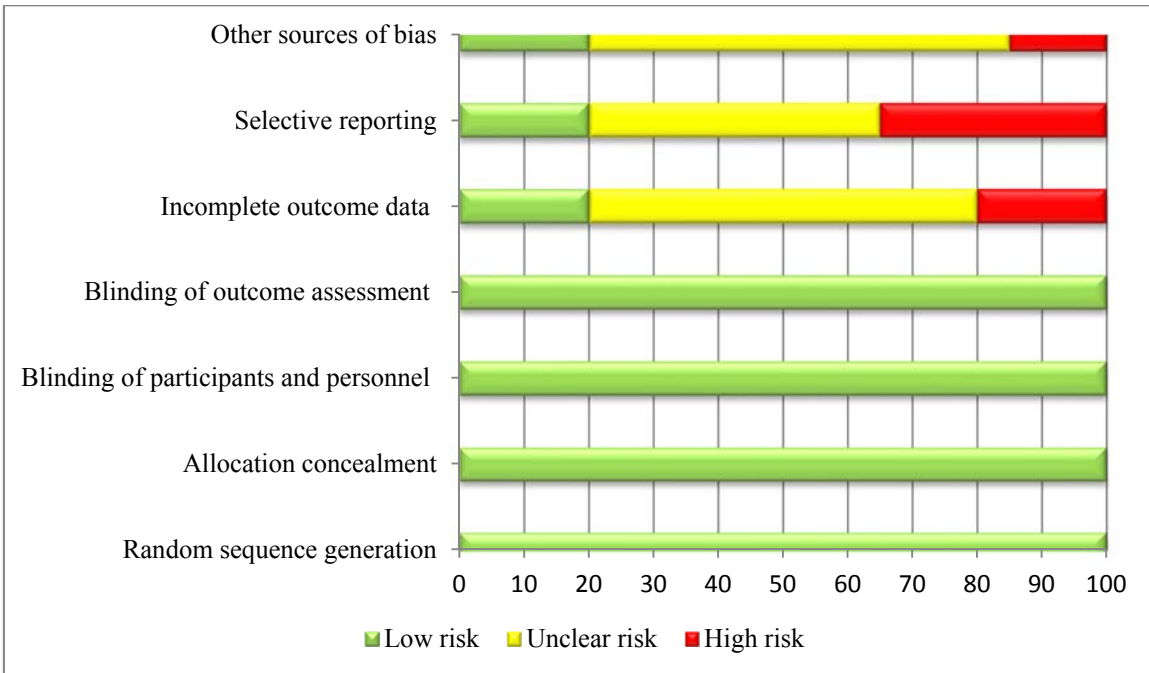


Table A - Common Hierarchy of Evidence

Level	Description
1	Experimental studies (i.e. RCT with concealed allocation)
2	Quasi-experimental studies (i.e. studies without randomisation)
3	Controlled observational studies
3a	Cohort studies
3b	Case control studies
4	Observational studies without control groups
5	Expert opinion based on theory, laboratory research or consensus

Table B - Review Hierarchy of Evidence

Level	Description
1	Controlled observational studies
1a	Cohort studies Prospective cohort studies Longitudinal cohort studies
1b	Retrospective (Historical) cohort studies
2	Cross-sectional analyses
2a	Epidemiological prevalence studies
2b	Cross-sectional analyses
3	Observational studies without control groups

Table C - Study Design Hierarchy

Assessment of risk of bias of included studies by design.

Level 1a	Prospective Cohort Studies
	1. Gilchrist, Hannaford, Frank, & Kay, (1995).
	2. Lauzon, Roger-Achim, Achim, & Boyer (2000).
	Longitudinal Cohort Studies
	1. Fergusson, Boden & Horwood (2008).
	2. Fergusson, Horwood & Boden (2009).
	3. Fergusson, Horwood, & Ridder (2006).
Level 1b	Retrospective Cohort Studies
	1. Cagnacci, A., & Volpe, A. (2001). Record study of seasonal rhythm
	2. Gissler, Berg, Bouvier-Colle & Buekens (2005). Record linkage study
	3. Gissler, Hemminki & Lonnqvist (1996). Death register linkage study
	4. Reardon, Ney, Scheuren, Cogle, Coleman & Strahan (2002). Record linkage study
	5. Dzurova, D., L. Ruzicka, et al. (2006). Review of trends and differentials
	6. Lončar, M. et al. (2006). Retrospective study of two time points
Level 2a	Epidemiological Prevalence Studies
	1. Steinberg, Becker & Henderson (2011).
	2. Goldstein, Strober, Birmaher, Axelson et al. (2008).
Level 2b	Cross-sectional Studies
	1. Mota, Burnett, & Sareen (2010).
	2. Pinheiro, da Cunha Coelho, da Silva, et al. (2012).
	3. da Silva, Ores, Jansen, Moraes, Souza, Magalhaes, & Pinheiro (2012).
	4. Ely, Nugent, Cerel & Vimbba (2011).
	5. Ely, Nugent, & Flaherty (2009).
	6. Zapata, Kissina, Bogoliubovab, Yoricke, Krafta, Jamiesona, Marchbanksa, & Hillis, (2013).

Table D - Summary Measures

Number of Studies	Principal Summary Measures and References
8	<p>Odds ratio: Gissler, Hemminki, & Lonnqvist (1996); Goldstein, Strober et al. (2008); Lončar, Medved, Jovanović, & Hotujac (2006); Steinberg, Becker, & Henderson (2011); Lauzon, Roger-Achim, Achim, & Boyer, (2000).</p> <p>Adjusted odds ratio: Mota, Burnett, & Sareen (2010); Zapataa, Kissina et al. (2013); da Silva, Ores et al. (2012).</p>
5	<p>Relative risk ratios: Gilchrist., Hannaford, Frank, & Kay (1995); Gissler, Berg, Bouvier-Colle, & Buekens (2005); Reardon, Ney, Scheuren, Cogle, Coleman, & Strahan, (2002); Fergusson, Boden, & Horwood (2008); Fergusson, Horwood, & Ridder, (2006).</p>
2	<p>Incidence rate ratios: Fergusson, Horwood, & Boden (2009); Fergusson, Horwood, & Ridder, (2006).</p>
2	<p>Regression analyses: Dzurova, Ruzicka et al. (2006). (Stepwise regression of suicide rate by IVs); Ely, Nugent, Cerel, & Vimbba, (2011). (Ordinary least squares regression results)</p>
1	<p>Multivariate multiple-regression analyses: Ely, Nugent, & Flaherty (2009).</p>
1	<p>Prevalence ratios: Pinheiro, da Cunha Coelho, da Silva et al. (2012).</p>
1	<p>Distribution rates: Cagnacci & Volpe (2001). (Distribution over time & intervention.)</p>

Table E - Summary of Findings

<u>Abortion compared with no abortion for women engaging in suicidal behaviour</u>				
Population: Women and girls of childbearing age procuring an elective abortion				
Settings: Clinical and academic				
Intervention: Induced elective abortion				
Comparison: Without induced elective abortion				
Studies of completed suicide (4)	Results for specified outcomes	Number of participants	Quality of evidence	Comments & Conclusions
Cagnacci Volpe 01	Abortion seasonal rhythm with amplitude of 6.1-6.7 %, peaked in May (\pm 38 days). Female suicide also with amplitude of 11.1 %, peaked in June (\pm 37 days).	2,639,257	Moderate -All studies level 1b (4) -All studies of behavioural variable -All NCV	Abortion peaks before suicide; extreme overlap in rates; common risk factors; suicide not seen as consequence of abortion seasonal rhythm
Gissler Berg 05	Suicide following abortion sign. P=0.001; 33.8 vs. non-pregnant; 31.9 vs. pregnancy or birth; sign. for all ages (RR: 0.84; 95% CI: 0.69-1.01)	5,299		Protective effect of birth; higher risk of suicide after abortion
Gissler Hemminki 96	Abortion vs. Birth (OR: 5.9; 95% CI: 3.6-9.9). Abortion vs. General Suicide Rate (OR: 3.08; 95% CI: 1.57-6.03). Risk of suicide 11.3 per 100,000 general population vs. 34.7 abortion vs. 5.9 birth.	1,347		Common risk factors for abortion and suicide or harmful effects of abortion
Reardon Ney 2002	Abortion vs. Birth (Age-adjusted RR: 2.54; 95% CI: 1.14-5.67, $p < 0.0001$). First pregnancy abortion vs. birth (Age-adjusted & psych hx RR: 3.12 (1.25-7.78). Annual suicide rate for hx of abortion 7.8% vs. 3% hx of delivery. Different death rates over time for hx of abortion only vs. hx of delivery only ($p < 0.05$); abortion hx higher risk of suicide for 8 yrs.	173,279		Pre-existing conditions aggravated by abortion to explain persistence of higher death RR for abortion group vs. delivery

Studies of attempted suicide (2)	Results for specified outcomes	Number of participants	Quality of evidence	Comments
Gilchrist Hannaford 95	Abortion group: Standardized rate 66.5 (20); RR 1.3; 95CI: 0.7-2.6 of psychiatric illness and DSH; Standardized rate 8.4 (5); RR: 0.6; 95% CI: 0.2-2.6 of DSH only.	13,261	Moderate 1a	NCV
Goldstein Strober 08	12-month prevalence of abortion sign. greater among females (n=123) with vs. without SUD p<0.001; and greater lifetime prevalence of attempted suicide in SUD, BP group	249	Low risk 2a	Dx BPD NCV
Studies of attempted suicide & suicidal ideation (5)	Results for specified outcomes	Number of participants	Quality of evidence	Comments
Lauzon Roger-Achim 00	Abortion group (n=197) declared more suicide attempts in their whole lives (P= 0.00004) but not significantly more than in the last year (P= 0.0907); Significantly more women reported suicidal ideation at some time in their lives (P = 0.0034) and in the last year (P = 0.0015); Suicidal ideation in whole life (P < .012).	1,668	Low 1a	NCV; PrevA; FPregA
Lončar Medved 06	Suicide attempts and thoughts after rape were significant predictor of abortion (OR, 25.8; 95% CI, 2.5-263.2), explaining 48% of variance (Nagelkerke R2 = 0.0488).	68	Moderate 1b	Both combined into single outcome. CV; FPregA
Mota Burnett 10	Attempts, adjusted for demographic 2.18(1.66-2.86); adjusted for d and violence 1.51 (1.15-1.97) ns; Ideation 1.97(1.46-2.66) and 1.59(1.20-2.11), sign. PAF 5.8(2.1-10.4); Attempt after first abortion 23.1(13.6-36.2); ideation after first abortion 29.9(21.7-39.6)	3,310	Moderate 2b	After adjusting for violence only ideation was sign. CV
Pinheiro da Cunha Coelho 12	Some form of suicide risk behavior was found in 13.3%. Found rates of low, moderate, and high suicide risk in 8.6%, 1.3% and 3.4%, respectively; Lifetime suicide attempts reported by 7.4%, with	871	Low 2b	CV

Zapata Kissina 13	1.3% admitting to attempting suicide within the last month; Prevalence ratio of suicidal behavior more than two-fold higher in teenagers with prior history of abortion (PR: 2.60; 95%CI: 1.44–4.69). Females (n=133): prevalence of lifetime prgn and past-year suicide ideation 8 (22.86)* p=0.05; Attempted suicide 44.83% and planned a suicide 41.38%, both male & female; pregnancy ended in abortion 61.76%.	293	High risk 2b	Female gender sign. risk factor for both: 20.63% pregnancy 14.96, suicide behaviour. p=0.05 CV
Studies of suicidal ideation (7)	Results for specified outcomes	Number of participants	Quality of evidence	Comments
Fergusson Horwood 06	Suicidal ideation abortion versus non (%) pooled risk ratio p<.0.001. under 25 years, higher risk of mental health prob after ab.	520	High risk 1a	NCV
Fergusson Boden 08	Ideation in group with abortion by age 30: incidence rate ratio - IRR (95% CI) 1 1.25 (1.01–1.55) 1.56 (1.02–2.40); Females exposed to induced abortion had rates of mental health problems that were 1.49 (95% CI 1.24–1.80) times higher than the rates for those who did not become pregnant (P<0.001).	534	High risk 1a	Controlled for violence (CV)
Fergusson Horwood 09	Women aborting first pregnancy marginally more likely to have pre-pregnancy suicidal ideation, p < .07 (vs. delivery); Women with ideation more likely to have experienced pre-pregnancy sexual violence, p< .0005, or other violence, p< .005, and more likely to have had pre-pregnancy, suicidal ideation, p< .0005, or drug dependence, p< .0005.	534	High risk 1a	CV
Steinberg Becker 11	8.1% showed suicidality in the previous week. Among pregnant women with high rate of suicidal ideation, 26.4% had thoughts of abortion	1,765	Moderate 2a	CV

da Silva Ores 2012	<p>(p= 0.000). Ideation sign. related to thoughts of abortion (OR 4.48; CI95% 2.72; 7.38, p = 0.000).</p> <p>Suicidal ideation significantly related to thoughts of abortion (OR: 4.48; 95% CI: 2.72-7.38, p = 0.000). Ideation 8.1% sample, 3.5 in previous week. SI more likely for women with Sx of anxiety than no Sx (OR: 10.05; 95% CI: 4.93-20.50). Risk factors for suicidal ideation = thoughts of abortion, depressed (OR: 1.71; 95% CI: 1.17-2.50, p = 0.012); not depressed (OR: 6.40; 95% CI: 2.79-14.71, p = 0.000).</p>	1,334	High risk 2b	
Ely Nugent 09	<p>After controlling for covariates, dating violence was related to suicidal ideation, $t(66) = 2.35$, $p < .02$ (one tail) and disturbing thoughts, $t(66) = 2.35$, $p < .02$ (one tail). ($F(11, 66) = 2.36$, $p < .02$);</p>	120	Low risk 2b	This and next study use same sample. CV
Ely Nugent 11	<p>As severity of general problems with aggression increased, magnitude of relationship between dating violence and severity of suicidal thinking increased (aggression .52, $p < .05$).</p>	120	Moderate 2b	CV

Table F - Characteristics of Included Studies

In order as applied to Table C - Study Design Hierarchy

CITATION	METHODS	PARTICIPANTS	INTERVENTION	COMPARISONS	OUTCOMES	NOTES	FUNDING
	Country Study design Duration N	Setting Age Health status Other	Groups: 1. Int., 2. No int. Trimester at ab Previous prg Previous ab Previous chld	Births-Delivery Miscarriage	Outcomes: 1st & 2nd Time points: Follow-up length & reports		
Gilchrist, A.C., Hannaford, P.C., Frank, P., & Kay, C.R. (1995). Termination of Pregnancy and Psychiatric Morbidity. <i>British Journal of Psychiatry</i> , 167, 243-248.	U.K. Prospective cohort study. 1976-1979 N=13,261	Clinic. Age unknown. Under 19 to over 35. Psychiatric illness or psychoses	Abortion n=6410 No abortion request n=6151 Were refused abortion n=379 Changed decision before abortion performed n=321 85% first trimester Previous ab	Level 1a Abortion with Control/ Comparison	1. Suicide attempt: Deliberate self-harm no other psychiatric illness GPs provided 6-month follow-ups until end of study or patient left care	Age indirectly standardized.	Department of Health & Social Security, Health Research Council of NZ, National Child Health Research Foundation, Canterbury Medical Research Foundation, New Zealand Lottery Grants Board
Lauson, P., Roger-Achim, D., Achim, A., & Boyer, R. (2000). Emotional Distress Among Couples Involved in First-Trimester Induced Abortions. <i>Canadian Family Physician</i> , 46, 2033-2040.	Canada. Prospective cohort study. 1991-1993 N=1,668	Clinic. 15-35 Clinically significant psychological distress	Abortion n=197 No abortion control n=728 100% first trimester Previous prg/ab/chld	Level 1a Abortion with Control/ Comparison Control group: unknown if seeking ab	1. Suicide attempt 2. Suicidal ideation 1-3 weeks after ab single follow-up questionnaire		Family Medicine Department, University of Montreal
Fergusson, D.M., Boden, J.M., & Horwood, L.J. (2008). Abortion and Mental Health Disorders: Evidence from a 30-year Longitudinal Study. <i>The British Journal of Psychiatry</i> , 193, 444-451.	New Zealand. Longitudinal cohort Study. 30 years N=534	Gathered over course of Christchurch Health and Development Study 15-30 years Mental health disorders	Pregnancy n=284 Abortion n=117 Preg unwanted-loss n=95 Preg unwanted-birth n=52 Preg wanted-birth n=197	Level 1a Abortion Without Control/ With Comparison	2. Suicidal ideation 3-5 years post-ab, at 6-month intervals	Unspecified measure suicidal ideation	Health Research Council of NZ, National Child Health Research Foundation, Canterbury Medical Research Foundation and New Zealand Lottery Grants Board

CITATION	METHODS	PARTICIPANTS	INTERVENTION	COMPARISONS	OUTCOMES	NOTES	FUNDING
Fergusson, D.M., Horwood, L.J., & Boden, J.M. (2009). Reactions to Abortion and Subsequent Mental Health. <i>The British Journal of Psychiatry</i> , 195, 420-426.	New Zealand. Longitudinal cohort Study. 30 years N=534	Gathered over course of Christchurch Health and Development Study 15-30 years Mental health disorders	Pregnant n=284 (53%) Abortion n=117 Preg unwanted-loss n=95 Preg unwanted-birth n=52 Preg wanted-birth n=197	Level 1a Abortion Without Control/ With Comparison	2: Suicidal ideation Intervals 15–18, 18–21, 21–25, 25–30 years	Unspecified measure suicidal ideation	Health Research Council of NZ, National Child Health Research Foundation, Canterbury Medical Research Foundation, New Zealand Lottery Grants Board
Fergusson, D.M., Horwood, L.J., & Ridder, E.M. (2006). Abortion in Young Women and Subsequent Mental Health. <i>Journal of Child Psychology & Psychiatry & Allied Disciplines</i> , 47(1), 16-24.	New Zealand. Longitudinal cohort Study. 30 years N= 506 and 520	Gathered over course of Christchurch Health and Development Study 15-25 years Mental health disorders	Pregnant n= 205 (41%) Abortion n=74	Level 1a Abortion Without Control/ With Comparison	1. <u>Suicide attempts*</u> 2. Suicidal ideation Intervals 15–18, 18–21 and 21–25 years	Unspecified measures of self-reported suicidal ideation & attempts Sample members questioned about frequency of suicidal thoughts in previous 12 mths <u>*No stats on attempt</u>	Health Research Council of NZ, National Child Health Research Foundation, Canterbury Medical Research Foundation, New Zealand Lottery Grants Board
Cagnacci, A. & Volpe, A. (2001). Is Voluntary Abortion a Seasonal Disorder of Mood? <i>European Society of Human Reproduction & Embryology</i> , 16(8), 1748-1752.	Italy. Retrospective cohort Study. 1995-1998 N=2,639,257	Gathered from national database & clinic medical records	Abortion n=508,130 Delivery n=2,131,127 Suicide female 1 n=3,481 Suicide male 1 n=10,456 Suicide female 2 n=2784 First trimester	Level 1b Suicide with Control/ Comparison	1. Completed suicide	Record study of seasonal rhythm in rate of elective abortion and of suicide.	No information
Gissler, M., Berg, C., Bouvier-Colle, M.H., & Buekens, P. (2005). Injury Deaths, Suicides and Homicides Associated with Pregnancy, Finland 1987-2000. <i>European Journal of Public Health</i> , 15, 459-463.	Finland. Retrospective cohort Study. 1987-2000 N=5,299	Record linkage study of pregnancy associated deaths from external causes 15-49 years Injury deaths, suicides and homicides	Pregnant n=212 Abortion n= 92 Delivery n= 81	Level 1b Suicide with Control/ Comparison	1. Completed suicide		No information

CITATION	METHODS	PARTICIPANTS	INTERVENTION	COMPARISONS	OUTCOMES	NOTES	FUNDING
Gissler, M., Hemminki, E., & Lonnqvist, J. (1996). Suicides After Pregnancy in Finland 1987-1994: Register Linkage Study. <i>British Medical Journal</i> , 313, 1431-1434.	Finland. Retrospective cohort Study. 1987-1994 N= 1,347	Death register records for 1,347 suicides linked to pregnancy 15-49 years	Pregnancy n=73 Abortion n= 29 Delivery n=30 Miscarriage n=14	Level 1b Suicide with Control/ Comparison Abortion Birth Miscarriage	1. Completed suicide	Deaths occurring within one year of birth, abortion.	National Research and Development Centre for Welfare and Health
Reardon, D.C., Ney, P.G., Scheuren, F., Cogle, J., Coleman, P.K., & Strahan, T.W. (2002). Deaths Associated with Pregnancy Outcome: A Record Linkage Study of Low Income Women. <i>Southern Medical Journal</i> , 95, 834-841.	USA. Retrospective cohort Study. 1989-1997 N=173,279	Record linkage study using data from California Medicaid 13-49 years	1. Abortion n= 30,260 Delivery n= 83,690 2. Abortion n= 41,956 Delivery n= 17,472	Level 1b Suicide with Control/ Comparison	1. Completed suicide		No information
Dzurova, D., Ruzicka, L., & Dragomirecká, E. (2006). Demographic and Social Correlates of Suicide in the Czech Republic. <i>Sociologicky Casopis-Czech Sociological Review</i> , 42(3), 557-571.	Czech Republic. Retrospective cohort study N=x	Review of trends and differentials in mortality	No comparison group. 0.163 abortions per 100 live births	Level 1b Suicide Without Control/ Comparison	1. Completed suicide	Problem: No N, no usable numbers	
Lončar, M., Medved, V., Jovanović, N., & Hotujac, L. (2006). Psychological Consequences of Rape on Women in 1991-1995 War in Croatia and Bosnia and Herzegovina. <i>Croatian Medical Journal</i> , 47(1), 67-75.	Croatia. Retrospective cohort Study. 1992-1995 N=68	Clinical. 14-83 years (m=32 +- 6 yrs) Psychological consequences	Pregnant n=29 Abortion n=17 Birth n=12	Level 1b Other Without Control/ Comparison	1. Suicide attempts 2. Suicidal ideation n=25, 1 & 2	Raped & tortured during war	No information

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CITATION	METHODS	PARTICIPANTS	INTERVENTION	COMPARISONS	OUTCOMES	NOTES	FUNDING
Steinberg, J.R., Becker, D., & Henderson, J.T. (2011). Does the Outcome of a First Pregnancy Predict Depression, Suicidal Ideation, or Lower Self-Esteem? <i>American Journal of Orthopsychiatry</i> , 81(2), 193–201.	USA. Epidemiological prevalence study. 1990-1992 N=1,765	Data from National Comorbidity Survey, household-based sample via structured psychiatric interview 15-54 years	Abortion n=218 Delivery n=1,547	Level 2a Abortion with Control/ Comparison	2. Suicidal ideation	Suicidal thoughts, plans, or attempts was used to code when ideation occurred relative to first pregnancy outcome	Ellerston Fellowship, NIH /NICHHD Mentored Research Scientist Development Award in Population, And NIH /NCRROD UCSF-CTSI
Goldstein, B.I., Strober, M.A., Birmaher, B., Axelson, D.A., Esposito-Smythers, C., Goldstein, T.R., Leonard, H., Hunt, J., Gill, M.K., Iyengar, S., Grimm, C., Yang, M., Ryan, N.D., & Keller, M.B. (2008). Substance Use Disorders Among Adolescents with Bipolar Spectrum Disorders. <i>Bipolar Disorders</i> , 10, 469–478.	USA. Epidemiological prevalence study. N=249	Clinical. 12-17 years With Bipolar disorder I, II or NOS	Females n=139 With SUD n=40 Without SUD n=209	Level 2a Other with Control/ Comparison	1. Suicide attempt	Suicide attempt met 1 of 3 criteria Life Events Checklist 12 month prevalence for abortion	National Institute of Mental Health
Mota, N.P. Burnett, M., & Sareen, J. (2010). Associations Between Abortion, Mental Disorders, and Suicidal Behaviour in a Nationally Representative Sample. <i>Canadian Journal of Psychiatry</i> , 55(4), 239-247.	USA. Cross-sectional study. 2001-2003 N= 3310	Survey was administered by trained lay interviews in households of respondents 18-60+ years Mental disorders, abortion and suicide	Pregnancy n=3291 Abortion Hx n=452 No abortion hx n=2,839	Level 2b Abortion Without Control/ Comparison	1. Suicide attempts 2. Suicidal ideation Collected once	Exposure to violence confound	National Institute of Mental Health and the National Institute of Drug Abuse

CITATION	METHODS	PARTICIPANTS	INTERVENTION	COMPARISONS	OUTCOMES	NOTES	FUNDING
Pinheiro, R., da Cunha Coelho, F., da Silva, R., de Ávila Quevedo, L., Dias de Mattos Souza, L., Dias Castelli, R., Bonati de Matos, M., & Amaral Tavares Pinheiro, K. (2012). Suicidal Behavior in Pregnant Teenagers in Southern Brazil: Social, Obstetric and Psychiatric Correlates. <i>Journal of Affective Disorders</i> , 136, 520–525.	Brazil. Cross-sectional study 2009-2011 N=871	Clinical; prenatal medical assistance by national public health system in urban area 13-19 years	Participant n=828 Abortion (previous) n=87 Unplanned n=603 Undesired n=26 Abortion intention, current prg n=115 Abortion attempt n=18	Level 2b Suicide Without Control/ Comparison	1. Suicide attempts 2. Suicidal ideation		Brazilian research grants from Brazilian CNPq, CAPES, PRONEX
da Silva, R., Ores, L., Jansen, K., Moraes, I., Souza, L.D., Magalhaes, P., Pinheiro, R. (2012). Suicidality and Associated Factors in Pregnant Women in Brazil. <i>Community Mental Health Journal</i> , 48(3), 392-395.	Brazil. Cross-sectional study. 2006-2008 N=1,334	Clinical, pre-natal (Brazilian National System of Public Health) 25 (SD=6.51) Mean age, no other information	Abortion thoughts n=132 (9.7%)	Level 2b Suicide Without Control/ Comparison	2. Suicidal ideation Measured once		No mention
Ely, G.E., Nugent, W.R., Cerel, J., & Vimmba, M. (2011). The Relationship Between Suicidal Thinking and Dating Violence in a Sample of Adolescent Abortion Patients. <i>Crisis: The Journal of Crisis Intervention & Suicide Prevention</i> , 32(5), 246-253.	USA. Cross-sectional study 6 months in 2002 N= 120	Clinical. Presented for pregnancy termination appointment 14–21 years	Abortion intention n=120	Level 2b Abortion Without Control/ Comparison	2. Suicidal ideation Measured once	Sampling bias? Excluded observed to be excessively upset during counselling session	No mention

CITATION	METHODS	PARTICIPANTS	INTERVENTION	COMPARISONS	OUTCOMES	NOTES	FUNDING
Ely, G. E., Nugent, W. R., & Flaherty, C. (2009). The Relationship Between Dating Violence and Psychosocial Problems in a Sample of Adolescent Pregnancy Termination Patients. <i>Violence and Victims, 24</i> (5), 577-590.	USA. Cross-sectional study No mention of duration N=120	Clinical. Presented for pregnancy termination appointment 14–21 years	Abortion intention n=120 Final sample n=78	Level 2b Abortion Without Control/ Comparison	2. Suicidal ideation Measured once	Problem: Attrition of 42	No mention
Zapata, L., Kissin, D., Bogoliubova, O., Yorick, R., Kraft, D., Jamieson, P., Marchbanks, P., & Hillis, S. (2013). Orphaned and Abused Youth Are Vulnerable to Pregnancy and Suicide Risk. <i>Child Abuse & Neglect, In Press.</i>	Russia-USA. Cross-sectional study. 2007-2008 N=293	Three technical schools, St. Petersburg 16–23 years	Female n=133 Abortion Lifetime 61.8% Pregnancy Lifetime n=9 No pregnancy n=17	Level 2b Other Without Control/ Comparison	1. Suicide attempt 2. Suicidal ideation	Orphaned youth reporting past year suicide ideation, nearly half attempted suicide 44.8%	Division of Reproductive Health, Centers for Disease Control & Prevention

Table G - Risk of Bias

Study Identification	Selection, Performance & Detection Bias	Incomplete outcome data	Selective reporting	Other sources of bias
Gilchrist Hannaford 95	No	Missing data: unknown. By end study, 2122 (34.40%) of termination group and 3000 (42.4%) of those who did not request termination were still under observation.	No	Under or imprecise dx possible, p. 247. Under-reporting of suicide attempts, p. 248. No ethnicity data.
Lauzon Roger-Achim 00	No NB Limitation: Excluded under 15 yrs., could not read French, pregnant from rape or incest, or past 3 rd trimester.	Many subjects lost to follow up: 35.5% of women. 10% did not return initial measure. 127 of 197 (64%) completed follow-up measure.	No	Short follow-up: 1-3 weeks post-abortion; No ethnicity data.
Fergusson Boden 08	No	Sample attrition bias, p.446: 80-83% of sample represented.	No	Unclear what measures used of self-reported suicidal ideation 'questioned about the frequency of suicidal thoughts in previous 12 months.' No ethnicity data.
Fergusson Horwood 09	No	Of 117, 79 (68%) gave consistent prospective & retrospective reports; 25 (21%) reported abortion retrospectively but not prospectively; and 13 (11%) reported abortion prospectively but not retrospectively: Kappa 0.76. 84-89% of sample represented.	No	Unclear what measures used of self-reported suicidal ideation; Possible recall bias; No ethnicity data.

Study Identification	Selection, Performance & Detection Bias	Incomplete outcome data	Selective reporting	Other sources of bias
Fergusson Horwood 06	No	No	Suicide attempt & ideation in abstract, only ideation in analyses	Suicide outcome measure unspecified: adequate? Underreporting of abortion. No ethnicity data.
Cagnacci Volpe 01	No	No	No	No ethnicity data. Underreporting of suicide.
Gissler Berg 05	No	No	No	Underreporting of suicide. Limited ethnicity data: citizens & residents.
Gissler Hemminki 96	No	No	No	Underestimate of number suicides associated with pregnancy; Comorbidity unknown: psychiatric admissions; Limited ethnicity data (Finnish women).
Reardon Ney 2002	No	No	Analysis 1: 21,415 cases (419 deaths) not calculated due to aberrant, indeterminate or out-of-scope data; A2: 8,703 (48 deaths) excluded if more than one type of pregnancy outcome in reproductive history	No data on race, marital status or parity.
Dzurova Ruzicka 2006	Not assessed	Not assessed	Not assessed	Not assessed
Lončar Medved 06	No	No	No	Baseline mental state due to war effects confound.
Steinberg Becker 11	No	Abortion group size represents 14,09% of delivery group size – borderline for statistical comparisons	No	Suicide ideation assessed with 3 questions (included made an attempt); Underreporting of abortion.

Study Identification	Selection, Performance & Detection Bias	Incomplete outcome data	Selective reporting	Other sources of bias
Goldstein Strober 08	No	No	No	Suicide attempt based on 1 of 3 criteria; Limited ethnicity data.
Mota Burnett 10	No	Overall response rate 70.9%	No	Suicide attempt & ideation measured by 2 items; Under-reporting of suicide & abortion.
Pinheiro da Cunha Coelho 12	No	No	No	No ethnicity data.
da Silva & da Costa Ores 13	No	No	No Limitation: Excluded pregnant women unable to understand or answer questionnaire	Main outcome variable suicidal ideation measured by single item.
Ely Nugent 11	No	96 of 120 (80%) completed ST subscale. Mean substitution used for 7 cases of missing data.	No	Sampling issue: Excluded the excessively upset during counselling session (n=?).
Ely Nugent 09	No	Time & scheduling factors impacted on ability of some patients to complete measures. Missing data suicidal thinking, 20%.	No	Participants presenting with excessive emotional distress about pending abortion excluded.
Zapataa Kissina 13	No	No	No	One item to measure Suicide outcome; Under-reporting of abuse & pregnancy. No ethnicity data.

Appendix A

Electronic Search Strategies

OvidSP Psycinfo and MedLine – OVID

Step 1: 'suicid* AND abortion OR pregnancy termination'

Step 2: limit to 1990-2012

Results: 99 references and 299 references, respectively.

Final search, one new result

CINAHL Plus with full text

Step 1: 'suicide* AND abortion'

Step 2: limit to 1990-2012

Results: 77

Final search, no new results

EMBASE

Step 1: 'suicid* AND abortion OR pregnancy termination'

Step 2: limit to 1990-2012

Step 2: exclude Medline articles

Results: 24

Final search, no new results

Web of Science (ISI)

Step 1: (suicide* AND abortion) & limit to 1990-2012 including Science Citation Index Expanded (SCI-Expanded), Social Sciences Citation Index (SSCI), and Arts and Humanities Citation Index (A&HCI)

Step 2: Refined by article and review, excluding Letters, proceedings papers and editorial material

Results: 100

Final search, no new results

All EMBASE REVIEWS

Step 1: search suicide\$ AND abortion OR pregnancy termination

Step 2: limit to 1990-Current (Limit not valid in DARE, records were retained)

Result: 7

Final search, no results

Appendix B
Data Collection Form

Review identifier: **AbSu13**

Version number: **V1**

Researcher ID: **R1 or R2**

Date of completed collection:

Notes

Add notes, questions or reminders pertaining to this specific file.

Source

- Study ID (created by review author). **First two authors and last two digits of publication date**
- File ID (created by review author). **First authors' last initials and last two digits of publication date**
- Review author ID (created by review author). **GT13**
- Citation and contact details. **Full citation**
→ Full contact information

Eligibility

- Confirm eligibility for review. **Provide reason for confirmation**
- Reason for exclusion.

Methods

- Study design.
- Total study duration.
- Sequence generation*.
- Allocation sequence concealment*.
- Blinding*.
- Other concerns about bias*.

Participants

- Total number.
- Setting.
- Diagnostic criteria.

- Age.
- Sex. **Female**
- Country.
- [Co-morbidity].
- [Socio-demographics].
- [Ethnicity].
- [Date of study].

Interventions

- Total number of intervention groups.

*For each intervention and comparison group of interest: **Abortion***

- Specific intervention.
- Intervention details (sufficient for replication, if feasible).

[Integrity of intervention].

*For each intervention and comparison group of interest: **Delivery or Miscarriage***

- Specific intervention.
- Intervention details (sufficient for replication, if feasible).

[Integrity of intervention].

Outcomes

- Outcomes and time points (i) collected; (ii) reported*.

*For each outcome of interest: **Suicide, completed***

- Outcome definition (with diagnostic criteria if relevant).
- Unit of measurement (if relevant).
- For scales: Upper and lower limits, and whether high or low score is good.

*For each outcome of interest: **Suicide, attempted***

- Outcome definition (with diagnostic criteria if relevant).
- Unit of measurement (if relevant).
- For scales: Upper and lower limits, and whether high or low score is good.

*For each outcome of interest: **Suicide, ideation***

- Outcome definition (with diagnostic criteria if relevant).
- Unit of measurement (if relevant).
- For scales: Upper and lower limits, and whether high or low score is good.

Results

- Number of participants in each intervention group (**i.e., pregnancy outcome**).

*For each outcome of interest: (**i.e., Suicide, completed or attempted**)*

- Sample size.
- Missing participants*.
- Summary data for each intervention group (e.g. 2×2 table for dichotomous data; means and SDs for continuous data).
- [Estimate of effect with confidence interval; P value].
- [Subgroup analyses].

For each outcome of interest: (i.e., Suicide, ideation)

- Sample size.
- Missing participants*.
- Summary data for each intervention group (e.g. 2×2 table for dichotomous data; means and SDs for continuous data).
- [Estimate of effect with confidence interval; P value].
- [Subgroup analyses].

Miscellaneous

- Funding source.
- Key conclusions of the study authors.
- Miscellaneous comments from the study authors.
- References to other relevant studies.
- Correspondence required.
- Miscellaneous comments by the review authors.

Appendix C
Reporting of Bias Tool

Domain	Support for judgement	Review authors' judgement
<i>Selection bias.</i>		
Random sequence generation.	Describe the method used to generate the allocation sequence in sufficient detail to allow an assessment of whether it should produce comparable groups.	Selection bias (biased allocation to interventions) due to inadequate generation of a randomised sequence.
Allocation concealment.	Describe the method used to conceal the allocation sequence in sufficient detail to determine whether intervention allocations could have been foreseen in advance of, or during, enrolment.	Selection bias (biased allocation to interventions) due to inadequate concealment of allocations prior to assignment.
<i>Performance bias.</i>		
Blinding of participants and personnel <i>Assessments should be made for each main outcome (or class of outcomes).</i>	Describe all measures used, if any, to blind study participants and personnel from knowledge of which intervention a participant received. Provide any information relating to whether the intended blinding was effective.	Performance bias due to knowledge of the allocated interventions by participants and personnel during the study.
<i>Detection bias.</i>		
Blinding of outcome assessment <i>Assessments should be made for each main outcome (or class of outcomes).</i>	Describe all measures used, if any, to blind outcome assessors from knowledge of which intervention a participant received. Provide any information relating to whether the intended blinding was effective.	Detection bias due to knowledge of the allocated interventions by outcome assessors.
<i>Attrition bias.</i>		
Incomplete outcome data <i>Assessments should be made for each main outcome (or class of outcomes).</i>	Describe the completeness of outcome data for each main outcome, including attrition and exclusions from the analysis. State whether attrition and exclusions were reported, the numbers in each intervention group (compared with total randomized participants), reasons for attrition/exclusions where reported, and any re-inclusions in analyses performed by the review authors.	Attrition bias due to amount, nature or handling of incomplete outcome data.

<i>Reporting bias.</i>		
Selective reporting.	State how the possibility of selective outcome reporting was examined by the review authors, and what was found.	Reporting bias due to selective outcome reporting.
<i>Other bias.</i>		
Other sources of bias.	State any important concerns about bias not addressed in the other domains in the tool. If particular questions/entries were pre-specified in the review's protocol, responses should be provided for each question/entry.	Bias due to problems not covered elsewhere in the table.

Appendix D

Quality Assessment Checklists

The quality assessment checklist for **Cohort studies** was based on the following criteria:

- How were subjects chosen for the new intervention?
- How were subjects selected for the comparison or control?
- Were drop-out rates and reasons for drop-out similar across intervention and unexposed groups?
- Does the study adequately control for demographic characteristics, and other potential confounding variables in the design or analysis?
- Was the measurement of outcomes unbiased (i.e. blinded to treatment group and comparable across groups) and of appropriate quality?
- Were there exclusions from the analysis?

The quality assessment checklist for **Cross-sectional studies** was based on the following criteria:

- Were the samples sufficiently large?
- Were the samples sufficiently representative (randomly selected)?
- How satisfactory was the response rate?
- Have cases and controls undergone similar detection procedures?
- Does the study adequately control for demographic characteristics, and other potential confounding variables in the design or analysis (hospital vs. population based cases and controls)?
- Were all selected subjects included in the analysis?
- Were interventions and other exposures assessed in the same way for cases and controls?
- Was an appropriate statistical analysis used (i.e. matched or unmatched)?