

Review article

Abortion and long-term mental health outcomes: a systematic review of the evidence

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Abstract

Claims that women who have elective abortions will experience psychological distress have fueled much of the recent debate on abortion. It has been argued that the emotional sequelae of abortion may not occur until months or years after the event. Despite unclear evidence on such a phenomenon, adverse mental health outcomes of abortion have been used as a rationale for policy-making. We systematically searched for articles focused on the potential association between abortion and long-term mental health outcomes published between January 1, 1989 and August 1, 2008 and reviewed 21 studies that met the inclusion criteria. We rated the study quality based on methodological factors necessary to appropriately explore the research question. Studies were rated as Excellent (no studies), Very Good (4 studies), Fair (8 studies), Poor (8 studies), or Very Poor (1 study). A clear trend emerges from this systematic review: the highest quality studies had findings that were mostly neutral, suggesting few, if any, differences between women who had abortions and their respective comparison groups in terms of mental health sequelae. Conversely, studies with the most flawed methodology found negative mental health sequelae of abortion. © 2008 Elsevier Inc. All rights reserved.

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1. Introduction

While there have been notable improvements in the research on abortion and mental health in the past 2 decades, methodological limitations persist, and studies continue to be biased by political motivations. Claims that women who have elective abortions will experience psychological distress, or a “postabortion syndrome” akin to posttraumatic stress disorder, have fueled much of the recent debate on abortion. It has been argued that the emotional sequelae of abortion often may not occur until months or years after the event [1,2]. Recently, the US Supreme Court referenced adverse mental health outcomes for women as part of the rationale for limiting late term abortions¹. Despite claims of

emotional harm, the existence of such an abortion-related syndrome has yet to be established empirically [3,4]. This article will systematically review recent research that has explored the associations between elective abortion and long-term mental health outcomes.

In 1989, C. Everett Koop, then the U.S. Surgeon General well-known for his opposition to abortion, reviewed the research examining the psychological sequelae of elective abortion and concluded in a letter to President Reagan that the politics of abortion skewed our scientific understanding of its impact and that the empirical evidence was inconclusive [5]. Other reviews have also found the literature either to be inconclusive [6–8] or reflective of normal stress and coping rather than psychopathology [9–16]. This perspective was once again reinforced recently by the American Psychological Association [17].

The present study differs from previous systematic reviews of the topic in that it focuses solely on *long-term* mental health effects, delineates clear criteria for research quality, and presents a framework against which all published research was judged.

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¹ “While we find no reliable data to measure the phenomenon, it seems unexceptionable to conclude some women come to regret their choice to abort the infant life they once reacted and sustained. See brief for Sandra Cano et al. as Amici Curiae in No. 05.30 pp. 22–24. Severe depression and loss of esteem can follow.” *Gonzales v. Carhart*, 550 U.S.127 S.Ct. 1610 (2007) (slip opinion).

2. Methods

2.1. Search strategy and selection criteria

We identified studies published between January 1, 1989, and August 1, 2007, using PubMed via Medline, EMBASE, Scopus and PsycINFO. Combinations of the following keywords were used in the search: *abortion, mental health, mental disorders, mental health services, adjustment disorders, depression, anxiety, and suicide*. Reference lists of relevant review articles were also reviewed (details of the search strategy available upon request).

In order to be included, articles had to: (1) be published after 1988 (when Koop [5] completed his review); (2) have at least 100 subjects; and (3) have follow-up times of longer than 90 days after termination of pregnancy. The sample size criterion was set to ensure adequate power based on recommendations from past reviews and on two factors: (1) long-term complications are rare, and reported effect sizes are small; and (2) the need to account for several covariates and confounding factors [8]. We selected a minimum follow-up time of 90 days to allow for a return to baseline hormonal levels after the pregnancy event [18]. Only articles available in English were reviewed. Several studies have noted that limiting literature searches to the English language does not substantially affect results [19,20]. Articles were excluded if the study explored (1) abortion due to fetal abnormality, (2) effects of illegal abortions, (3) comparisons between various abortion methods, (4) sexual functioning after abortion, (5) how adults and adolescents process abortion differently, or (6) cultural differences in abortion reactions. This review primarily focuses on women with one abortion, since women who have multiple elective abortions may differ in many ways from women who have one abortion. There are numerous confounding factors that predispose a woman to multiple unintended pregnancies that may also predispose her to poor mental health outcomes. The majority of the studies

reviewed only analyze outcomes for one termination; thus, comparison across studies is most appropriate in relation to one termination.

Two of the three reviewers (randomly assigned dyad combinations of authors V.E.C., C.B.P., and S.K.S.) independently appraised and rated each article using standardized abstraction forms. Where questions existed, all three reviewers participated in the article review; discrepancies were resolved in consultation with the senior author.

Articles were separated into two major categories: articles which included a comparison group of women who did not undergo abortions (analytical studies) and articles without such a comparison group (descriptive studies) [21]. Only analytical studies allow for the assessment of a potential causal association between abortion and mental health outcomes, since the comparison group theoretically allows researchers to observe differences among individuals exposed and not exposed to abortion. Even when a comparison group is present, the validity of the comparisons depends on the similarities between the two groups on factors other than the abortion. Without such a comparison group, the study is descriptive and can only yield limited information.

Analytical studies were rated on a scale from *Excellent* to *Very Poor* using five major criteria: (1) use of an appropriate comparison group; (2) use of valid mental health measures; (3) control for preexisting mental health status; (4) control for confounders; and (5) whether there was comprehensive exploration of the research question. Table 1 shows the criteria for each rating level. Other methodological factors were considered in the rating but were not able to be uniformly considered across studies.

In this review, we focus primarily upon the analytical studies, since the lack of a comparison group significantly limits the scientific contribution to our question of interest.

Table 1
Quality criteria

Quality level	Appropriate comparison group	Validated mental health tools	Pre-existing mental health ^a	Confounder control ^b	Comprehensive exploration ^c
Excellent	+	+	+	+(Thorough)	+
Very good	+	+	+	+(Thorough)	–
Fair	+/-	+	+	+(Adequate)	–
Poor	–	+	+(Weak)	+(Weak/adequate)	–
Very poor	–	+/-	–	+/-	–

+ indicates that criterion was included in the study; –, criterion was not included in the study; +/-, criterion was included in some, but not all, studies within the rating.

^a Studies with weak control for preexisting mental health are limited in the tools or methods used to measure prior psychological state.

^b Studies with thorough confounder control accounted for several covariates that would help to isolate the effect of the abortion event on mental health outcomes. Adequate refers to studies that adjusted for fewer covariates than were necessary to appropriately isolate the effect of the abortion event. Studies with weak confounder control adjusted for a limited number of covariates and confounders in their analysis.

^c Comprehensive exploration distinguishes an Excellent from a Very Good study, by indicating that all quality criteria were thoroughly addressed. To appropriately explore the research question would require explicit theoretical grounding, study design appropriate for complex analysis and establishment of temporality, appropriate comparison group, thorough confounder control including adjustment for prior psychological state and validated mental health diagnostic tools.

2.2. Methodological factors informing the rating system

Our study quality criteria are based on the methodological factors which impact the ability to accurately determine an association between abortion and mental health.

2.2.1. Appropriateness of comparison groups

Having an appropriate comparison group is critical to disaggregating the impact of abortion as opposed to other key factors and confounders. The research question and supporting theory should dictate the selection of an appropriate comparison group. Several studies compared women who had an abortion with women who carried their pregnancy to term without accounting for pregnancy intention (*unintended pregnancies* are those that are either *unwanted* or *mistimed*.) [22] Women who have an unintended pregnancy may be very different than women who have an intended pregnancy and may be predisposed to different mental health outcomes regardless of undergoing an abortion experience. The best measures of pregnancy intentions are assessed prior to pregnancy since retrospective assessments of pregnancy intention can change over time or be influenced by recall [23].

Research focused on adolescent pregnancies may account for intention somewhat by assuming that all such pregnancies were mistimed (rather than planned), although this may not be true in all racial or ethnic groups. Studies assessing how women cope with grief and loss related to a pregnancy may appropriately use comparison groups such as women who experienced spontaneous abortion, therapeutic abortion, or stillbirth. Regardless of the research question, selecting an appropriate comparison group is necessary in order to draw any conclusions regarding associations and causality.

2.2.2. Control for preabortion mental health status

Prior to 1988, studies rarely contained information about women's preconception psychological state. Adjusting for prepregnancy mental health, which is a major predictor of current and future mental health, is critical to isolating the effects of abortion on mental health.

2.2.3. Mental health measurement

A clinician's diagnosis is the gold standard for mental health research. In lieu of that, either validated diagnostic instruments, such as the Diagnostic Interview Schedule (DIS), or symptom scales, such as the Center for Epidemiologic Studies-Depression Scale (CES-D) should be used to ensure valid analyses of associations between abortion and subsequent mental health [24]. There is a lack of consistency among studies in methods used to measure mental health. Without standardization in methods used to measure mental health, drawing valid conclusions is difficult.

2.2.4. Confounder control

Reported associations between abortion and adverse outcomes sometimes fail to account for underlying or

antecedent risk factors such as age, education, socioeconomic status, and others. Failure to include and adjust for these factors in the analyses would likely result in spurious associations. The data source used also impacts the ability to control for confounding factors. The use of claims or other registry data often lacks important contextual information that would allow for appropriate confounder control.

2.2.5. Conflating correlation with causation

Some studies equate correlations between variables with causation. A study that finds a correlation between having an abortion and a mental health outcome is indicative that there is a relationship. However, establishing causality that the abortion itself directly led to the mental health outcome requires several other factors, including temporality, consideration of alternate explanations and isolation of the event.

2.2.6. Selection bias

Selection bias may occur as a result of country-specific regulations limiting access to abortion to certain groups. For example, in a country which only allows women with health problems or traumatic sexual histories to access abortion, comparing the mental health of aborting women with nonaborting women may produce spurious associations. Differential exclusion of women who gave birth but had a subsequent abortion from the sampling criteria is another form of selection bias, which limits generalizability to the overall population of women.

2.2.7. Information bias

Abortion and mental illness both tend to be stigmatized in most populations. If women selectively reveal or suppress information about their abortion or mental health history, bias will result. This can be problematic since abortion is commonly underreported, particularly in retrospective analyses of large cohort studies [25,26].

2.2.8. Lack of explicit theoretical grounding

Theoretical frameworks are rarely made explicit [27], complicating assessment of whether research questions are adequately addressed. There are few existing rigorous qualitative studies informing theory development in this area [28]. One perspective dominating a segment of the literature focuses on psychopathological responses following abortion, while another is suggestive of normal levels of stress and coping responses. From the second perspective, unwanted pregnancy and pregnancy termination are seen as potentially stressful events that pose challenges to the individual but do not necessarily lead to psychopathological outcomes [29]. Each perspective affects the research questions asked and the methodologies used [10].

In addition, factors such as gestational age, social supports for the woman, stigma concerning the pregnancy event, relationship dynamics precipitating the abortion or

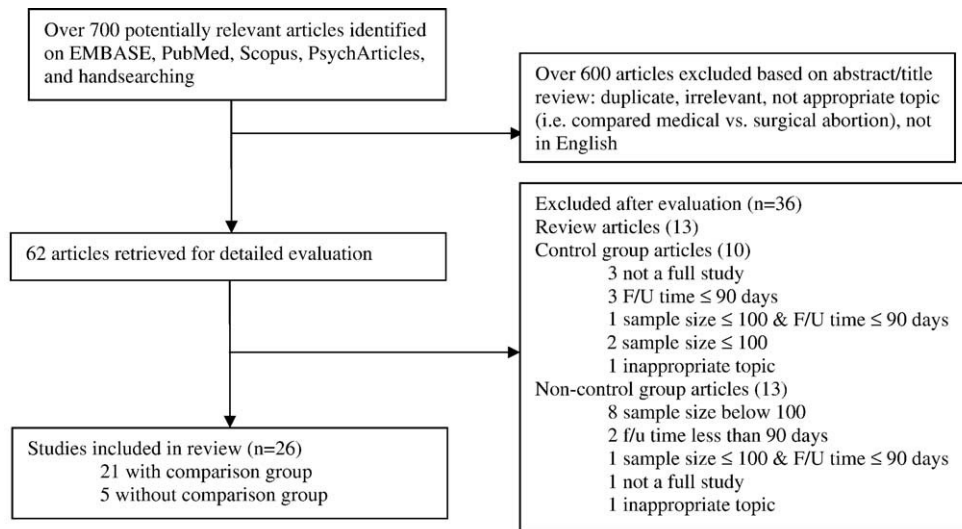


Fig. 1. Systematic literature search for published articles on abortion and mental health.

whether the woman has previously experienced an abortion are rarely incorporated in the analyses.

All studies were assessed based on the extent to which they met the five criteria in Table 1. Particular emphasis was put on those study quality criteria which overcame the methodological limitations from earlier research, specifically control for preexisting mental health and accounting for pregnancy intention through confounder control or by selection of appropriate comparison groups. Additional factors noted above were reviewed, as applicable, in ascertaining a final rating.

3. Results

Fig. 1 summarizes the results of the search process. Our search strategy identified over 700 articles. After excluding articles determined to be inappropriate on the basis of title and/or abstract review, full texts of all remaining articles ($n=61$) were reviewed for potential inclusion. Of these, 36 did not meet inclusion criteria. In total, 25 articles were retained and abstracted, including 21² analytical studies and 5 descriptive studies.

The 21 analytical studies were comprised of 7 prospective cohort studies, 11 retrospective cohort studies, and 3 cross-sectional studies. Sample sizes ranged from 120 to 133,950; and maximum follow-up time was 25 years. Populations studied came from seven countries and participants spanned the reproductive age range (12 to 54). Although sample size varied substantially, only one of the 21 studies included power calculations.

Sixteen of the 21 studies assessed abortions through self-report, while others used record linkage or recruited women at clinics. Six out of 18 studies (excluding the 3 cross-sectional studies) provided information on whether differential loss to follow-up occurred. Twelve out of 21 studies used inappropriate comparison groups such as failing to control for intentionality by comparing mental health outcomes of women who had abortions (presumably unintended pregnancies) to women who delivered (presumably both intended and unintended pregnancies) or women who had never been pregnant.

The majority (19 out of 21 studies) attempted to control for pre-pregnancy mental health status representing a major improvement from studies reported in previous reviews [5,7]. However, methods used to control for previous mental health varied widely in quality. Another methodological improvement over earlier abortion and mental health research is that 20 out of 21 included studies used validated instruments or other appropriate tools (e.g. clinician diagnosis) to assess mental health outcomes. Complicating comparisons is the wide variety of mental health outcomes considered: depression, anxiety, guilt, relief, intrusion, quality of life, self-esteem, impact of event, suicidal ideation, suicide attempts, completed suicide, locus of control, psychotic episodes, self-injurious behavior, seeking of psychiatric treatment, psychiatric problems, and psychiatric admissions. Even when two studies explored the same outcome, they were rarely measured in the same way, making comparisons difficult.

Major findings of all analytical studies are shown in Table 2. We characterized overall findings to assess whether patterns emerged between study quality and direction of findings. Findings characterized as *neutral* indicate that no significant differences were noted between the study comparison groups, while findings characterized as *negative* indicate that the abortion group fared worse than the

² One article had two separate studies using different datasets within it [30]. The studies were thus assessed separately and will be distinguished as Steinberg, 2008a and Steinberg, 2008b.

Table 2
Summary of analytical studies

Study (country)	Design/sample description	Comparison group	Mental health outcome/tool	Results	Strengths	Limitations
Excellent: excellent evidence, low risk of bias						
–						
Very good: good evidence, low risk of bias						
Gilchrist et al., 2008 (UK) [32]	Prospective; cohort; $n=13,261$; age not reported; 3 years F/U;	Delivery, abortion, requested abortion but were refused, and requested abortion but then changed their minds; all were unplanned pregnancies	Psychotic episodes, self-injurious behavior; GP diagnosis	Neutral: rates of psychiatric disorder were the same for women after termination of pregnancy as after childbirth.	Appropriate comparison groups, physician diagnosis of mental health outcomes, thorough confounder control	Restrictive abortion laws may introduce selection bias.
Russo and Zierk, 1992 (USA) [33]	Retrospective cohort; $n=5295$; Age 22–30; 8 years F/U;	0/1/multiple abortion groups and unwanted deliveries	Self-esteem; Rosenberg Self-Esteem Scale	Neutral: one abortion is associated with higher feelings of self-esteem as compared to not having an abortion, but effect disappeared after controlling for pre-existing self-esteem. No difference in well-being.	Appropriate comparison group, thorough confounder control; control for pre-existing mental health, validated mental health measurement	Minor reporting issues in statistical tables
Schmiege and Russo, 2005 (USA) [34] (reanalysis of Reardon and Cogle, 2002) [35]	Retrospective cohort; $n=1247$; Age 14–21 at baseline; up to 13 years F/U;	Abortion vs. delivery of unwanted first pregnancy	Depression; CES-D	Neutral: abortion group no more likely to be clinically depressed than group delivering unwanted pregnancy	Appropriate comparison group; validated mental health measurements, improved variable coding and sampling methods	Confounder control limited including control for preexisting mental health, inappropriate stratification – all due to duplication of Reardon 2002 [49]
Steinberg and Russo, 2008 (USA) [30]	Cross-sectional; $n=3,482$; Age 15–44	Abortion vs. delivery of unintended or all first pregnancies	Anxiety; interview questions that reflect DSM-IV criteria	Neutral – After controlling for pre-existing anxiety and contextual factors, there was no greater risk of anxiety in either abortion or delivery groups.	Appropriate comparison group; theory driven; thorough confounder control; control for pre-existing mental illness	Cross-sectional analysis increases likelihood of recall bias; anxiety measure not explicitly validated
Fair: fair evidence, moderate risk of bias						
Broen et al., 2006 (Norway) [39]	Prospective; $n=120$; Age 18–45; 5 years F/U;	Elective vs. spontaneous abortions	Depression and Anxiety; HADS	Neutral: no differences in depression or anxiety	Control for pre-existing mental health, validated mental health measurements; Adequate confounder control	Questionable comparison group given scope of analysis; Unclear reporting (concluding differences without a discussion of the magnitude of the difference)

Broen et al., 2005 (Norway) [40]	Prospective; n=120; Age 18–45; 5 years F/U;	Elective vs. spontaneous abortions	Depression, Anxiety, Guilt, Relief, Intrusion, Quality of Life; HADS and IES.	Mixed: women with miscarriage had more intrusive thoughts in the short term. Women with abortion had higher avoidance in long term (2 years and 5 years), higher guilt at 6 months, 2 years, and 5 years, higher shame at all time points. No differences in quality of life, depression, anxiety, or anger. Women with abortion had higher relief at all time points. Women with miscarriage had higher grief at 10 days, 6 months and 2 years, and higher loss at 10 days and 6 months.	Control for pre-existing mental health, validated mental health measurements; Adequate confounder control	Questionable comparison group given scope of analysis; Unclear reporting (concluding differences without a discussion of the magnitude of the difference)
Broen et al., 2004 (Norway) [41]	Prospective; n=120; Age 18–45; 2 years F/U;	Elective vs. miscarriage (no accounting for intention, but looking at loss)	Avoidance, grief/loss guilt/shame; IES	Mixed: more avoidance among abortion group (vs. miscarriage group) at 2 years, but not significant at 10 days or 6 months. Regarding intensity of feelings, miscarriage group felt more loss/grief at 10 days and 6 months, while abortion group felt more relief at all time points. No differences in guilt/shame.	Control for preexisting mental health, validated mental health measurements; Adequate confounder control	Questionable comparison group given scope of analysis; Unclear reporting (concluding differences without a discussion of the magnitude of the difference)
Cougle et al., 2005 (USA) [31]	Cross-sectional; n=2846; Age 15–44; average. 12 years F/U;	Abortion vs. delivery of unintended pregnancy	Anxiety; interview questions that reflect <i>DSM-IV</i> criteria	Negative: among women unmarried at pregnancy, and women under 20, aborters had higher generalized anxiety than deliverers.	Appropriate comparison group, control for pre-existing mental health	Differential exclusion criteria, potential for recall bias
Fergusson et al., 2006 (New Zealand) [36]	Retrospective cohort; n=520; birth cohort followed for 25 years	Abortion, delivery, no pregnancy groups (no accounting for intention)	Depression Anxiety and Suicidal Ideation or attempts; DIS	Negative: for young women, exposure to abortion is associated with a detectable increase in risks of concurrent and subsequent mental health problems (depression, suicidal behaviors, and substance use disorders).	Validated mental health measurements, thorough confounder control	Do not account for pregnancy intention. Limited control for pre-existing mental health control only up to 15 years of age. Restrictive abortion laws may introduce selection bias.

Table 2 (continued)

Study (country)	Design/sample description	Comparison group	Mental health outcome/tool	Results	Strengths	Limitations
Reardon and Cogle, 2002 (USA) [35]	Retrospective cohort; <i>n</i> =1076; Age 14–21 at baseline; up to 13 years F/U;	Abortion vs. delivery of unintended pregnancy	Depression; CES-D	Mixed: among married women, those who aborted were at higher risk of clinical depression than those who delivered unintended pregnancies. The difference was not significant among unmarried women.	Appropriate comparison group, validated mental health measurements	Questionable pre-existing mental health control, differential exclusion criteria, inappropriate stratification
Taft and Watson, 2008 (Australia) [37]	Retrospective cohort; <i>n</i> =9333; Age 18–23; Up to 5 yrs F/U	Abortion vs. delivery groups; (no account for intention)	Depression; CES-D	Neutral – association between depression and prior termination was not found as being statistically significant	Validated mental health measure; thorough confounder control; theory driven	Did not account for intention
Zabin et al., 2006 (USA) [38]	Prospective; <i>n</i> =360; Age <17; 3 years F/U;	Mistimed abortion vs. mistimed delivery vs. no pregnancy	Anxiety, Self-Esteem, Locus of Control; Spielberger State-Trait Anxiety Index, Rosenberg Self-Esteem Scale, Locus of Control from Rotter Scale	Neutral: no difference in anxiety or self-esteem between young women with negative pregnancy test, positive pregnancy test and childbirth, and positive pregnancy test and abortion.	Validated mental health measurements, control for pre-existing mental health,	Intention accounted for only by mistimed pregnancy (but adolescent population)
Poor: mediocre evidence, moderate risk of bias						
Bailey et al., 2001 (Brazil) [42]	Prospective; <i>n</i> =563; Age 12–18; 1 year F/U;	Births, spontaneous, and elective abortions (accounting for intention)	Self-Esteem; Rosenberg Self-Esteem Scale	Mixed: while young mother had the highest self-esteem, teens who terminated their pregnancies showed the greatest increase in self-esteem.	Appropriate comparison groups, validated mental health measurements	No control for pre-existing mental health, highly selected population (legality of abortion, and all previously pregnant teens)
Coleman et al., 2002 (USA) [46]	Retrospective cohort; <i>n</i> =54,419; average age delivered=25.41 and aborting=25.62; up to 4.5 years F/U;	Abortion vs. delivery (no accounting for intention)	Psychiatric treatment claim; ICD Dx	Negative: abortion group had higher first-time psychiatric outpatient treatment rate than birth group at 90 days, 180 days, 1 year and 2 years (not at 3 and 4 years). Abortion group had higher rates of treatment for adjustment reaction, bipolar disorder, neurotic depression, and schizophrenic disorders. No differences between groups for single episode or recurrent depressive psychosis, depression not otherwise classified, nonorganic psychoses, psychalgia, acute stress reaction, or in the category of other diseases.	Abortion not self-reported	Inappropriate comparison group; limited confounder control; record-linkage data provides limited contextual information.

Cougle and Reardon, 2003 (USA) [43]	Retrospective cohort; n=1884; age 14–21 at baseline; up to 13 years F/U;	Abortion vs. delivery (with no subsequent abortion) for first reproductive event (no accounting for intention)	Depression, psychiatric problems; CES-D, individual survey items	Mixed-aborters had higher odds of depression, sadness scores, and negative relationships than deliverers. No difference in enjoyment or self-esteem between groups. Subgroup analysis suggested no differences in physician diagnosis of emotional, nervous, or psychiatric problems, or current experience of depression, excessive worry, or nervous trouble.	Validated mental health measurements	Inappropriate comparison groups, differential exclusion criteria, invalidated pre-existing mental health control
Pedersen, 2008 (Norway) [45]	Prospective cohort; n=968; Age 12-15 at baseline; Up to 13 yrs F/U	Abortion and delivery groups vs. no pregnancy	Depression; Kandel and Davies Depression Mood Inventory	Mixed – Neither abortion or delivery group had a significant change in odds of depression among teenagers; Abortion group but not delivery group had increased risk of depression among young adults	Validated mental health measure; longitudinal study;	Inappropriate comparison groups
Reardon et al., 2002 (USA) [49]	Retrospective cohort; n=133,950; age 13–49; up to 8 years F/U;	Women who had: deliveries, abortions, abortion followed by delivery, delivery followed by abortion, and delivery followed by miscarriage (no accounting for intention)	Suicide; ICD Dx	Negative: suicide is higher among women who aborted as compared to delivered.	Abortion not self-reported	Inappropriate comparison groups, limited confounder control; record-linkage data provides limited contextual information
Reardon et al., 2003 (USA) [48]	Retrospective cohort; n=56,741; age 13–49; up to 4 years F/U;	Abortion vs. delivery (no accounting for intention)	Psychiatric admissions; ICD Dx	Negative: abortion group had higher odds of psychiatric admission compared to women who had delivered from every period from 90 days to 4 years, even when stratified by age.	Abortion not self-reported	Inappropriate comparison group, limited confounder control; record-linkage data provides limited contextual information
Rees and Sabia, 2007 (USA) [44]	Retrospective cohort; n=2844; Age mean (sd) 29.62 (6.24)	Abortion vs. no pregnancy and delivery vs. no pregnancy	Depression; CIDI-SF*;	Mixed – Both abortion and delivery groups had significantly higher risk of depression than those without a pregnancy event. When comparing aborters to deliverers, no difference was found in risk of depression.	Validated mental health measure	Inappropriate comparison group
Steinberg and Russo, 2008 (USA) [30]	Cross-sectional; n=1822; Age 15-54	First pregnancy abortion vs. delivery; (no account for intention)	GAD*, Social anxiety, and PTSD*; CIDI*	Neutral – Rates of GAD, social anxiety, and PTSD were not statistically different between abortion and delivery groups for first pregnancy.	Validated mental health measure	Did not account for intention

Table 2 (continued)

Study (country)	Design/sample description	Comparison group	Mental health outcome/tool	Results	Strengths	Limitations
Very Poor: poor evidence, high bias, serious flaws Gissler et al., 2005 (Finland) [47]	Retrospective cohort; <i>n</i> =212; age 15–49; 45–365 days F/U;	Women who experienced pregnancy or birth, spontaneous abortion, elective abortion, or no pregnancy (no accounting for intention	Homicide, unintentional injury, and suicide	Negative: while overall mortality was lower in women whose pregnancy was terminated, they were at an increased risk for suicide and homicide.	Abortion not self-reported	Inappropriate comparison groups, no control for pre-existing mental health, no control for confounders, poor statistical reporting; record-linkage data provides limited contextual information

CIDI/CIDI-SF – Composite International Diagnostic Interview / Short Form; CES-D – Center for Epidemiologic Studies Depression Scale; DIS – Diagnostic Interview Schedule; DSM – Diagnostic and Statistical Manual of Mental Disorders; GAD – Generalized Anxiety Disorder; HADS – Hospital Anxiety and Depression Scale; ICD Dx – International Classification of Diseases Diagnosis; IES – Impact of Event Scale; PTSD – Post Traumatic Stress Disorder.

comparison group. *Mixed* was used to characterize those studies with results that included both types of finding characterizations. Table 3 shows the interrelationships between the quality of the articles and the directionality of the findings.

3.1. Analytical studies

None of the articles reviewed met all of the criteria for an *Excellent* rating (Table 3). An *Excellent* study would have involved a comprehensive exploration of the potential association between abortion and long-term mental health, characterized by an appropriate analytical study design and explicit theoretical grounding framing the research question, choice of an appropriate comparison group, the use of validated mental health tools, accounting for preexisting mental health and thorough confounder control. Although there has been considerable improvement in study design and analysis since 1989, none of the included studies addressed all of the methodological limitations stated above.

The one study in this review that approximates an *Excellent* rating, but in the final analysis received a *Very Good* score, is that of Steinberg and Russo (2008) [30]. In a cross-sectional analysis of Cycle V of the National Survey of Family Growth, Steinberg and Russo [30] explored the relationship between anxiety after first pregnancy outcome (abortion vs. delivery), as well as whether any potential relationship should be explained by other experiences known to co-vary with anxiety and abortion. One of the strengths of the present analysis over another (discussed below) that also used the NSFG Cycle V data [31], Steinberg and Russo did not exclude women who had pre-pregnancy anxiety, but rather controlled for pre-pregnancy anxiety in their analyses as the measure of pre-existing mental health. Another strength of the Steinberg and Russo analysis is that the authors assessed anxiety using validated criteria consistent with the DSM-IV and DSM-IV-TR. After controlling for pre-pregnancy anxiety, rape experience, and relevant demographic covariates (including marital status, income, education, and age) in a sample of 3482 unintended pregnancies, abortion was no longer found to be associated with the risk for anxiety symptoms for either aborters or deliverers. Using a *priori* theory about violence, unintended pregnancy, and anxiety to guide their work, Steinberg and Russo, 2008 [30] offered a comprehensive exploration of the constellation of factors that may explain potential associations between pregnancy outcome and mental health. The primary limitation of this study is that while longitudinal data were available, the authors chose to limit their analysis to cross-sectional data. Limitations that derive from using only cross-sectional data include recall bias and the potential to conflate correlation with causation. Three other studies in the *Very Good* category reported neutral findings. In the second of the *Very Good* studies, the authors conducted a prospective analysis of 13,261 women with an unintended pregnancy in the United Kingdom, Gilchrist et al. [32] found rates of psychiatric disorder were the same for women after abortion

as after childbirth. Like all studies with a prospective design, this study has the advantage of gathering information and comparing across groups at multiple time points. Other major strengths of this study include use of physician diagnosis to assess the psychiatric disorders, controlling for preexisting mental health status and thorough confounder control. In addition, the authors accounted for pregnancy intention by comparing women who requested a termination (assuming that these pregnancies were unintended) and a comparison group of women whose pregnancy were unintended and gave birth. Two comparison groups were included: women who were refused a termination and women who changed their minds before the termination was performed. The study is limited by the selection bias that could be introduced by the restrictive abortion laws in the United Kingdom. Abortion is legal in the United Kingdom up to the 24th week of pregnancy. However, if there is a substantial risk to the woman's life or if there are fetal abnormalities, there is no time limit. To comply with the 1967 Abortion Act, two doctors must consent, stating that to continue with the pregnancy would present a risk to the physical or mental health of the woman or her existing children. Provisions are also considered on the basis of age, or in cases of rape. As a result, women allowed to abort their pregnancies are likely to be in vulnerable situations, including being more likely to have mental health issues. These women may differ in fundamental ways to the overall population of women who did not request a termination. Although the restrictive laws are a contextual effect beyond the control of the authors, it limits both the ability to isolate the effect of the abortion event on the long-term outcomes and the generalizability of the findings beyond the United Kingdom or other places with similar restrictions on access to abortion. The authors control for preexisting mental health and for other contextual factors may partially address this bias. In another attempt to address this bias, the authors also compared women who requested a termination but were refused and those who changed their minds before termination.

In another *Very Good* study, an 8-year retrospective analysis of 4482 women in the National Survey of Family Growth (NSFG), Russo and Zierk [33] found no differences in self-esteem among women having abortions when compared with those delivering unwanted pregnancies. Strengths of this study included an appropriate comparison group by accounting for intention, control for preexisting self-esteem, the use of a validated mental health tool (the Rosenberg Self-Esteem Inventory) and control of confounding variables including employment, education, income, poverty status and marital status. The primary limitation of this work is the potential for underascertainment of exposure due to abortion underreporting that may bias the results.

One *Very Good* study (Schmiege and Russo [34]) and one *Fair* study (Reardon and Cogle [35]) came to different conclusions based on retrospective analysis of the same dataset. Reardon and Cogle [35] used the United States

Table 3
Summary of direction of findings by quality rating

Rating	Neutral findings	Mixed findings	Negative findings	Total
Excellent	–	–	–	0
Very good	4	–	–	4
Fair	3	3	2	8
Poor	1	4	3	8
Very poor	–	–	1	1

National Longitudinal Survey of Youth (NLSY) to undertake a study of depression among women who had a history of abortion compared with those who delivered an unintended pregnancy. The Reardon and Cogle analysis suggested mixed results. They found that married women who had abortions were at higher risk of depression than peers who delivered unintended pregnancies, after controlling for locus of control as a measure of preexisting mental illness. The Rotter scale and locus of control are not typically used as measures of mental health and, as such, present a weak control for preexisting mental illness. Reardon and Cogle used a validated mental health tool to assess depression: the CES-D. The primary analyses were based on stratification by marital status, but marital status was measured 6–8 years after pregnancy and may have changed in the intervening period. Unmarried women showed no significant differences in the risk of depression based on their pregnancy outcome. The authors controlled for other potential confounding factors (family income, education, race, age at first pregnancy). The authors differentially excluded women who had given birth but subsequently had an abortion but did not exclude any women with a post-abortion pregnancy event which may have introduced selection bias.

Questioning Reardon and Cogle's [35] findings, Schmiege and Russo [34] examined the same relationship, and unlike Reardon and Cogle, found that pregnancy outcome did not predict depression scores. Discrepancies in the findings between these two studies can be explained by differential coding of key variables and by sample selection. Schmiege and Russo [34] used the original NLSY coding scheme, which represents a major improvement upon Reardon and Cogle's analysis. Arguing that Reardon and Cogle's differential exclusion criteria was unjustified and reduced generalizability, Schmiege and Russo also included women in the delivery group with a subsequent abortion. Both studies used appropriate comparison groups by accounting for pregnancy intention, and used the CES-D (a validated mental health tool), but both were also limited by weak control for prior psychological state (the Rotter scale) and stratification by marital status, as well as by potential information bias introduced by the underreporting of abortion in the NLSY. Although the two studies are flawed in some similar ways, Schmiege and Russo [34] used measures consistent with original coding and a sampling frame less likely to introduce selection bias and thus received a higher rating.

Another study rated as *Fair* is that of Fergusson et al. [36], an analysis of a 25-year cohort study using a high standard of mental health assessment with control for several important contextual factors. Their findings suggested that, for young women, abortion is associated with increased risk of concurrent and subsequent mental health problems (depression, suicidal behaviors and substance use disorders). Despite the design strengths, the study by Fergusson and colleagues has important weaknesses that merit the rating of *Fair*. The study failed to take pregnancy intentions into account by comparing nulligravid women, aborting women and delivering women, without any information on whether the pregnancy (in the latter two comparison groups) was intended or not. In addition, control for preexisting mental health only occurred up to 15 years of age, although the majority of pregnancy events occurred at least 3 years after that assessment. In addition, New Zealand restricts abortion to cases in which two certifying medical consultants agree that: (1) that the pregnancy would seriously harm the life, physical or mental health of the woman or baby; or (2) that the pregnancy is the result of incest; or (3) that the woman is severely mentally disabled. Provisions are also considered on the basis of age, or in cases of rape. Given these restrictions, women receiving abortion in New Zealand may be a highly selected group which may differ from the comparison population in important ways that are not controlled for in the analysis.

Taft and Watson's study [37], rated as *Fair*, shares some of the same limitations of the Fergusson study [36], but unlike Ferguson reports neutral findings. Like Fergusson [36], the study has numerous design strengths, but is primarily limited by an inappropriate comparison group which does not account for pregnancy intention. Using a linked analysis of the Younger Cohort of the Australian Longitudinal Study of Women's Health, the authors examined the association of probable current depression with termination of pregnancy and women's experience of violence. Using a similar theory to Steinberg, 2008 [30], the authors explored whether violence, which is associated with both unintended pregnancy and poor mental health outcomes, was a potential contributor to depressive symptoms in young women in Australia. The study used validated mental health tool to indicate levels of depressive symptomatology (CES-D 10) and had adequate confounder control, including state of residence. Abortion laws in Australia vary from state to state; thus state-specific analyses are necessary to assess whether there was an impact of abortion restrictions on sample bias. After controlling for previous mental health and other potential confounders, the authors did not find a statistically significant positive association between depression and women who aborted as compared to those who delivered. In spite of the design strengths, like Fergusson, 2006 [36], the authors failed to control for pregnancy intention, resulting in a *Fair* ranking. In another study ranked as *Fair* study, Zabin et al. [38] prospectively compared 360 adolescents with a negative pregnancy test,

positive pregnancy test with childbirth, and a positive pregnancy test with abortion, and found no differences in anxiety or self-esteem between the three groups. This study controlled for previous mental health and used validated mental health tools. The primary limitation was failure to explicitly account for pregnancy intention, but the study was restricted to include only adolescent girls, who are more likely than other women to experience mistimed, and therefore unintended, pregnancies.

Broen et al. [39–41] authored three relevant studies using a prospective cohort, all of which are ranked as *Fair*. The researchers compared the mental health outcomes of 120 women who either miscarried or elected abortion over 2 and 5 years after the event. In the first of these studies, which followed women for 2 years after the resolution of the pregnancy event [41], the results were mixed. The authors used the Impact of Event Scale (IES) to measure intrusion and avoidance in the study population. The abortion group reported experiencing more avoidance than the miscarriage group at 2 years but also more relief at all time points. The miscarriage group felt more loss and grief at 10 days and 6 months. No differences were found in guilt or shame. This study specifically explored the relative comparison of the abortion as compared to the miscarriage group on measures to assess coping with grief and loss. Two other Broen et al. [39,40] studies compared the same prospective cohort of women who miscarried to those who aborted for 5 years. The authors found that aborters had consistently higher scores for relief than the group who miscarried. After 5 years of follow-up, there were no differences in depression and anxiety, but in one of the studies when compared with women who miscarried, aborters had more guilt, avoidance and shame [40]. Strengths of all three studies include control for preexisting mental health status, use of validated tools to assess mental health outcomes (the Hospital Anxiety and Depression Scale and Life Events Scale), and adequate confounder control. A limitation was that the studies did not explicitly account for pregnancy intention. The Broen et al. [41] study in 2004 limited the analysis to an assessment of coping with grief and loss — outcomes that are directly related to the abortion or miscarriage event. However, unlike the Broen 2004, the scope of the analysis (in the 5-year follow-up studies) included measures of depression and anxiety. Without accounting for intention, the broadened scope of this analysis over the 2-year follow-up [39,40] (that includes measures of depression and anxiety that could be attributed to other contextual factors or life events) makes the comparison group of those who miscarried to aborters questionable. Although selection of confounders was sufficient and statistical analysis was appropriate, the reporting was unclear and called into question whether the sample size was sufficient to detect the differences reported.

Another *Fair* study by Cogle et al. [31] performed a cross-sectional analysis of 2842 women using the NSFG to explore anxiety among aborters compared with peers who delivered, accounting for intention. Researchers found that

aborters had higher generalized anxiety than those who delivered. Strengths of the study include an appropriate comparison group of women with unintended pregnancies ending in abortion and those with unintended pregnancies ending in a live birth event, as well as control for preexisting mental health status. However, the authors themselves note that the prepregnancy mental state is weakened by the fact that it relied on self-reported periods of anxiety. Limitations include a high risk of recall bias due to the fact that the interviews occurred an average of 13 months after the target pregnancy. Like other retrospective analyses of large cohort studies, there is the potential for information bias from the underreporting of abortion. Finally, the study differentially excluded delivering women with subsequent abortions which may introduce selection bias.

The first of the *Poor*-rated studies reported mixed results. In a prospective cohort study of 563 adolescents in Brazil [42], Bailey et al. compared adolescent girls with an unintended birth, intended birth, spontaneous abortion and elective abortion and found that deliverers had the highest self-esteem, while teens who terminated their pregnancies had the lowest initial self-esteem but showed the greatest increase in self-esteem over time. The study used validated mental health tools but failed to control for preexisting mental health status and did not address potential biases related to the limited legality of adolescent abortion in Brazil.

Another *Poor* study by Cogle et al. retrospectively analyzed NLSY data, comparing women who gave birth to those who aborted [43]. Aborters had higher depression and sadness scores and more negative relationships than deliverers, but there were no differences in enjoyment; self-esteem; emotional, nervous, or psychiatric problems; current depression; excessive worry; or nervous trouble. The authors used a validated tool for the mental health outcome (CES-D) and had adequate confounder control, but the confounder selection method was questionable and the comparison group failed to account for pregnancy intention. Other limitations included differential exclusion of women who gave birth but subsequently aborted, as well as the potential for abortion underreporting. Finally, the authors use an abbreviated, unvalidated version of the Rotter Internal–External locus of control scale.

Another study rated as *Poor* is the second set of analyses presented in the paper by Steinberg and Russo, 2008 [30], which found neutral results for first pregnancy outcome. Analyzing 1822 women with a reported first pregnancy outcome in the National Comorbidity Survey, the authors found that women who terminated a first pregnancy did not have significantly higher rates of experiencing anxiety disorder, social anxiety, or post-traumatic stress disorder (PTSD) compared to women who delivered a first pregnancy. Using validated mental health diagnostic tools (the majority of studies use measures of mental health symptoms, not diagnosis), the authors found that it was the mental health effect of women's victimization (rape, molestation, being physically attacked), not pregnancy termination, that was

associated with anxiety outcome. The primary limitation of the study was that the comparison group failed to account for intention. In addition, some of the confounding variables that were controlled for in the analysis (married/cohabiting/never married) were inconsistently defined between groups. Similar to the other analyses of national data sets, the threats of recall and information bias may have impacted the findings.

Another *Poor* study using data from the Fragile Families and Child Wellbeing Study, Rees and Sabia [44] found mixed results. The authors reported a significant association between abortion and symptoms of major depression compared to women who were not pregnant. They found that giving birth was also associated with an increase in the risk of major depression as compared to women who were not pregnant. No difference was found in reporting of major depressive symptoms between women who aborted and those who delivered. Limitations of this study include multiple inappropriate comparisons, including comparing aborters to a composite category of women who had miscarried, given birth, were not pregnant, or were pregnant at the time of the 2nd follow-up. These groups differ from one another in numerous ways and combining them into one category violates the assumptions of independence necessary for analysis. In another analysis, the authors compared aborters to women who had no pregnancy, which is also inappropriate. The theoretical or programmatic reasons for such a comparison is unclear. In attempting to unravel the impact of a pregnancy outcome (abortion or delivery) on mental health, a woman who is not pregnant is not at risk of any outcome related to pregnancy. In addition, the comparison of aborters and deliverers without accounting for intention is also inappropriate. Strengths of the study include the use of a validated mental health tool, the Composite International Diagnostic Interview Short Form (CIDI-SF) to assess the presence of major depressive symptoms, and control for pre-pregnancy mental health and various confounders.

Using a population-based longitudinal study of the “Young in Norway”, Pedersen [45] found mixed results for the association between abortion and depression; and was rated as *Poor*. After controlling for various potential confounders and pre-existing mental health, the authors found a higher prevalence of depression among young adult women who have had an abortion as compared to young women who had never been pregnant. This association did not appear for teenagers, whose likelihood of depression was not linked with the abortion. Like Rees and Sabia [44], this study inappropriately compares aborters with women who have never been pregnant and with deliverers without accounting for intention. An additional limitation of the study is the choice of mental health tool. The authors used Kandel and Davies’ Depressive Mood Inventory. Although the questions are patterned after DSM diagnostic criteria, the tool is not validated.

Three *Poor* studies (as well as one *Very Poor* study) used record linkage as their data source [46–49]. All of these studies are limited by their inability to control for relevant

confounders. Coleman et al. [46] used record linkage of 54,419 California State Medi-Cal claims to compare rates of first time mental health treatment for 4 years following either an abortion or a birth among low-income women. At 90 days, 1 year and 2 years (but not 3 and 4 years) post pregnancy event, aborters had higher first-time psychiatric outpatient treatment rates than women who gave birth. That the abortion was not self-reported is a strength of the study, as is the control for 1-year previous psychiatric history. However, the authors compare women who gave birth to those who had an abortion without controlling for intention, and the authors failed to assess or control for baseline differences between the two groups.

Another record linkage study with several limitations was Reardon et al. [49], which linked 133,950 Medi-Cal claims to death certificates, and found that suicide was higher among women who had abortions when compared with those who delivered. Although the authors controlled for 1-year previous psychiatric history, intention was not controlled for and there was limited confounder control. Finally, the wide confidence intervals and limited reporting of statistical methods raise questions about the quality of the analysis. One year later, another record linkage study linked 56,741 Medi-Cal claims with psychiatric admissions comparing low-income women in California who aborted against those who delivered [48]. Aborters had higher odds of psychiatric admission compared to deliverers, even when stratified by age. The authors controlled for 1-year previous psychiatric history by excluding women with psychiatric admissions during the year before the target pregnancy. This study was limited by its use of an inappropriate comparison group by not accounting for pregnancy intention, failure to account for baseline differences between groups and differential exclusion of women who gave birth but subsequently aborted.

The final study by Gissler et al. [47], rated as *Very Poor*, used record linkage to examine pregnancy-associated injury deaths, suicides and homicides using the Finnish Cause-of-Death register. Cause of death for 212 women who experienced no pregnancy, a birth, a spontaneous abortion or elective abortion were compared. Compared to age-adjusted mortality among nonpregnant women, overall mortality was lower in aborters, but they also appeared to be at increased risk for suicide. The authors failed to account for intention and failed to control for any potential confounders, including preexisting mental health. Furthermore, no theoretical basis is provided for why increased injury or homicide should be expected to follow abortion.

4. Discussion

A clear trend emerges from this systematic review: the highest quality studies had findings that were mostly neutral, suggesting few, if any, differences between aborters and their respective comparison groups in terms of mental health

sequelae. Conversely, studies with the most flawed methodology consistently found negative mental health sequelae of abortion. A similar trend was present in our examination of descriptive studies, but we do not focus on those studies in this review.

Elective abortion is one the most common medical interventions in the world; 1.29 million are performed annually in the United States alone. With so many women experiencing a termination, one would anticipate that long-term postabortion mental health problems would be similarly common, were it a prevalent consequence of the procedure. However, the highest-quality research available does not support the hypothesis that abortion leads to long-term mental health problems. Lingering post-abortion feelings of sadness, guilt, regret, and depression appear to occur in only a minority of women.

If questions regarding associations between abortion and long-term mental health are worth pursuing further, a higher standard of science should be met than what characterizes much of the extant research. This would necessitate longitudinal, prospective study designs assessing the numerous contextual variables and potential confounders associated with having an elective abortion and mental health status — an expensive and time-consuming proposition. If researchers do choose to continue researching this relationship, the proposed study quality criteria present a standard for such investigations (Table 1). Failure to address the methodological shortcomings that have limited the existing research on abortion and mental health will add little to what is already known.

In the 20 years since Koop's review, scientists are still conducting research to answer politically motivated questions. Recent literature overcomes some, but not all, of the limitations present in literature reviews conducted prior to 1988. Even the best of studies are limited by the complexity of the question. Programs and policies based on claims derived from flawed research should be modified to reflect the most scientifically sound literature. For example, health professionals involved in pre- and postabortion counseling and treatment may find value in identifying the risk factors to having adverse mental health outcomes after an abortion; including preexisting mental health conditions. However, making policy recommendations such as the enforcement of so-called "informed consent" laws (which often provide misinformation regarding mental health risks of abortion) is unwarranted based on the current state of the evidence. If the goal is to help women, we are obligated to base program and policy recommendations on the best science, rather than using science to advance political agenda.

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