

## Pregnancy associated death in record linkage studies relative to delivery, termination of pregnancy, and natural losses: A systematic review with a narrative synthesis and meta-analysis

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### Abstract

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#### Objectives:

Measures of pregnancy associated deaths provide important guidance for public health initiatives. Record linkage studies have significantly improved identification of deaths associated with childbirth but relatively few have also examined deaths associated with pregnancy loss even though higher rates of maternal death have been associated with the latter. Following PRISMA guidelines we undertook a systematic review of record linkage studies examining the relative mortality risks associated with pregnancy loss to develop a narrative synthesis, a meta-analysis, and to identify research opportunities.

#### Methods:

MEDLINE and SCOPUS were searched in July 2015 using combinations of: mortality, maternal death, record linkage, linked records, pregnancy associated mortality, and pregnancy associated death to identify papers using linkage of death certificates to independent records identifying pregnancy outcomes. Additional studies were identified by examining all citations for relevant studies.

#### Results:

Of 989 studies, 11 studies from three countries reported mortality rates associated with termination of pregnancy, miscarriage or failed pregnancy. Within a year of their pregnancy outcomes, women experiencing a pregnancy loss are over twice as likely to die compared to women giving birth. The heightened risk is apparent within 180 days and remains elevated for many years. There is a dose

effect, with exposure to each pregnancy loss associated with increasing risk of death. Higher rates of death from suicide, accidents, homicide and some natural causes, such as circulatory diseases, may be from elevated stress and risk taking behaviors.

#### Conclusions:

Both miscarriage and termination of pregnancy are markers for reduced life expectancy. This association should inform research and new public health initiatives including screening and interventions for patients exhibiting known risk factors.

**Keywords:** Maternal mortality, pregnancy associated death, longevity, pregnancy loss, termination of pregnancy, abortion, miscarriage, risk factors, pregnancy screening, health policy

#### Introduction

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Maternal deaths associated with pregnancy are a major public health concern. Death rate calculations based on death certificates alone, however, consistently miss cases due to the fact that registrars often lack information about the deceased's woman's complete pregnancy history. This problem can be alleviated in part by linking death certificates to birth certificates, fetal death records, termination of pregnancy (TOP) registries, and medical treatment records.

Without such record linkage only 26% of deaths during pregnancy or after live birth or stillbirth would have been identified from the death registry or death certificates alone, according to a Finnish study.<sup>1</sup> Using death certificates alone, only 12% of deaths following miscarriage or ectopic pregnancy and just 1% of deaths following termination of pregnancy (TOP) could be identified without record linkage.<sup>1</sup> The importance of systematically using record linkage to identify deaths associated with pregnancy losses (TOP, miscarriage, and ectopic pregnancies) is further demonstrated by the same study's findings, which demonstrate that the mortality rate in the year following a pregnancy loss was two to four times higher than that of delivering women.

Record linkage studies are therefore clearly necessary to properly identify the effects of pregnancy on the health and longevity of women. This methodology is especially important to understanding mortality rates associated with TOP and natural pregnancy losses precisely because such deaths are (a) much more common than deaths during pregnancy or after delivery, and (b) less likely to be identified on death certificates alone.<sup>1</sup>

Compared to women who deliver, those who miscarry or have TOP face significantly elevated rates of psychiatric disorders,<sup>2-10</sup> substance use,<sup>5,6,10-13</sup> suicidal behaviors,<sup>5,6,13-16</sup> sleep disorders,<sup>17</sup> post-traumatic stress disorders,<sup>7,18,19</sup> a decline in general health,<sup>20</sup> and elevated rates of recourse to medical treatments in general,<sup>21,22</sup> most of which have been observed within the first through ten years following the pregnancy loss. Any and all of the aforementioned conditions may shorten longevity. It is therefore especially important from a public health and economic viewpoint to improve investigations regarding the mortality rates associated with pregnancy losses.

While the importance of research on maternal mortality is widely recognized, it has appeared increasingly evident to the authors that insufficient attention has been devoted to examining the subset of women's deaths following pregnancy losses. Greater insight into this subset of deaths may help to guide and prioritize the development of proactive health initiatives that can save women's lives and improve health.

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