

Summary of Known Health-Risks of Abortion:

How Abortion Harms Women and Why Concerns for Women's Health must be part of Abortionrelated Policies and Media Debate

The grisly trial of now-convicted murderer Dr. Kermit Gosnell brought national attention to the deplorable conditions in America's "legal" abortion industry. Gosnell's trial showed that abortion carries inherent risks to women, whether it is performed at a clinic like his, or not.

In an increasingly health-conscious society, why does abortion lack a "warning label?" Numerous, well-documented studies in peer-reviewed medical journals demonstrate that abortion poses significant medical risks for women.

The health risks of abortion undermine the false narrative promoted by the abortion industry, namely that the abortion debate requires choosing sides between mothers and their unborn children. The truth is that regulating abortion benefits both mothers *and* children – even their children in future pregnancies.

Women and girls deserve to know the facts about abortion. Information is the lynchpin of true "choice." Consider the following:

1. Abortion has undisputed immediate health risks.

The <u>undisputed risks</u> of immediate medical complications from abortion include blood clots, hemorrhage, incomplete abortions, infection, and injury to the cervix and other organs. Abortion can also cause cardiac arrest, respiratory arrest, renal failure, metabolic disorder, shock, and missed ectopic pregnancy.

Immediate medical complications affect approximately 10 percent of women undergoing abortions, and approximately one-fifth of these complications are life threatening.ⁱⁱ

- 2. Studies reveal that the long-term physical and psychological consequences of abortion include an increased risk of:
 - subsequent preterm birth;
 - placenta previa (a complication during pregnancy where the placenta partially or totally covers the mother's cervix and which can cause severe bleeding before or during delivery);
 - serious mental health problems;
 - breast cancer as a result of the loss of the protective effect of a first full-term pregnancy;
 - miscarriage;
 - and death. iii



These medical risks, consistently documented by peer-reviewed medical journals, gravely endanger women's physical and psychological health.

In addition, the impact on her reproductive future and health of subsequently born children is vital information for a woman to have if she considers abortion, as up to 75% of women who have an induced abortion will become pregnant again. iv

a. Abortion increases the risk of pre-term birth in future pregnancies.

A preterm birth (PTB) is a birth occurring three or more weeks before the due date of the baby.

The link between having an induced abortion and PTB has been recognized in over 130 peer-reviewed scientific studies^{vi}, as well as being listed as an "immutable medical risk factor" by the Institute of Medicine. Some of the reasons given for abortion increasing a woman's risk for PTB in later pregnancies commonly include: "mechanical trauma to the cervix, infection, and scarring of the endometrium." A recent study found that 31.5% of preterm births are likely to be the result of a woman having an abortion earlier in her life. It

PTB is the leading cause of infant death both globally and in the United States. Worldwide PTB causes over 3 million deaths every year. xi

Another major concern with PTB is the baby being significantly underweight when born ("very low birth weight" or VLBW). Babies born with a VLBW face many health consequences and have an increased risk for developmental problems. Some of the potential long term complications include: cerebral palsy, cognitive impairment, vision problems, hearing problems, dental problems, behavioral problems, psychological problems, and chronic health issues. These complications may not be realized immediately, and can surface later in childhood or even into adulthood. The complications is the problems of the potential long term complications include: cerebral palsy, cognitive impairment, vision problems, hearing problems, dental problems, behavioral problems, psychological problems, and chronic health issues. These complications may not be realized immediately, and can surface later in childhood or even into adulthood.

There are also high financial costs associated with PTB. Hospital costs alone coming from abortion-related PTB are estimated to be \$1.2 billion per year. That figure does not include any long term costs to the families providing care for the prematurely born babies who suffer from conditions requiring long term treatment.

b. Induced abortion is a risk factor for a woman developing Placenta Previa in future pregnancies.

Placenta Previa, a complication during pregnancy where the placenta partially or totally covers the mother's cervix and which can cause severe bleeding before or during delivery, can be dangerous for both the mother and the baby. One of the greatest risks to the mother is hemorrhaging, which is extremely serious as the amount of blood lost in fifteen minutes is enough to be potentially life



threatening.^{xvi} The placement of the placenta over the cervical canal may also require and emergency cesarean section be performed to deliver the baby early (often prior to full term) so to not cause the severe bleeding to the mother.^{xvii}

Induced abortion is a risk factor for a woman developing Placenta Previa in future pregnancies. The risk of Placenta Previa after a dilation and curettage (D&C) abortion holds a relative risk (odds ratio, or OR) of 1.9 compared with women who do not have an abortion. The risk of Placenta Previa is also greater for women who get infections following their abortion procedure. After an infection from her abortion, a woman's risk of Placenta Previa is 3.6 (OR) compared with women who do not have an abortion history. The risk of Placenta Previa is 3.6 (OR) compared with women who do not have an abortion history.

c. Decades of medical evidence has revealed that abortion carries significant psychological risks, including increased risks of depression, anxiety, and suicide.

The data surrounding abortion shows a high correlation between abortion and an increased risk of mental health problems. There are over 100 studies that demonstrate the connection between abortion and subsequent mental health problems. One study found that women whose first pregnancies ended in abortion were 65 percent more likely to score in the "high risk" range for clinical depression than women whose first pregnancies resulted in a birth—even after controlling for age, race, marital status, divorce history, education, income, and pre-pregnancy psychological state. Studies found that 10% of mental health problems suffered by women are directly attributable to abortion.

Studies also reveal an increased risk of suicide ideation and suicide following induced abortion.

One of the leading studies, led by a pro-abortion researcher and controlling for all relevant factors (including prior history of depression and anxiety and prior history of suicide ideation), found that 27 percent of women who aborted reported experiencing suicidal ideation, with as many as 50 percent of minors experiencing suicide or suicidal ideation. The risk of suicide was three times greater for women who aborted than for women who delivered. The study also found that 42 percent of women who aborted reported major depression by age 25, and 39 percent of post-abortive women suffered from anxiety disorders by age 25.

Studies have linked a history of abortion to sleeping disorders and eating disorders. Adolescents who had abortions were three times more likely to experience trouble sleeping.

d. Abortion is associated with an increased risk of breast cancer.

As with every topic touching on the issue of abortion, the abortion-breast cancer link has been hotly disputed. However, it is scientifically undisputed that a woman's first full-term pregnancy reduces her risk of breast cancer. Aborting a first pregnancy before 32 weeks eliminates the protective affect against breast cancer for that woman. It is also undisputed that the earlier a woman has a first full-term pregnancy, the lower her risk of breast cancer becomes. XXIX



The association between having an induced abortion and a subsequent increased risk of breast cancer has been examined in 70 studies. ** Of these studies, 33 showed a positive association between having an abortion and developing breast cancer, 19 of which were statistically significant. None of the studies showing a negative association were statistically significant.

3. The known, substantial health risks of chemical abortions may be significantly underreported.

Because of its known dangers, the use of the mifepristone and misoprostol chemical abortion drug regimen (also commonly referred to as "RU-486") has been strictly regulated by the Food and Drug Administration (FDA). On its website, the FDA notes, "Since its approval in September 2000, the [FDA] has received reports of <u>serious adverse events</u>, including <u>several deaths</u>, in the United States following medical abortion with mifepristone and misoprostol." A 2011 FDA report accounts for at least 2,207 cases of severe adverse events, including hemorrhaging, blood loss requiring transfusions, serious infection, and death.

Thousands of reported instances of serious adverse events, including death, already raises alarm. The concern for women's health and safety is heightened when considering the known inadequacies of what is being reported to the FDA about chemical abortions and that FDA reports capture "only a small proportion of events that actually occur." **xxxii*

Additionally, abortion-providers are openly flouting the FDA protocol and state laws designed to protect women against these dangers. Planned Parenthood's own studies acknowledge that off-label use of chemical abortions has come at the cost of women's lives and "higher-than-expected" consequences to health. According to a 2009 study produced by Planned Parenthood,

Prompted by the deaths that occurred after medical abortion and internal data that show a higher-than-expected rate of serious infection, [Planned Parenthood Federation of America] changed its medical abortion protocol at the end of March 2006. **xxxiii**

Only after women died and suffered serious infections did Planned Parenthood stop the vaginal use of misoprostol, an off-label use never approved by the FDA.

In her "whistleblower" lawsuit filed against Planned Parenthood of the Heartland, Sue Thayer alleges that, lacking the ability to care for these women at their own facilities, Planned Parenthood's "telemed" chemical abortion patients who later experienced significant bleeding were told "to go to an emergency room and report that they were experiencing a spontaneous miscarriage." On top of being unethical, encouraging a woman to be dishonest jeopardizes her health. Lying to a healthcare provider about the cause of the patient's condition leads to a host of obvious problems including inappropriate care and inaccurate reporting of abortion complications.

Studies have also found chemical abortions can carry even more risk to women than surgical abortion.

For example, a major review of nearly 7,000 abortions performed in Australia in 2009 and 2010 found that 3.3 percent of patients who used mifepristone in the first trimester required emergency hospital



treatment, in contrast to 2.2 percent of patients who underwent surgical abortions. **xxxv* Women receiving chemical abortions were admitted to hospitals at a rate of 5.7 percent following the abortion, as compared with 0.4 percent for patients undergoing surgical abortion.

Another study revealed that the overall incidence of immediate adverse events is fourfold higher for chemical abortions than for surgical abortions. *xxxvi*

4. It is undisputed that the later in pregnancy an abortion occurs, the riskier it is and the greater the chance for significant complications.

A well-respected peer-reviewed journal—one which is also frequently cited by abortion advocates—notes that, "Abortion has a higher medical risk when the procedure is performed later in pregnancy. Compared to abortion at eight weeks of gestation or earlier, **the relative risk increases exponentially** at higher gestations." **xxxvii*

Gestational age is the strongest risk factor for abortion-related mortality. Compared to abortion at eight weeks gestation, the relative risk of mortality increases significantly (by 38 percent for each additional week) at higher gestations. In other words, a woman seeking an abortion at 20 weeks (five months) is 35 times more likely to die from abortion than she was in the first trimester. At 21 weeks or more, she is 91 times more likely to die from abortion than she was in the first trimester.

Moreover, researchers have concluded that it may not be possible to reduce the risk of death in later-term abortions because of the "inherently greater technical complexity of later abortions." This is because later-term abortions require a greater degree of cervical dilation, with an increased blood flow in a later-term abortion which predisposes the woman to hemorrhage, and because the myometrium is relaxed and more subject to perforation. xli

At least two studies have concluded that second-trimester abortions (13-24 weeks) and third-trimester abortions (25-26 weeks) pose more serious risks to women's physical health than first-trimester abortions. xlii

Researchers have also found that women who undergo abortions at 13 weeks or beyond report "more disturbing dreams, more frequent reliving of the abortion, and more trouble falling asleep." xliii

Even Planned Parenthood, the largest abortion provider in the United States, agrees that abortion becomes riskier later in pregnancy. Planned Parenthood states on its national website, "The risks [of surgical abortion] increase the longer you are pregnant. They also increase if you have sedation or general anesthesia [which would be necessary at or after 20 weeks gestation]."xliv

5. Myth: Abortion is safer than childbirth



Other researchers confirm a substantially increased risk of death from abortions performed later in gestation, equaling or surpassing the risk of death from live birth. xlv

When the Supreme Court decided *Roe v. Wade* in 1973, there was no evidence in the record related to medical data. The "abortion is safer than childbirth" mantra of 1973 continues to be repeated by abortion advocates today. However, it has been undermined by the plethora of peer-reviewed studies published in the last 40 years. Specifically, recent studies demonstrate that childbirth is safer than abortion especially at later gestations. ^{xlvi}

ⁱ While they downplay their significance, the websites for abortion organizations such as Planned Parenthood and the National Abortion Federation acknowledge these risks of abortion. *See*, *e.g.*, Planned Parenthood, *In-Clinic Abortion Procedures* (2010), available at http://www.plannedparenthood.org/health-topics/abortion/abortion-procedures-4359.htm (last visited July 24, 2013); Planned Parenthood, *The Abortion Pill (Medical Abortion)*, available at http://www.plannedparenthood.org/health-topics/abortion/abortion-pill-medication-abortion-4354.asp (last visited July 24, 2013); National Abortion Federation, *Abortion Facts*, available at http://www.prochoice.org/pubs_research/publications/downloads/about_abortion/safety_of_abortion.pdf (last visited July 24, 2013).

ii Shadigian, Elizabeth. "Reviewing the Medical Evidence: Short and Long-Term Physical Consequences of Induced Abortion", testimony before the South Dakota Task Force to Study Abortion, Pierre, South Dakota September 21, 2005.

For more information *see* AUL Talking Points on Health Risks to Women from Late-Term Abortion *available at* http://www.aul.org/womens-health-defense-actlate-term-abortion-ban/ (last visited July 24, 2013).

iv John M. Thorp, Jr., Public Health Impact of Legal Termination of Pregnancy in the US: 40 Years Later, SCIENTIFICA 2013 at 5.

V Mayo Clinic Staff, PREMATURE BIRTH, http://mayoclinic.com/health/premature-birth/DS00137 (last visited June 3, 2013).

vi At the time this was written there were 139 known peer-reviewed studies demonstrating the link between abortion and preterm birth

Vii INST. OF MED. OF THE ACADEMIES, PRETERM BIRTH: CAUSES, CONSEQUENCES, AND PREVENTION, 625 (Richard E. Behrman and Adrienne Stith Butler, eds., 2007) *available at* http://books.nap.edu/openbook.php?record_id=11622&page=625 (last accessed June 14, 2013).

viii Thorp *supra* note xii at 5.

ix Byron C. Calhoun, et.al., Cost Consequences of Induced Abortion as an Attributable Risk for Preterm Birth and Impact on Informed Consent, 52 THE JOURNAL OF REPRODUCTIVE MEDICINE 929-937, 931 (2007).

^x World Health Org., *supra* note iii.

xi Byron C. Calhoun, Preterm Birth Update, 79 THE LINACRE QUARTERLY, 231, 231(2012).

xii Mayo Clinic Staff *supra* note i.

xiii Mayo Clinic Staff *supra* note i.

xiv *Id.* at 932.

xv Medline, *Placenta Previa*, "Symptoms", http://www.nlm.nih.gov/medlineplus/ency/article/000900.htm.

xvi L.G. Johnson, et al., *The Relationship of Placenta Previa and History of Induced Abortion*, 81 Int'l J. Gynecology & Obstetrics 191, 191 (2002).

xvii Medline, *supra* note iii at "Treatment."

xviii John M. Thorp, et al., Long-Term Physical and Psychological Health Consequences of Induced Abortion: Review of the Evidence, 58 Obstetrical & Gynecological Survey 67, 70 (2002); Cande V. Anath, et al., The Association of Placenta Previa with History of Cesarean Delivery and Abortion: A Metaanalysis, 177 Am. J. Obstetrics & Gynecology 1072, 1075 (1997). xix Johnson, supra note v at 194.



xx Id. at 193.

xxv Id. at 183

xxvi D.M. Fergusson et al., *Abortion in young women and subsequent mental health*, J. CHILD PSYCHOLOGY & PSYCHIATRY 47:16 (2006).

xxvii D.C. Reardon & P.C. Coleman, Relative Treatment Rates for Sleep Disorders and Sleep Disturbances Following Abortion and Childbirth: A Prospective Record-Based Study, J. Sleep 29:105-06 (2006).

xxviii American Association of Prolife Obstetricians and Gynecologists (AAPLOG), *Induced Abortion and Subsequent Breast Cancer Risk: An Overview* (2008), available at http://www.aaplog.org/complications-of-induced-abortion/induced-abortion-and-subsequent-breast-cancer-risk-an-overview/ (last visited Apr. 20, 2010).

xxix Scientists define an "early first full-term pregnancy" as one that takes place before the age of 24. Coalition on Abortion/Breast Cancer: *ABC Link: Two Ways that Abortion Raises Breast Cancer Risk* (2007), available at http://www.abortionbreastcancer.com/The_Link.htm (last visited Apr. 20, 2010).

xxx Breast Cancer Prevention Institute, *Epidemiologic Studies: Induced Abortion & Breast Cancer Risk*, (September 2012) http://www.bcpinstitute.org/FactSheets/BCPI-FactSheet-Epidemiol-studies 7 2013.pdf.

The FDA report documents reported serious adverse events through April 30, 2011. Obtained by the Family Research Council, the FDA report, "Mifepristone U.S. Postmarketing Adverse Events Summary through 04/30/2011," is *available at* http://downloads.frc.org/EF/EF11G29.pdf. (last visited July 14, 2011).

A 2006 review of Adverse Event Reports (AERs) related to the use of the RU-486 drug regimen, conducted by Dr. Margaret M. Gary, M.D. and Dr. Donna J. Harrison, M.D. found "AERs relied upon by the FDA to monitor mifepristone's postmarketing safety are grossly deficient due to extremely poor quality." Analysis of Severe Adverse Events Related to the Use of Mifepristone as an Abortifacient. What is perhaps even more disturbing than the lack of essential facts in what is reported to the FDA about chemical abortions—precluding accurate, or even any, analysis—is what is not being reported to the FDA about the dangerous drug regimen. The limitation of the AER system was detailed by Michael F. Mangano, Principal Deputy Inspector General of the Department of Health and Human Services, in his testimony before the U.S. Senate committee, "Adverse Event Reporting systems typically detect only a small proportion of events that actually occur. They are passive systems that depend on someone linking an adverse event with the use of a product, then reporting the eventAdverse Event Reports in and of themselves typically cannot generate conclusive evidence about the safety of a product or ingredient. Rather the system generates signals that FDA must assess to confirm if, in fact, a public health problem exists... With limited information to draw upon to generate signals, it is not surprising that FDA rarely reaches the point of knowing whether a safety action is warranted to protect consumers." Hearing on consumer safety and weight-loss supplements. Before the Subcomm. on Oversight of Gov't Mgmt, Restructuring, and the District of Columbia, S. Comm on Gov't Affairs. 107th Cong. (2002) (statement of Michael F Mangano, Principal Deputy Inspector General, Office of Inspector Gen., U.S. Dep't of Health & Human Servs.), available at http://www.hsgac.senate.gov/search/?q=consumer+safety+and+weightloss+supplements&access=p&as dt=i&as epq=&as eq=&as lq=&as occt=any&as oq=&as q=&as sitesearch=&client=hs gac&sntsp=0&filter=0&getfields=&lr=&num=15&numgm=3&oe=UTF8&output=xml no dtd&partialfields=&proxycustom =&proxyreload=0&proxystylesheet=default_frontend&requiredfields=&sitesearch=&sort=date%3AD%3AS%3Ad1&start=0 &ud=1 under the title "http://hsgac-amend.senate.gov/old_site/073102mangano.htm" (last visited July 14, 2011).

^{xxi} Id.

xxii John M. Thorp, Jr., Public Health Impact of Legal Termination of Pregnancy in the US: 40 Years Later, SCIENTIFICA 2013.

xxiii Priscilla K. Coleman, Abortion and Mental Health: A Quantitative Synthesis and Analysis of Research Published 1995-2009, 199 THE BRIT, J. OF PSYCHIATRY, 180, 180.

xxiv J.R. Cougle et al., *Depression associated with abortion and childbirth: A long-term analysis of the NLSY cohort*, MED. SCI.MONITOR 9(4):CR157 (2003).



xxxiii Mary Fjerstad, N.P., M.H.S., et al, *Rates of Serious Infection after Changes in Regimens for Medical Abortion*, 361 NEW. ENG. J. MED. 145 (2009). Mrs. Fjerstad and Dr. Cullins report having been employed by Planned Parenthood Federation of America (PPFA) at the time of the study. Drs. Lichtensberg and Trussell report serving on the PPFA National Committee. "No other conflict of interest relevant to this article was reported."

xxxiv Second Amended Complaint at 45, United States and Iowa *ex rel* Thayer v. Planned Parenthood of the Heartland, No. CV00129 (S.D. Iowa July 26, 2012).

xxxv E. Mulligan & H. Messenger, Mifepristone in South Australia: The First 1343 Tablets, Australian Family Physician 40(5):342-45 (May 2011).

M. Niinimaki et al., Immediate Complications after Medical compared with Surgical Termination of Pregnancy, Obstet. Gynecol. 114:795 (Oct. 2009).

^{xxxvii} (L.A. Bartlett et al., *Risk factors for legal induced abortion-related mortality in the United States*, OBSTETRICS & GYNECOLOGY 103(4):729-37 (2004)). ^{xxxvii} From the Bartlett study:

The risk of death associated with abortion increases with the length of pregnancy, from one death for every one million abortions at or before eight weeks gestation to one per 29,000 abortions at sixteen to twenty weeks and one per 11,000 abortions at twenty-one or more weeks.

xxxviii L.A. Bartlett et al., at 731. xxxix *See id.* at 729, 731. xl *Id.* at 735.

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xlii P.K. Coleman et al., Late-Term Elective Abortion and Susceptibility to Posttraumatic Stress Symptoms, J. PREGNANCY 2010:1, 7 (2010) (citing S.V. Gaufberg & P.L Dyne, ABORTION COMPLICATIONS (2012), available at http://emedicine.medscape.com/article/795001-overview (last visited May 20, 2013); L.A. Bartlett et al., supra). xliii P.K. Coleman et al., Late-Term Elective Abortion and Susceptibility to Posttraumatic Stress Symptoms, supra, at 7. xliv Planned Parenthood Federation of America, In-Clinic Abortion Procedures (2012), available at

http://www.plannedparenthood.org/health-topics/abortion/in-clinic-abortion-procedures-4359.asp (last visited May 20, 2013). xlv For example, one study found that the mortality ratio at 21 weeks is 8.9 deaths per 100,000 abortions. D. Grossman et al., Complications after second trimester surgical and medical abortion, REPROD. HEALTH MATTERS 16:173-82 (May 2008). Another study found that the mortality ratio at the same gestation is 10.4 deaths per 100,000 abortions. M. Paul et al., A CLINICIAN'S GUIDE TO MEDICAL AND SURGICAL ABORTION Chap. 15 (1999). See also H.W. Lawson et al., Abortion mortality, United States, 1972 through 1987, Am. J. OBSTET. GYNECOL. 171(5):1365 (1994) (demonstrating through Table 15-1 that the combined mortality for abortions at or after 21 weeks was 10.4 per 100,000 procedures). On the other hand, the mortality ratio for women who give birth is just 8.8 per 100,000 live births—clearly demonstrating that the risk of death from abortion is at least equal to, if not greater than, the risk of death from live birth. Again, such medical data places the determination of how to best protect maternal health into the hands of a state or federal legislature.

sivi See e.g. D.C. Reardon & P.K. Coleman, Short and long term mortality rates associated with first pregnancy outcome: Population register based study for Denmark 1980-2004, MED. SCI. MONIT. 18(9):71-76 (Aug. 2012). "Compared to women who delivered, women who had an early or late abortion had significantly higher mortality rates within 1 through 10 years." This study is particularly striking in the range studied—even up to 10 years after birth or abortion, more women die after abortion than after childbirth. See also E. Koch et al., Women's Education Level, Maternal Health Facilities, Abortion Legislation and Maternal Deaths: A Natural Experiment in Chile from 1957 to 2007, PLoS ONE 7(5):e36613 (May 4, 2012), available at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3344918/ (last visited May 20, 2013). The May 2012 study out of Chile is particularly significant because it examined trends in maternal death both when abortion was legal in Chile and after abortion was prohibited. The study found that death rates did not increase after abortion was made illegal. In fact, the maternal mortality ratio decreased from 41.3 deaths per 100,000 live births when abortion was legal, to just 12.7 maternal deaths per 100,000 live births after abortion was made illegal. Today, Chile has a lower maternal mortality ratio than the United States and it has the lowest maternal mortality ratio in all of Latin America. Moreover, the leading cause of death for a pregnant woman between 1957 and 1989 (the time in which abortion was legal) was abortion. This data convincingly demonstrates that the 1989 law prohibiting abortion has not put women's lives at risk, effectively refuting the claims that



abortion advocates routinely employ against most abortion restrictions. See also . Carroll, Ireland's Gain: The Demographic Impact and Consequences for the Health of Women of the Abortion Laws in Ireland and Northern Ireland since 1968, at Figure 8 (Dec. 2011), available at http://papriresearch.org/ESW/Files/Irelands_Gain.pdf (last visited May 20, 2013). The study compared maternal mortality rates in Ireland (where abortion is illegal) to England and Scotland (where abortion is legal). Researchers found that maternal mortality rates were much lower in Ireland than in England or Scotland. Specifically, in Ireland, there are 1-2 maternal deaths per 100,000 live births, whereas in England/Wales there are 10 deaths per 100,000 live births, and in Scotland there are 10-12 deaths per 100,000 live births. If abortion is safer than childbirth, then the data should confirm that assumption in countries where abortion is illegal. But studies prove exactly the opposite: where abortion is restricted, maternal mortality rates decrease.