The Burden of Abortion and the Preterm Birth Crisis

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Itinerary

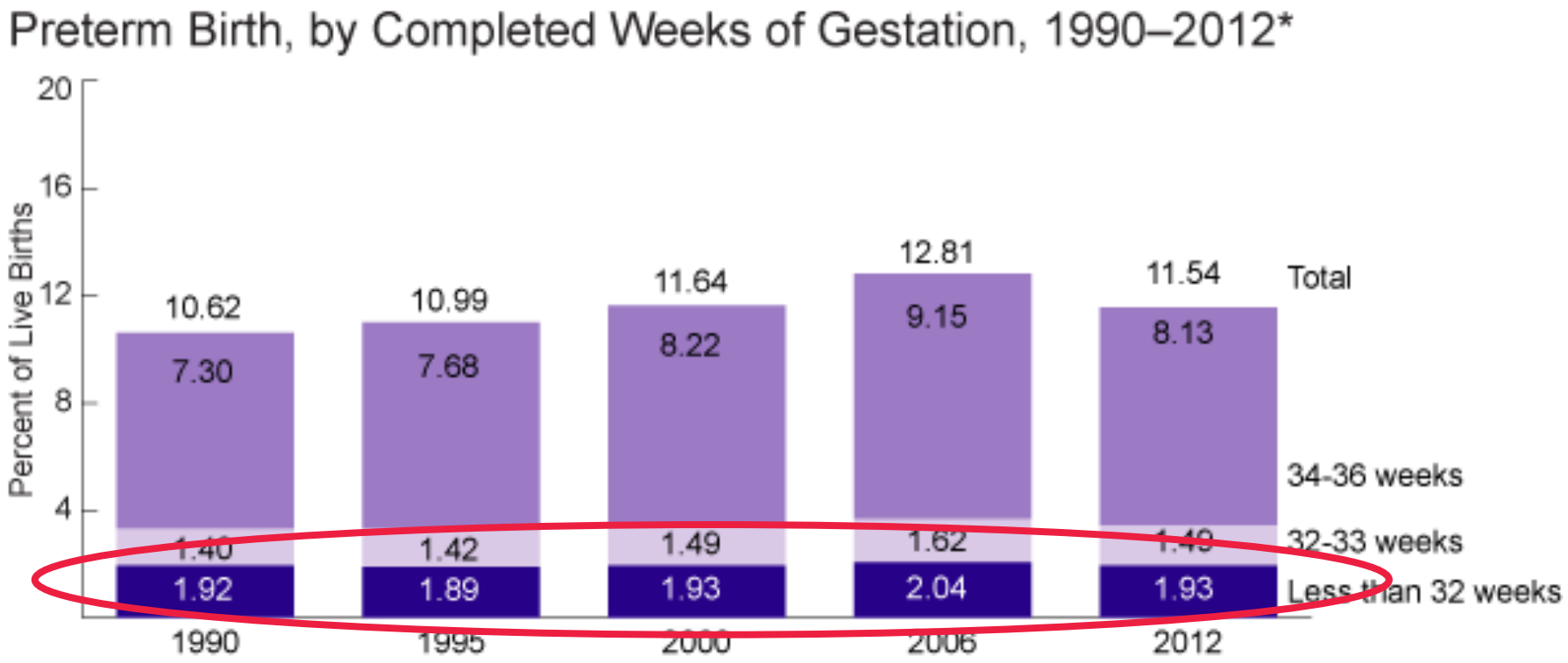
- The preterm birth epidemic
- Are all associations equal in the preterm birth discussion?
  - Smoking and surgical abortion
- The evidence for the associations
- Is the abortion association moot in an era of medical abortion?
- Estimating the impact of abortion on very preterm births
- Counting the cost of abortion's impact on VPB
- What then?

The Preterm Birth Crisis

- In 2015, 9.6% of all babies born in the United States are born preterm
- Over the last two decades, the percentage of pre-term deliveries has risen 20 percent
- Preterm birth vs LBW
  - Prematurity, defined as a birth prior to 37 weeks
  - LBW < 2500 grams or 5 lbs 8 oz
- .
- In 2015 63,000 US births are classified as Very Preterm Births (VPBs): < 32 weeks.
- VPBs constitute 1.6% of all births in the US
- These births associated with the highest risk for death and morbidity
  - Respiratory Distress Syndrome and Chronic Lung disease
  - Necrotizing enterocolitis
  - Intraventricular Hemorrhage (IVH) or brain bleeding
  - Blindness
  - Hearing loss
  - Mental retardation
  - Cerebral Palsy
- The estimated annual cost for care attributable to preterm birth in the United States is $26 billion

Institute of Medicine, National Academy of Science, Preterm Birth: Causes, Consequences, and Prevention, National Academies Press, Washington DC, 2006.

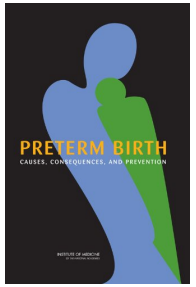
Preterm Birth Trends



Data for 2012 are preliminary.

Source: Hamilton BE, Martin JA, Ventura SJ. Births: Preliminary data for 2012. National vital statistics reports; vol 62 no 3. Hyattsville, MD: National Center for Health Statistics. 2013.
Martin JA, Hamilton BE, Ventura SJ, et al. Births: Final data for 2011. National vital statistics reports; Vol 61 no 1. Hyattsville, MD: National Center for Health Statistics. 2013.

IOM Report on Preterm Birth: Causes, Consequences, and Prevention

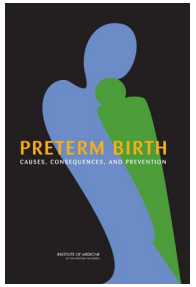


- Established in 1970 by the National Academy of Sciences to secure the services of eminent members of appropriate professions in the examination of policy matters pertaining to the health of the public.
- The IOM acts under the responsibility given to the National Academy of Sciences by its congressional charter to be an adviser to the federal government.
- The majority of IOM studies and other activities are requested and funded by the federal government.

Institute of Medicine, National Academy of Science, Preterm Birth: Causes, Consequences, and Prevention, National Academies Press, Washington DC, 2006.

Per IOM: “Immutable Risk Factors” Associated With Preterm Birth

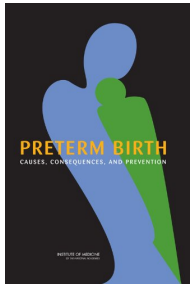
- Previous low birth weight or preterm delivery
- Multiple 2nd trimester spontaneous abortion
- **Prior first trimester induced abortion**
- Familial and intergenerational factors
- Placental abnormalities
- Cervical and uterine anomalies
- In utero diethylstilbestrol exposure
- Multiple gestations
- Infant sex
- Short stature
- Low prepregnancy weight/low body mass index
- Urogenital infections
- Preeclampsia



Institute of Medicine, National Academy of Science, Preterm Birth: Causes, Consequences, and Prevention. National Academies Press, Washington DC, 2006: Appendix B, Table B-5, p 625.

Per IOM: Possibly Mutable Risk Factors Associated With Preterm Birth

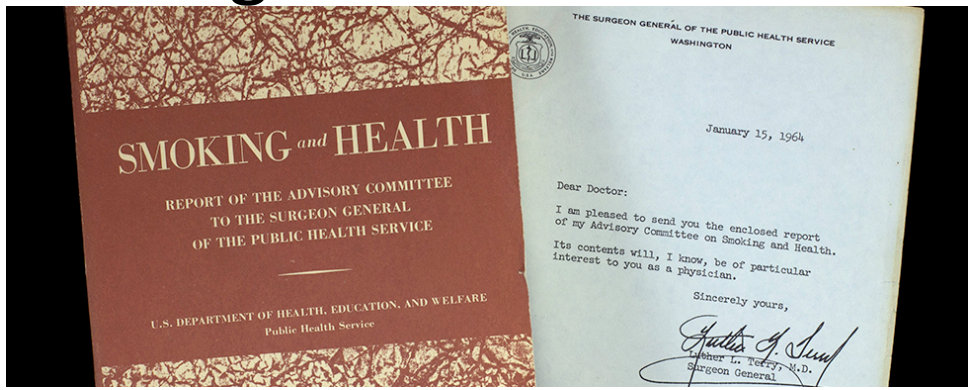
- **Cigarette smoking**
- No or inadequate prenatal care usage
- Use of marijuana and other illicit drugs
- Cocaine use
- Alcohol consumption
- Caffeine intake
- Maternal weight gain
- Dietary intake
- Sexual activity during late pregnancy
- Leisure-time physical activities



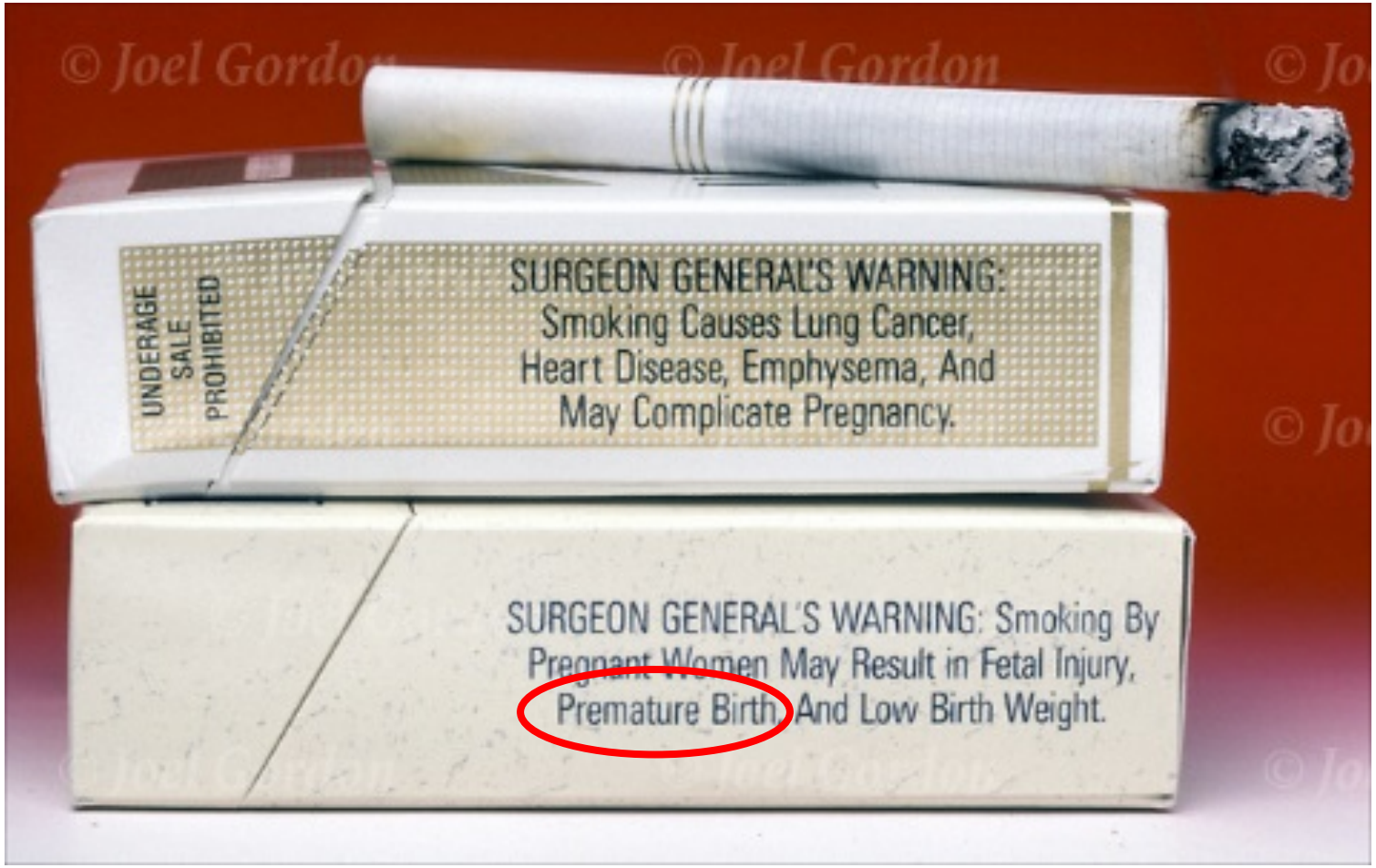
Institute of Medicine, National Academy of Science, Preterm Birth: Causes, Consequences, and Prevention, National Academies Press, Washington DC, 2006.

Report of the Advisory Committee to the Surgeon General of the United States: 1964

"Five retrospective and two prospective studies have shown an association between maternal smoking during pregnancy and birth weight of the infant. Women smoking during pregnancy have babies of lower birth weight than non-smokers of the same social class. They have also a significantly greater number of premature deliveries **(defined as birth weight of 2,500 grams or less**) than the non-smoking controls."

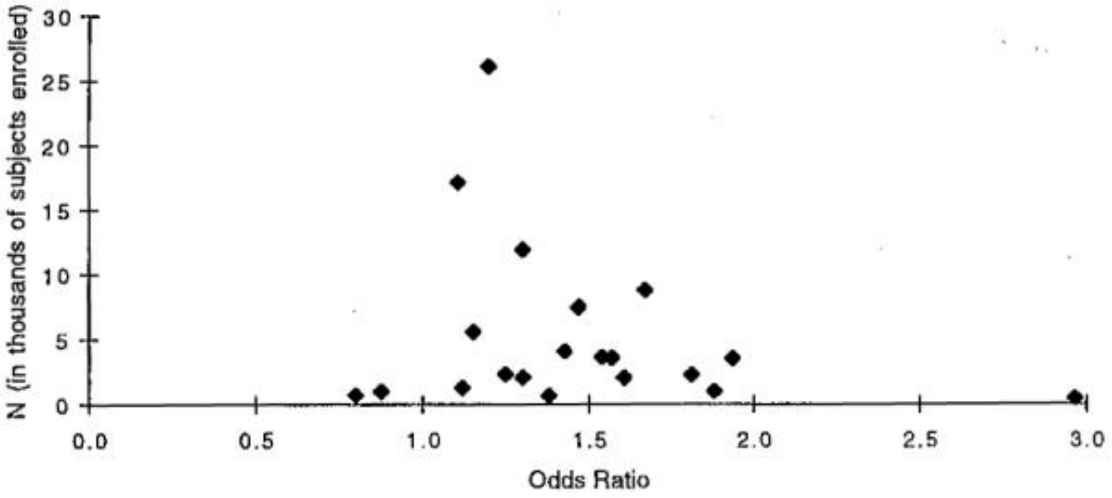


Cigarette Smoking and Preterm Birth: 1985



The Data on Smoking and Preterm Birth

- A 1984 meta analysis which examined 5 studies, used unadjusted odds ratios[1]
- Since one systematic review meta analysis of good quality[2]
- Pooled point estimate for any maternal smoking versus no maternal smoking was 1.27 (95% confidence interval, 1.21-1.33)
- None of the studies included prior abortion as a variable
- Heavier smoking trended to increased risk for preterm birth
- "Publication bias may affect the results of this study, but we believe its contribution is minimal…despite the possible existence of some publication bias, the pooled estimate is likely a valid estimate of the true underlying effect."



1. McIntosh ID. Smoking and pregnancy. II. Offspring risks. Public Health Rev. 1984;12:29–63.
2. Shah NR and Bracken MB. A systematic review and meta-analysis of prospective studies on the association between maternal cigarette smoking and preterm delivery. Am J Obstet Gynecol. Feb 2000; 182(2): 465–472.

Cigarette Smoking and Preterm Birth

- Cigarette smoking is recognized to be among the most prevalent, preventable causes of adverse pregnancy outcomes.
- Smoking is strongly related to placental abruption, reduced birth weight, and infant mortality
- “The relationship of cigarette smoking to preterm birth is rather modest and not entirely consistent.”
- The range of odds ratio for studies showing such an association is from 1.1-2. There are a number of studies showing no relationship. There are some studies showing a protective effect of smoking.

Institute of Medicine, National Academy of Science, Preterm Birth: Causes, Consequences, and Prevention, National Academies Press, Washington DC, 2006.

The Data on Abortion and Preterm Birth

- 145 statistically significant studies demonstrating the association of preterm birth with abortion (1963-Present)
- 26 statistically significant studies demonstrating the association of very preterm birth (< 32 weeks) or very low birth weight (VLBW < 1500 grams) with abortion (1978-Present)
- There are studies which fail to show an association of abortion with preterm birth but they are small
- Any large study with at least 30,000 mothers or 500 deliveries < 33 weeks shows an association of abortion and preterm birth

The Systematic Reviews and Meta Analyses Examining Abortion and Preterm Birth

- Systematic Reviews involve a detailed and comprehensive plan and search strategy derived a priori, with the goal of reducing bias by identifying, appraising, and synthesizing all relevant studies on a particular topic.
- Systematic Reviews may include a meta-analysis (SRMA) component which involves using statistical techniques to synthesize the data from multiple studies into a single quantitative estimate or summary effect size
  - Swingle HM, Colaizy TT, Zimmerman MB, Morriss FH. Abortion and the risk of subsequent preterm birth: A systematic review with meta-analyses. J Rrepro Med 2009;54:95-108.
  - Shah PS, Zao J. Induced termination of pregnancy and low birthweight and preterm birth: a systematic review and meta-analysis. BJOG 2009;116:1425-1442.

Meta-analysis by Swingle, et al 2009

- Meta-analyses of literature 1995-2007
- Pro-abortion & pro-life authors
- 7,891 titles, 349 abstracts, 130 papers
- 30 abortion & 26 SAB papers included
- Analyzed data from 12 induced and 9 SAB papers

Swingle HM, Colaizy TT, Zimmerman MB, Morriss FH. Abortion and the risk of subsequent preterm birth: A systematic review with meta-analyses. J Repro Med 2009;54:95-108.

Meta-analysis by Swingle, et al 2009

- One induced abortion had a 1.25 adjusted OR [1.03-1.48] increased risk preterm birth < 37 weeks
- > 1 induced abortion 1.51 OR [1.21-1.75] increased risk preterm birth < 37 weeks
- > 1 induced abortion OR of 1.64 [1.38-1.91] for < 32 week delivery (VPB)

Meta-analysis by Shah et al 2009

- Screened 834 papers
- Excluded 765 for lack data/objective
- 69 citations reviewed
- 32 excluded, 37 included

Shah PS, Zao J. Induced termination of pregnancy and low birthweight and preterm birth: a systematic review and meta-analysis. BJOG 2009;116:1425-1442.7

Meta-analysis by Shah, et al 2009: 22 PTB Studies

- No abortion vs 1 Abortion
- 22 studies
- 268,379 patients
- OR 1.36 [1.24-1.50] for PTB

- No abortions vs > 1 Abortion
- 7 studies of 22
- 158,421 patients
- OR 1.93 [1.38-2.71] for PTB

Watson, et al: Identifying risk factors for very preterm birth (20- 31^6 weeks)

- Case control study from Australia; 603 cases and 796 controls from 2002-2004
- Findings:
  - 1 abortion OR 2.11 (1.3,3.4) $p<0.002$; AOR 2.02 (1.2,3.3) $p<0.004$
  - > 1 abortion OR 4.4 (1.9,9.1) $p<0.001$; AOR 3.50 (1.6,7.9) $p<0.002$

Watson LF, Rayner J-A, Forster D. Identifying risk factors for very preterm birth: A reference for clinicians. Midwifery May 2013;29(5):434-439

Hardy et al: Effect of induced abortions on early preterm births

- 17,916 patients
- 2276 (13%) had undergone one prior induced abortion, and 862 (5%) had undergone two or more prior induced abortions.
- Women who reported one prior induced abortion were more likely to have premature births by 32, 28, and 26 weeks
  - OR were 1.45 (95% CI 1.11 to 1.90), 1.71 (95% CI 1.21 to 2.42), and 2.17 (95% CI 1.41 to 3.35), respectively

Hardy G[1], Benjamin A, Abenhaim HA. Effect of induced abortions on early preterm births and adverse perinatal outcomes. J Obstet Gynaecol Can. 2013 Feb;35(2):138-43.

Klemetti, et al: Birth Outcomes After Induced Abortion

- Nationwide register-based outcomes of first births in Finland; *records linked to outcomes 1996-2008;* 300,858 first time mothers
- Controlled for comorbidities: maternal age, marital status, socioeconomic position, urbanity, smoking, reproductive history; method, timing and indication of abortion
- Increased odds for very preterm birth (<28 weeks) seen in all the subgroups exhibited a dose–response relationship: One IA 1.19, two IA's 1.69, three IA's 2.78

Klemetti R, Gissler M, Niinimaki M, Hemminki E. Birth outcomes after induced abortion: a nationwide register-based study of first births in Finland. Human Reproduction 2012 August 29

Klemetti, et al: Birth Outcomes After Induced Abortion

- “In terms of public health and practical implications, health education should contain information of the potential health hazards of repeat IAs, including very preterm birth and low birth weight in subsequent pregnancies.”
- “Health care professionals should be informed about the potential risks of repeat IAs on infant outcomes in subsequent pregnancy.”
- “Observational studies like ours, however large and well-controlled, will not prove causality.”

Klemetti R, Gissler M, Niinimaki M, Hemminki E. Birth outcomes after induced abortion: a nationwide register-based study of first births in Finland. Human Reproduction 2012 August 29

And the SRMAs Keep Coming

- Lemmers et al. reviewed 21 studies reporting on 1,853,017 women with the history of a dilatation and curettage (D&C) procedure for either termination of pregnancy or completion of miscarriage.
- In women with a history of D&C compared with those with no such history, the AOR for PTB was 1.29 [1.17;1.42], while for VPB AOR was 1.69 [1.20-2.38].
- For women with a history of multiple D&Cs compared with those with no D&C, the OR for PTB was 1.74 [1.10-2.76].
- Women with a previous D&C, for miscarriage or termination of pregnancy in the first trimester, are at increased risk for PTB and especially VPB in comparison to women without a previous D&C.
- "This meta-analysis shows that D&C is associated with an increased risk of subsequent preterm birth. The increased risk in association with multiple D&Cs indicates a causal relationship. Despite the fact that confounding cannot be excluded, these data warrant caution in the use of D&C for miscarriage and termination of pregnancy, the more so since less invasive options are available."

Lemmers M, Verschoor MA, Hooker AB, Opmeer BC, Limpens J, Huirne JA, Ankum WM, Mol BW. Dilatation and curettage increases the risk of subsequent preterm birth: a systematic review and meta-analysis. Hum Reprod. 2016 Jan; 31(1):34-45.

And the SRMAs Keep Coming

- Saccone et al. included 36 studies (1,047,683 women).
- 31 studies on I-TOP, 28 included 913,297 women with a history of surgical I-TOP, 3 included 10,253 women with a prior medical I-TOP.
- Women with a prior surgical I-TOP had a higher risk of PTB (5.4% vs 4.4%; OR, 1.52, 95% CI, 1.08–2.16)
- Medical I-TOP had a similar risk of PTB compared with those who did not have a history of I-TOP (28.2% vs 29.5%; OR, 1.50, 95% CI, 1.00–2.25)
- "Prior surgical uterine evacuation for either I-TOP or SAB is an independent risk factor for PTB. These data warrant caution in the use of surgical uterine evacuation and should encourage safer surgical techniques as well as medical methods."

Saccone G, Perriera L, Berghella V. Prior uterine evacuation of pregnancy as independent risk factor for preterm birth: a systematic review and metaanalysis. Am J Obstet Gynecol. 2016 May;214(5):572-91.

Abortion and Preterm Birth

Is medical abortion associated with preterm birth?

Virk J et al.: Medical abortion and the risk of subsequent adverse pregnancy outcomes

- Women in Denmark having abortion for nonmedical reasons between 1999-2004
- Compared surgical to medical first trimester abortion
- 11,814 pregnancies in women with previous first-trimester medical abortion (2710 women) or surgical abortion (9104 women)
  - No control group without an abortion
  - Did not describe the specific surgical abortion method (surgical ripening agents or not)
  - Did not analyze data for VPB
- "We found no evidence that a previous medical abortion, as compared with a previous surgical abortion, increases the risk of spontaneous abortion, ectopic pregnancy, preterm birth, or low birth weight."
- Medical abortion has the same risk for subsequent preterm birth.

Virk J, Zhang J and Olsen J. Medical abortion and the risk of subsequent adverse pregnancy outcomes.
N Engl J Med. 2007 Aug 16;357(7):648-53.

Liao et al: Repeated Medical Abortions and PTB

- Cohort study
- 4 years from January 2006-December 2009
- Interview based with delivery outcomes
- 18,323 women (19,527 interviewed) (93.8%)
- Divided into 3 comparison groups:
  - Nulliparous women with 1 or more first trimester medical abortions (mifepristone)
  - Nulliparous with surgical abortions (elective)
  - Nulliparous with no previous abortions

Liao H, Wei Q, Duan L, Ge J, Zhou Y, Zeng W. Repeated medical abortions and the risk of preterm birth in subsequent pregnancies. Arch Gynecol Obstet 2011;289:579-586

Liao et al: Repeated Medical Abortions and PTB

- Exceptional follow up
  - 7,478 with complete follow up in abortion group out of original 7,558 (98.9%)
  - 10,546 with complete follow up in no abortion group out of original 10,681 (98.9%)
- Findings OR 1.4 (1.1-1.8) preterm birth with 1 surgical abortion
- OR 1.62 (1.27-3.42) preterm birth > 3 surgical abortions (dose effect)
- OR 2.18 (1.51-4.42) preterm birth with medical & surgical abortions

Liao H, Wei Q, Duan L, Ge J, Zhou Y, Zeng W. Repeated medical abortions and the risk of preterm birth in subsequent pregnancies. Arch Gynecol Obstet 2011;289:579-586

Liao et al: Repeated Medical Abortions and PTB

- OR 1.03 (0.53-1.63) no increase risk of preterm birth with medical abortions compared to no abortions but…
  - OR 1.4 (1.1-1.8) preterm birth with 1 surgical abortion
  - OR 1.62 (1.27-3.42) preterm birth > 3 surgical abortions (dose effect)
  - OR 2.18 (1.51-4.42) preterm birth with medical & surgical abortions
- And…20.3% of patients needed a post-abortion suction curettage!
  - OR 1.69 (1.02-3.16) preterm birth risk in women with medical abortion < 7 weeks with curettage
  - OR for < 32 week delivery (VPB) was 3.61 (1.43-4.93) with < 7 week medical abortion with curettage (20% of patients)
- Did not report either of these findings in abstract

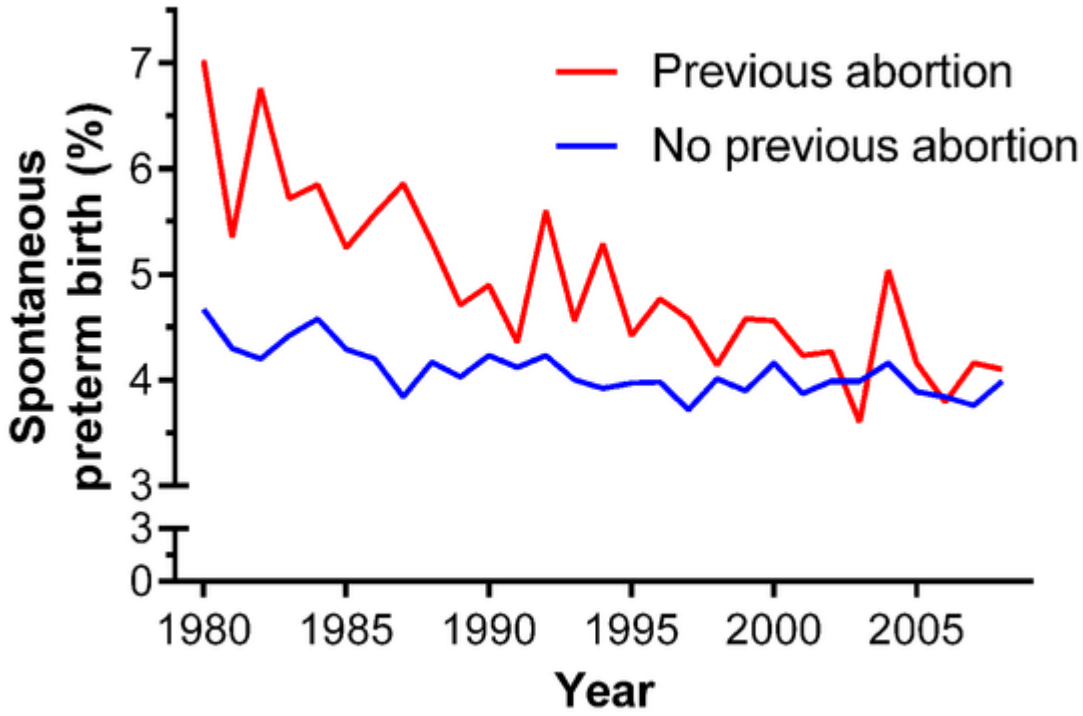
Liao H, Wei Q, Duan L, Ge J, Zhou Y, Zeng W. Repeated medical abortions and the risk of preterm birth in subsequent pregnancies. Arch Gynecol Obstet 2011;289:579-586

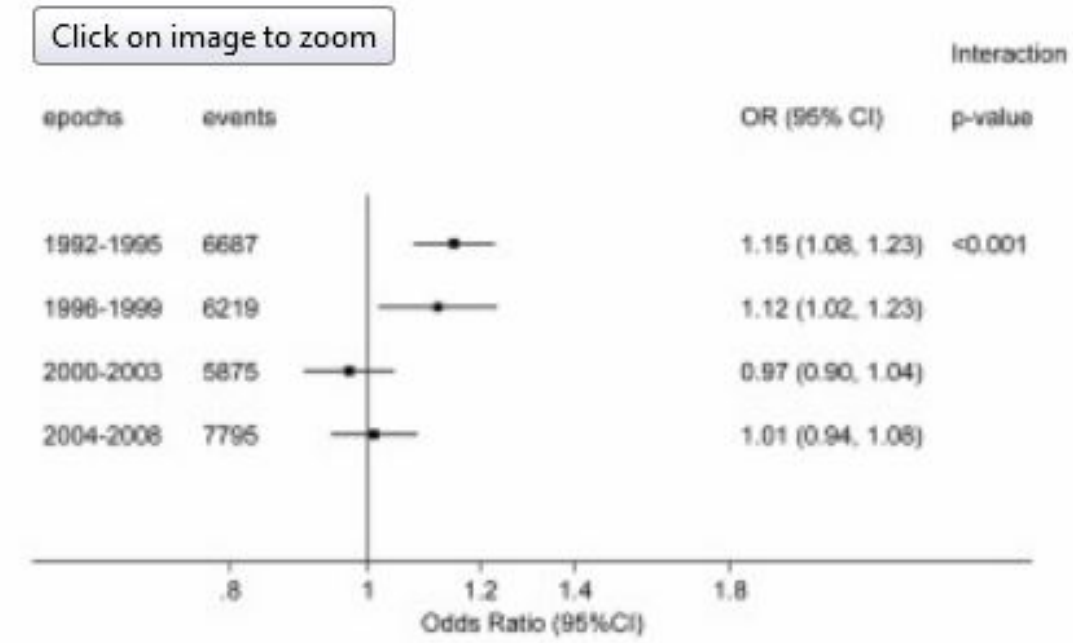
Oliver-Williams et al: Changes in Association between Previous Therapeutic Abortion and Preterm Birth in Scotland

- Historical cohort study of 732,719 first births >24 weeks
- Preterm delivery <37 weeks declined over time
- Surgical without use of cervical pre-treatment decreased from 31% to 0.4%; medical abortions increased from 18% to 68% during this period
- Previous abortion associated with preterm birth most prevalent 1980-1983 (OR 1.32 [1.21–1.43]) ; overall OR (1.12 [1.09–1.16])

Oliver-Williams C, Fleming M, Monteath K., Wood AM, Smith GCS. Changes in Association between Previous Therapeutic Abortion and Preterm Birth in Scotland, 1980 to 2008: A Historical Cohort Study. PLOS July 2013;10(7:1-11)

Oliver-Williams et al: Changes in association of abortion and preterm birth: Scotland 1980-2008





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Oliver-Williams et al: Changes in Association of Abortion and Preterm Birth in Scotland

Supplementary Table 1: Multivariate logistic regression analysis of the association between neonatal death and previous abortions (coded as categories)

	Odds Ratio (95% CI)						
	All Preterm Birth	Spontaneous Preterm Birth	Induced Preterm Birth	Preterm Birth (24-28 weeks)	Preterm Birth (29-32 weeks)	Preterm Birth (33-36 weeks)	Neonatal Death*
History of Therapeutic Abortion							
0 Abortions	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ref	ref	ref	ref	ref	ref	ref
1 Abortion	1.11	1.17	1.00	1.05	1.06	1.13	1.07
	(1.07-1.15)	(1.12-1.22)	(0.94-1.06)	(0.92-1.20)	(0.97-1.16)	(1.08-1.17)	(0.88-1.31)
2 Abortions	1.32	1.51	1.05	2.06	1.25	1.28	1.14
	(1.20-1.45)	(1.35-1.68)	(0.86-1.21)	(1.54-2.74)	(0.99-1.58)	(1.15-1.42)	(0.64-2.01)
3+ Abortions	1.45	1.64	1.17	3.33	1.46	1.30	2.68
	(1.15-1.84)	(1.24-2.18)	(0.78-1.74)	(1.83-6.06)	(0.82-2.59)	(0.98-1.72)	(1.00-7.20)
History of Miscarriage							
No History of Miscarriage	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ref	ref	ref	ref	ref	ref	ref
1+ Miscarriages	1.25	1.19	1.37	1.72	1.36	1.20	1.40
	(1.22-1.29)	(1.15-1.23)	(1.31-1.43)	(1.57-1.90)	(1.28-1.46)	(1.16-1.24)	(1.19-1.63)
Height (per cm)	0.97	0.98	0.97	0.97	0.97	0.97	0.99
	(0.97-0.98)	(0.98-0.98)	(0.96-0.97)	(0.96-0.97)	(0.97-0.97)	(0.97-0.98)	(0.98-1.00)
Marital Status							
Married	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	ref	ref	ref	ref	ref	ref	ref
Non-Married	1.22	1.27	1.10	1.31	1.30	1.19	1.14
	(1.19-	(1.23-1.30)	(1.05-1.16)	(1.19-1.45)	(1.22-1.38)	(1.16-1.23)	(0.99-1.32)

Oliver-Williams C, Fleming M, Monteath K., Wood AM, Smith GCS. Changes in Association between Previous Therapeutic Abortion and Preterm Birth in Scotland, 1980 to 2008: A Historical Cohort Study. PLOS July 2013;10(7:1-11)

Oliver-Williams et al: Changes in association of abortion and preterm birth: Scotland 1980-2008

- "We **speculate** that changes in the methods used to achieve termination of pregnancy are the most plausible explanation for the loss of the association between previous abortion and the subsequent risk of preterm birth….**The above interpretation assumes a causal association between surgical abortion without cervical pre-treatment and preterm birth, and there are a number of aspects of the current analysis that are supportive of a causal relation**."
- The researchers could not directly test whether the trends they note were related because they did not have information on the method of previous termination linked to subsequent birth outcome for individual women

So Is Medical Abortion Without Risk For Future Preterm Birth?

- In September 2000, the U.S. Food and Drug Administration approved mifepristone to be marketed in the United States as an alternative to surgical abortion.
- While admitting that surgical abortion increases the risk for preterm birth, some proponents of medical abortion advance the theory that injury from surgical abortion is the reason abortion has increased preterm birth risk
- This is an assumption not supported by current research
- If this conclusion was true we are still left with the fact that 77% of abortions in the United States in 2011 were surgical

Jones RK and Jerman J. Abortion incidence and service availability in the United States, 2011. Perspectives on Sexual and Reproductive Health, 2014, 46(1):3-14

Pathophysiology of Abortion and Preterm Birth

- Cervical trauma and injury
- Induction of or predisposition to inflammation
- Maternal stress
- Unknown factors

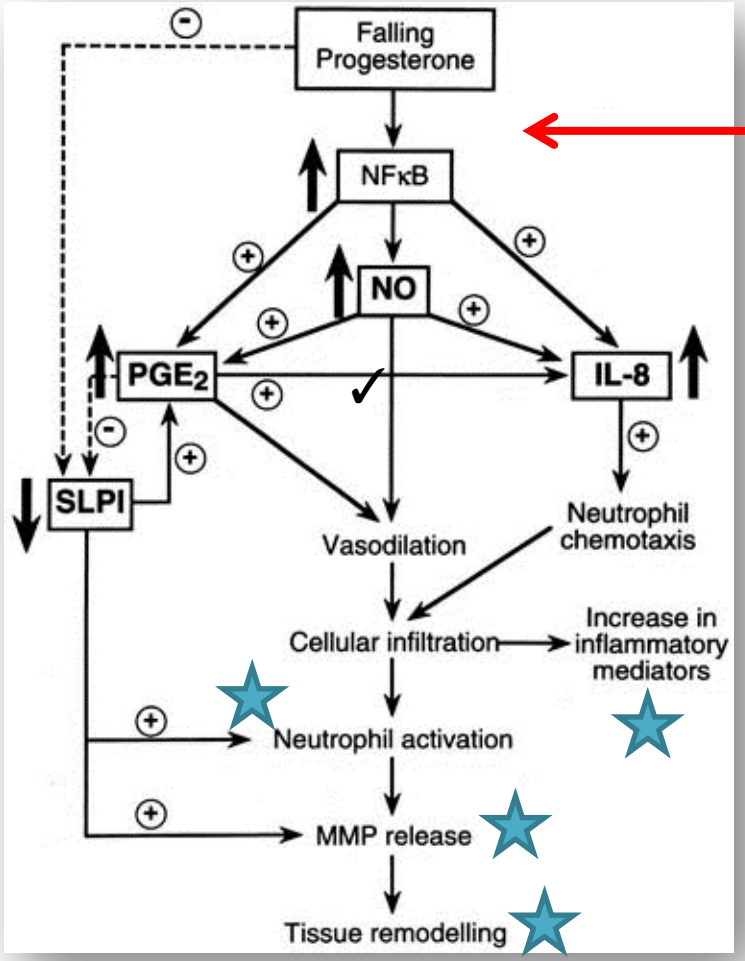
Impact of Medical Abortion: Mifepristone and the Cervix

- **Sudden loss of progesterone function upon RU486 administration differs from the more gradual withdrawal of progesterone occurring during normal term birth**
- Up-regulate Metal Metalloprotein-9 (MMP-9) release, degrades vascular basement membrane
- This in conjunction with release of chemokines including MCP-1 and IL-8, favors accumulation of infiltrating leukocytes, specifically neutrophils, monocytes and mast cells
- Release of collagenases MMP-1 and MMP-8 by stromal cells promote remodeling and loosening of cervical connective tissue stroma.
- Results in a combination of premature activation of processes involved in term ripening as well as a partial activation of resident neutrophils and macrophages similar to the PP repair phase of cervical remodeling.
- Mifepristone in mouse cervix upregulates genes including Chi313, Ptgs1(Cox 1)…genes of uncertain significance but noted to be active in inflammatory disorders

1. Denison FC et al. The effect of mifepristone administration on leukocyte populations, matrix metalloproteinases and inflammatory mediators in the first trimester cervix. Mol Hum Reprod. 2000 Jun;6(6):541-8.

2. Holt R et al. The Molecular Mechanisms of Cervical Ripening Differ between Term and Preterm Birth. Endocrinology. Mar 2011; 152(3): 1036–1046.

Impact of Medical Abortion: Mifepristone and the Cervix



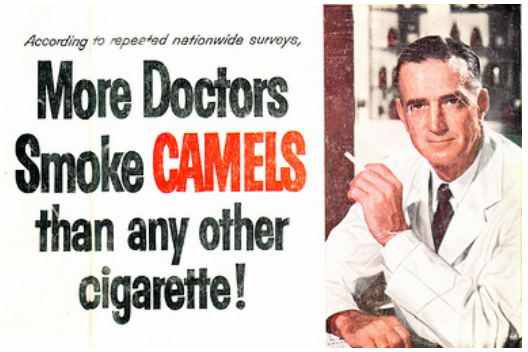
Mifepristone Administration

Risk of Chorioamnionitis After Prior Abortion

- Muhlemann et al.[1]
  - A threefold elevated risk for both induced and spontaneous abortion
- Krohn et al.[2]
  - Women with spontaneous abortion (odds ratio=4.3; 95% confidence interval 2.9 to 6.4) or elective termination (odds ratio=4.0; 95% confidence interval 2.7 to 5.8) had an increased risk of intraamniotic infection.

1. Muhlemann K. et al. Does an Abortion Increase the Risk of Intrapartum Infection in the Following Pregnancy? Epidemiology. 1996:7(2):194-198.
2. Krohn M. et al. Prior pregnancy outcome and the risk of intraamniotic infection in the following pregnancy. Am J Obst Gyn. 1998;178(2):381–385

Bradford Hill Criteria



- In his presidential address before the Royal Society of Medicine in 1965, Bradford Hill noted the following 9 conditions that help strengthen causal inference for an observed association: **strength of the association, consistency, specificity, temporality, dose response, plausibility, coherence, experiment, and analogy.**
- The US Surgeon General applied the newly developed Bradford Hill criteria for causality to the cigarette-lung cancer link epidemiologic studies to warn the public

Hill AB. "The environment and disease: association or causation?" in Bull World Health Organ, volume 83 on page 796.

Bradford Hill: Abortion, Smoking and Preterm Birth

- Timing: Abortion and smoking occur before preterm birth
- Dose effect: Demonstrated for abortion, less apparent for smoking
- Consistency of effect: Yes for abortion, not smoking
  - Repeatedly observed by different investigators at different times
- Strength of association: Abortion has a very specific association with very preterm birth
- Biological plausibility: Abortion yes, smoking uncertain

Hill AB. "The environment and disease: association or causation?" in Bull World Health Organ, volume 83 on page 796.

And Caution from Professor Hill

- “None of my nine viewpoints can bring indisputable evidence for or against the cause-and-effect hypothesis and none can be required as a sine qua non. **What they can do, with greater or less strength, is to help us to make up our minds on the fundamental question- is there any other way of explaining the set of facts before us, is there any other answer equally, or more likely, than cause and effect?”**
- **“All scientific work is incomplete – whether it be observational or experimental. All scientific work is liable to be upset or modified by advancing knowledge. That does not confer upon us a freedom to ignore the knowledge we already have, or to postpone the action that it appears to demand at a given time. “**
- “Who knows, asked Robert Browning, but the world may end tonight? True, but on available evidence most of us make ready to commute on the 8:30 next day.”

Hill AB. "The environment and disease: association or causation?" in Bull World Health Organ, volume 83 on page 796.

Abiding the Wisdom of Professor Hill

- Dr. Jay Iams: "Contrary to common belief, population-based studies have found that elective pregnancy terminations in the first and second trimesters are associated with a very small but apparently real increase in the risk of subsequent spontaneous preterm birth."[1]
- Dr. Phil Steer: "A key finding is that compared to women with no history of termination, even allowing for the expected higher incidence of socio-economic disadvantage, women with just one TOP (termination of pregnancy) had an increased odds of subsequent preterm birth. We have known for a long time that repeated terminations predispose to early delivery in a subsequent pregnancy. However the finding that even one termination can increase the risk of preterm birth means that we should continue to search for ways of making termination less traumatic. [2]
- Oliver Williams et al.: "In conclusion, we have shown that previous abortion was a risk factor for preterm birth among nulliparous women in Scotland prior to 2000."[3]

1. Iams JD and Berghella V. Care for women with prior preterm birth. Am J Obstet Gynecol. 2010; 203(2): 89–100.
2. Steer, P. (2009), Editors Choice BJOG: An International Journal of Obstetrics & Gynaecology. 2009;116(11):i–ii.
3. Oliver-Williams C et al. Changes in Association between Previous Therapeutic Abortion and Preterm Birth in Scotland, 1980 to 2008: A Historical Cohort Study. PLOS July 2013;10(7:1-11)

The Care of Women Requesting Induced Abortion

Evidence-based Clinical Guideline Number 7

November 2011

Royal College of
Obstetricians and Gynaecologists

Bringing to life the best in women's health care

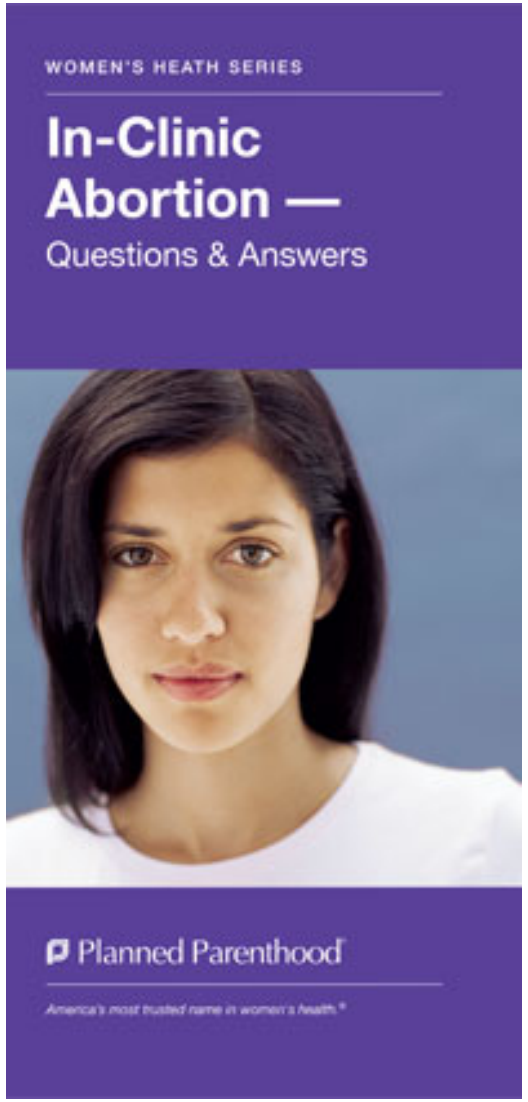
Abiding the Wisdom of Professor Hill

- Care of Women Requesting Induced Abortion
  - RECOMMENDATION 5.12:

  "Women should be informed that induced abortion is associated with a small increase in the risk of subsequent preterm birth, which increases with the number of abortions. However, there is insufficient evidence to imply causality."

Planned Parenthood: Rejecting Hill's Wisdom and the Right for Women to be Informed

- "There are many myths about the risks of abortion. Here are the facts. Abortion does not cause breast cancer. Safe, uncomplicated abortion does not cause problems for future pregnancies such as birth defects, premature birth or low birth weight babies, ectopic pregnancy, miscarriage, or infant death."



http://www.plannedparenthood.org/health-info/pregnancy/pregnant-now-what/thinking-about-abortion

ACOG: Ignores Hill Criteria

Are there any long-term health effects from having an abortion?

Some women worry that having an abortion could affect their future health. Most health care providers agree that one abortion does not affect your ability to get pregnant or the risk of future pregnancy complications. Recent studies have shown no link between abortion and breast cancer. For women with an unplanned pregnancy, there is no difference in the risk of ***depression*** or other mental health problems between those who have an abortion and those who have the baby.

Pediatrics: Dismissing the Hill Criteria

- "The consequences of preterm delivery are often severe, and the authors are passionate in their plea, as they have been in multiple other publications and in the lay press in North Carolina. However, I am not sure that Pediatrics is the best forum to highlight their concerns."
- "First, while they cite 2 well-done systematic reviews and meta-analyses (Swingle 2009 and Shah 2009), other authors contend that first-trimester surgical abortions and (as the authors here also state) medically-induced abortions confer little risk of future preterm deliveries (Virk and Zhou)."
- "Any approach to health that reduces risk of preterm birth is important. However, your discussion appears to assume that women are routinely using abortion as birth control which demonstrates a profound misunderstanding and lack of empathy regarding women[1]s reproductive decision making."

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

PEDIATRICS

The Abortion-Preterm Birth Association: An Opportunity to Reduce Infant Mortality…2014

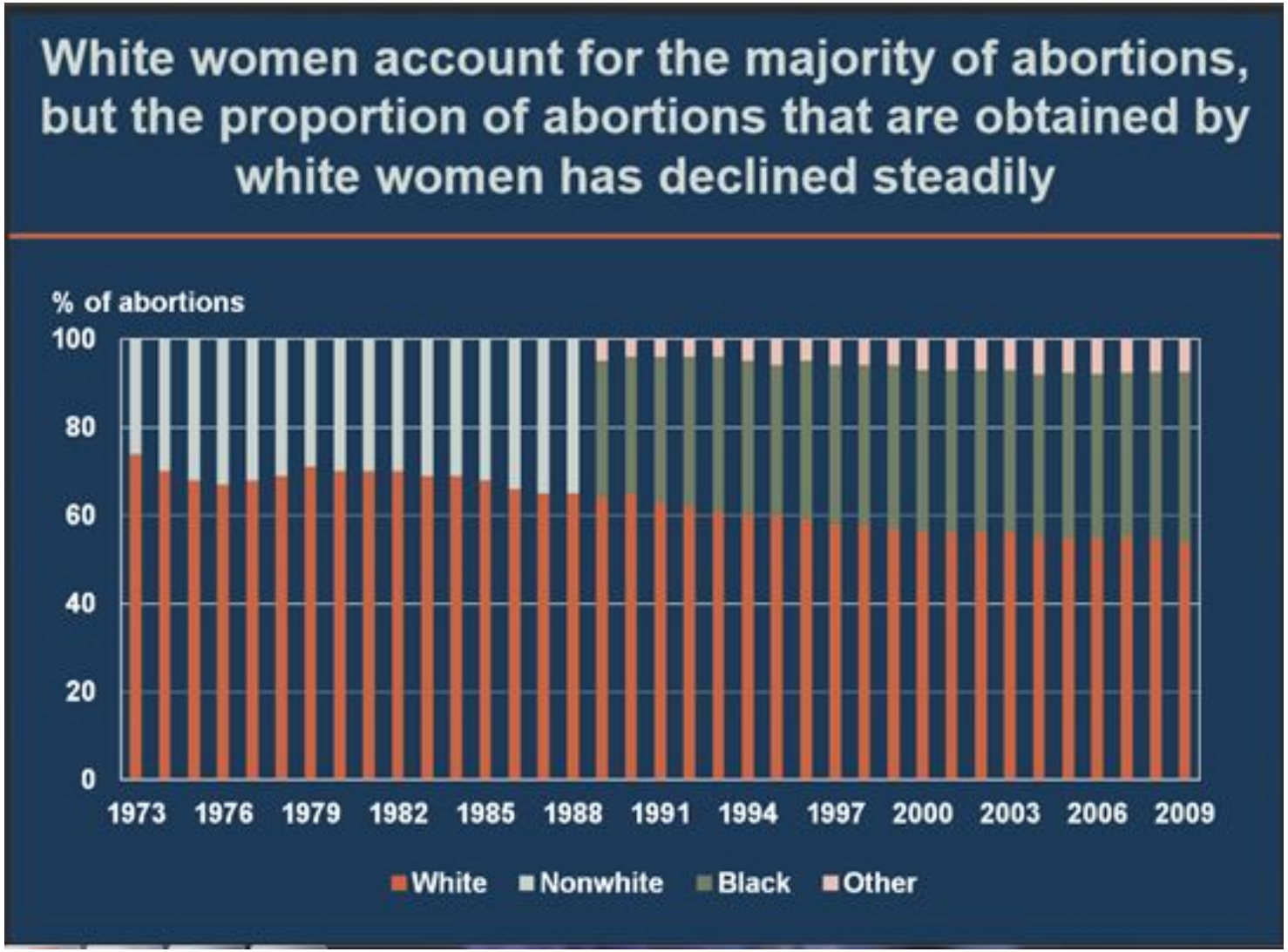
Pediatrics: Dismissing the Hill Criteria

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS
PEDIATRICS

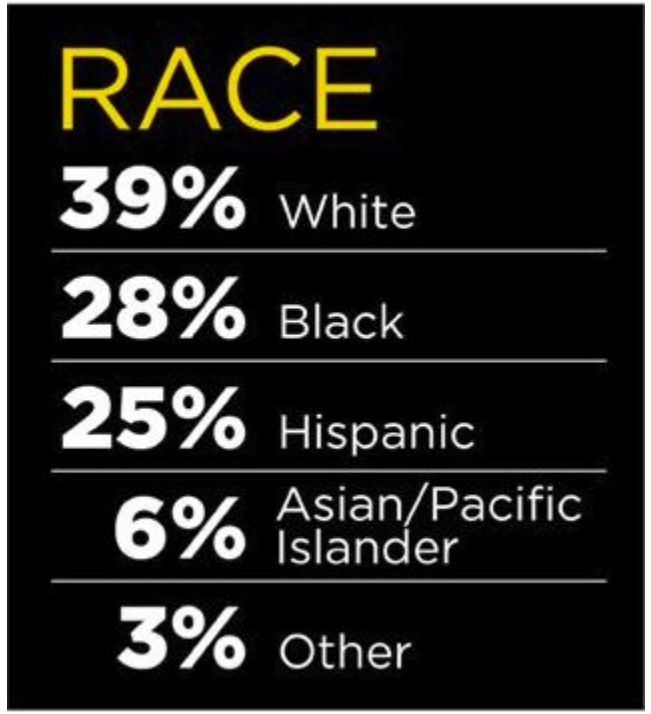
- "The recommendation to let the teen know at this time about a possible association of abortion with future preterm birth and about all the potentially dire consequences of preterm birth, has a strong flavor of a 'right to life' message that is not relevant to or supportive of the teen[1]s decision making."
- "Do you believe that a discussion about abortion risks should be part of routine health maintenance counseling for teens? Many providers would respectfully disagree. Families and teens do not need to be convinced that abortion is a negative choice. Time in counseling would likely be better spent addressing LARC (long acting reversible contraception), condom use, and emergency contraception, as well as date safety and intimate partner relationships."
- "We do not proscribe what reviewers do in terms of background work for their review (nor do other peer review journals as far as I am aware) but as stated previously, the issues you have raised have made and will continue to make for important editorial board discussions going forward. Thank you again for raising these issues for our editorial board to discuss."

The Abortion-Preterm Birth Association: An Opportunity to Reduce Infant Mortality…2014

Abortion Demographics



Guttmacher 2014



https://www.guttmacher.org/fact-sheet/induced-abortion-united-states

Estimating Impact of Abortion on VPB

- No publicly available reporting of abortion history prior to birth
- The impact can only be estimated
- Calhoun et al. reported on the cost consequences of abortion on VPB in 2007 (for 2002 data)…31.5% of VPB associated with abortion
- Estimate numbers of women giving birth with a prior abortion
  - Use known abortion rates in a population with high likelihood of future pregnancy
  - Estimate % of those women with one or multiple prior abortions
  - Assign relative risk for future VPB for one or multiple abortions
  - Calculate % of VPBs births impacted by abortion
  - Calculate subgroup impacts based on known differences in abortion rates in those communities
    - # VPBs, deaths, morbidities for very preterm births

Calhoun BC, Shadigian E, Rooney B.J Reprod Med. Cost consequences of induced abortion as an attributable risk for preterm birth and impact on informed consent. 2007 Oct;52(10):929-37.

Estimating Impact of Abortion on VPB

- 2010 a convenience sample year based on a report issued by Guttamcher examining teen pregnancy outcomes in 2010.[1]
- All estimations are based on model of Calhoun et al.[2]
- In 2010 the average age of first birth was 25.2 years. Based on this, the abortion rate for 15-24 year olds is used here as conservative representative of the group of women most likely to have an abortion before a live birth.
- Presume all induced abortions are surgical in this analysis
  - Given until 2000, no medical abortions
  - Most US abortions still surgical (69%) per Guttmacher for 2014
  - Not clearly established that medical abortion imposes less risk for a future VPB
  - 2-5% of induced medical abortions require surgical completion

1. Kost K and Henshaw S. U.S. Teenage Pregnancies, Births and Abortions, 2010: National and State Trends by Age, Race and Ethnicity. Guttmacher Institute. May 2014.
2. Calhoun BC, Shadigian E, Rooney B.J Reprod Med. Cost consequences of induced abortion as an attributable risk for preterm birth and impact on informed consent. 2007 Oct;52(10):929-37.

Estimating Impact of Abortion on VPB

- 15-24 year old experiencing a live birth with at least one prior abortion is the sum of the group rates expressed as a percentage:[5]

  204/1000 + 130/1000 = 334/1000 = 33.4%

  - Use 30% as reasonable estimate for women having a birth after an abortion
  - Accept that significant numbers of women will later have abortions which will impact preterm birth risk
- Thirty percent is the estimate for the percent of women giving birth after two or more prior abortions.[4]
- The RR of VPB after 1 abortion is 1.69[1]
- The RR of VPB after 2 or more abortions is estimated as 2.6 (average of Hardy and Martius)[2,3]
- 70% of women with a live birth had no prior abortion exposure and 30% had at least one prior induced abortion

1. Swingle HM, Colaizy TT, Zimmerman MB, Morriss FH. Abortion and the risk of subsequent preterm birth: A systematic review with meta-analyses. J Repro Med 2009;54:95-108.
2. Hardy G[1], Benjamin A, Abenhaim HA. Effect of induced abortions on early preterm births and adverse perinatal outcomes. . J Obstet Gynaecol Can. 2013 Feb;35(2):138-43
3. Martius JA. isk factors associated with preterm (<37+0 weeks) and early preterm birth (<32+0 weeks): univariate and multivariate analysis of 106 345 singleton births from the 1994 statewide perinatal survey of Bavaria. Eur J Obstet Gynecol Reprod Biol. 1998 Oct;80(2):183-9.
4. Cohen S. Guttmacher Policy Review. Spring 2007, Volume 10, Number 2
5., Jones RK et al. Trends in Abortion in the United States. Clinical Obstetrics and Gynecology. 2009;52(2):119-129

Estimating Impact of Abortion on VPB

- Of women with prior abortion annually giving birth, estimate 30% had two or more prior abortions. This represents 9% of the births (30%x30%).[4]
- The remaining women with a prior abortion had a single termination prior to birth. This number is 21% (30%-9%) of the total number of births after any abortion..
- Overall excess US RR for a VPB attributable to abortion =

$$(0.7x1.00) + (0.21x1.64) + (0.09x2.6) = 1.28$$

- Excess % of US VPBs attributable to prior abortion =

$$100\% \times (1.28-1.0/1.28) = 22\%$$

- There were 64,604 VPBs in 2010, estimate 14,212 of these VPBs (22%) are attributable to abortion
- Extrapolating Guttmacher subgroup specific 15-19 yo abortion rates, excess VPB% can be calculated
  - Hispanic rate 211/1000, white rate of 272/1000 and black rate of 400/1000.
  - Using lowest rate of exposure, Hispanic pregnancies (1x), as a baseline, white pregnancies faced a 1.29 greater likelihood of an abortion (1.29x) and black teen pregnancies a 1.9 greater likelihood of prior abortion exposure (1.9x)

Estimating Impact of Abortion on VPB

- Applying the excess % of VPB due to abortion to historical numbers of VPBs, the number of VPBs associated with AB for each subgroup can be calculated:

$$1x + 1.29x + 1.9x = 14{,}212$$

$$X = 3{,}392$$

- By race, based on best estimates and 2010 data, the annual number of abortion attributable excess VPBs:
    - Total VPBs: 14,212
    - Hispanic VPBs: 3,392 (1X)
    - White VPBs: 4,376 (1.2X)
    - Black VPBs: 6,445 (1.9X)

Counting the Cost of Abortion and VPB

- The mortality rate reported by the NVSS for 2010 for infants <32 weeks was 16.7%
- The number of deaths resulting from abortion attributable VPBs:
  - Total deaths: 2,373 (11,839 survivors)
  - Hispanic deaths: 567 (2,826 survivors)
  - White deaths: 731 (3,645 survivors)
  - Black deaths: 1076 (5,369 survivors)

National Vital Statistics Reports, Vol. 61, No. 1, August 2012

Counting the Cost

- New Cerebral Palsy Cases in 2010 VPBs Attributable to Abortion
  - Total infants with cerebral palsy: 1,657
  - Hispanic infants with cerebral palsy: 396
  - White infants with cerebral palsy: 510
  - Black infants with cerebral palsy: 752

New Significant Mental Delay (MDI < 70) Cases in 2010 VPBs Attributable to Abortion

  - Total infants with significant cognitive impairment: 3,433
  - Hispanic infants with significant cognitive impairment: 820
  - White infants with significant cognitive impairment: 1,057
  - Black infants with significant cognitive impairment: 1,557

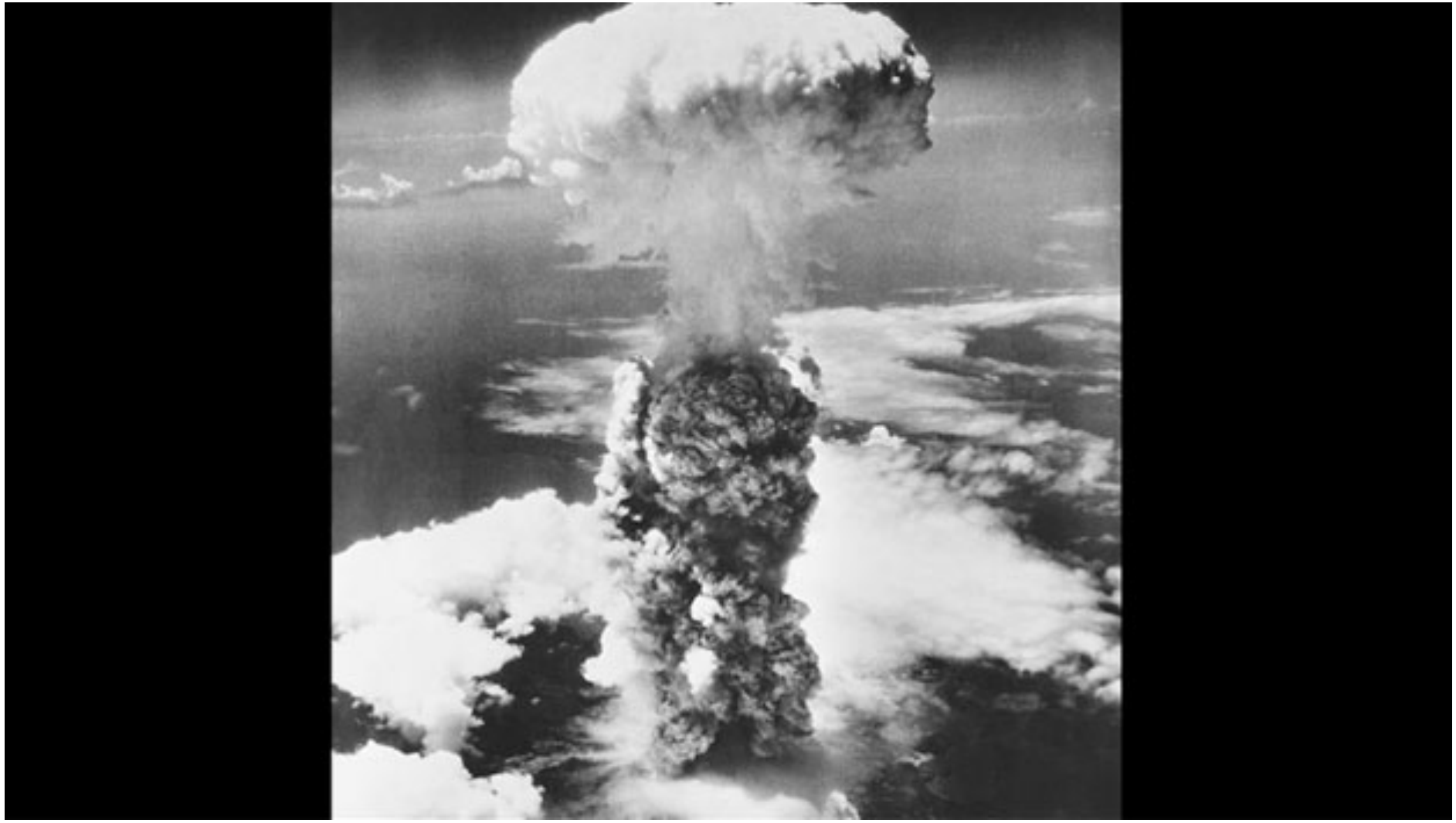
Vohr BR, Wright LL, Poole WK, McDonald SA. Neurodevelopmental outcomes of extremely low birth weight infants <32 weeks' gestation between 1993 and 1998. Pediatrics. 2005 Sep; 116(3):635-43.

Counting the Cost

- New Blindness in at Least One Eye in 2010 VPBs Attributable to Abortion
  - Total infants with blindness: 118
  - Hispanic infants with blindness: 28
  - White infants with blindness: 36
  - Black infants with blindness: 54

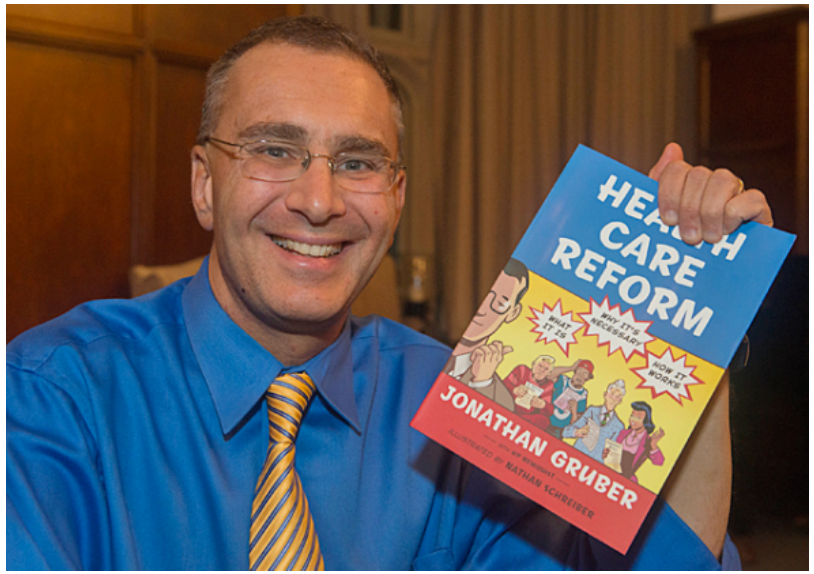
Vohr BR, Wright LL, Poole WK, McDonald SA. Neurodevelopmental outcomes of extremely low birth weight infants <32 weeks' gestation between 1993 and 1998. Pediatrics. 2005 Sep; 116(3):635-43.

Counting the Cost of VPBs Caused by Abortion Since 1973



Counting the Cost: The Gruber Calculation of Savings Resulting from Abortion

- "We find that for the marginal child not born due to increased abortion access…
  - "The odds of living in a single parent family would have been roughly 70 percent higher…
  - "The odds of living in poverty nearly 40 percent higher…
  - "The odds of welfare receipt 50 percent higher…
  - "From these results, we estimate that the legalization of abortion saved the federal government over $14 billion in welfare payments through 1994."



Gruber J, Levine P and Staiger D. Abortion Legalization and Child Living Circumstances: Who is the Marginal Child? National Bureau of Economic Research Working Paper 6034, 1997.

Counting the Financial Cost of Abortion Resulting from VPB

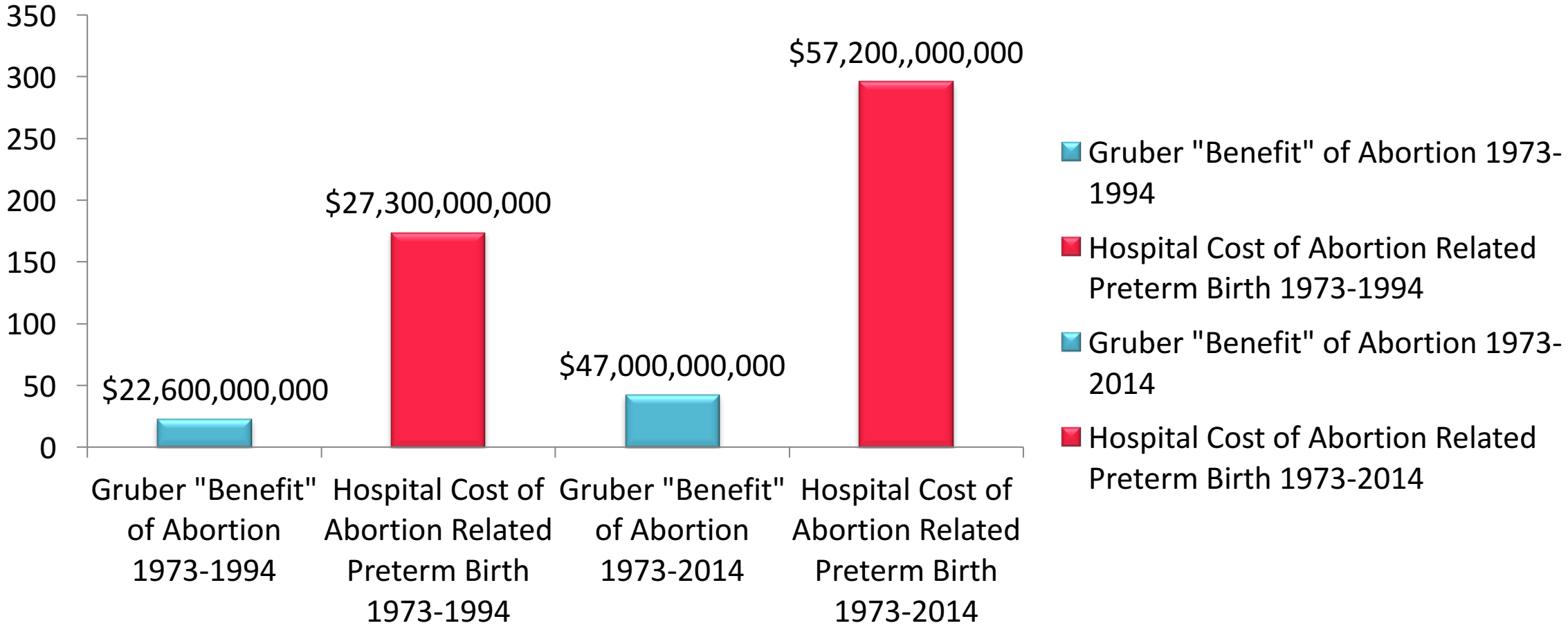
- 2010 Costs (in 2016$) for Abortion related VPB infant hospitalization:
  - Tricare 2016 DRG payments (http://www.tricare.mil/drgrates/)
- Model 1: Community (Non-Children's, Non-Residency Training Hospital) NICU Care

$981,142,551 (hospital charges) + $245,285,638 (pro fees) = **$1,226,428,188**

- Model 2: Community NICU (80% care) and Children's Hospital (20% care)

$784,914,041 (Community) + $283,053,772 (Children's Hospital) + $266,991,953 (pro fees) = **$1,334,959,766**

Counting the Cost of Abortion in VPB



Gruber J, Levine P and Staiger D. Abortion Legalization and Child Living Circumstances: Who is the Marginal Child? National Bureau of Economic Research Working Paper 6034, 1997.

What Next?

- Medical providers need to recognize their duty to create an informed consent process for women considering abortion that states the risk induced abortion, especially surgical abortion, imposes for a future VPB.
- Public health organizations need to accept their responsibility to inform the public, as they did with smoking and its association with PTB, that abortion is more highly associated and is a causal factor for a future VPB.
- Ideally women and men would be made aware of this association as a public service which would inform decisions being made prospectively regarding sexual activity and contraception
- State and federal Departments of Health and Human Services and Education need to incorporate into public school sex education curriculums the evidence that induced abortion is a mutable risk factor for a future PTB.
- The Center for Disease Control (CDC), as the stewards of public health for a nation experiencing a preterm birth epidemic, should acknowledge and educate the nation regarding the established scientific risk abortion poses for future preterm birth.

What Next?

- The March of Dimes needs to include the risk that abortion poses for a VPB as part of their efforts to reduce PTB. The mission of the March of Dimes is “We help moms have full-term pregnancies and research the problems that threaten the health of babies.”
- The American Academy of Pediatrics (AAP) Bright Futures Child Health Pathway should include counseling for adolescents that includes education regarding the risk abortion poses for a future preterm birth.
- The American Congress of Obstetricians and Gynecologists (ACOG) should follow the example of the Royal College of Medicine and recognize the abortion-VPB risk.
- Research efforts are necessary to examine the long term impact of medical abortion, and specifically mifepristone, on cervical architecture and remodeling.
- It should be a research priority to analyze the relationship between medical abortion and future PTB and VPB.
- It should be a research priority to evaluate the possible role of 17 Alpha-hydroxyprogesterone caproate (17-P) in preventing PTB when administered to mothers with a history of a prior abortion. The belief of some that a prior surgical abortion is an “immutable” risk factor for a future preterm birth may be an inaccurate assumption. It is possible that with 17-P we might be able to mitigate the risk for future preterm birth for women with an abortion history.

Recommended Sources

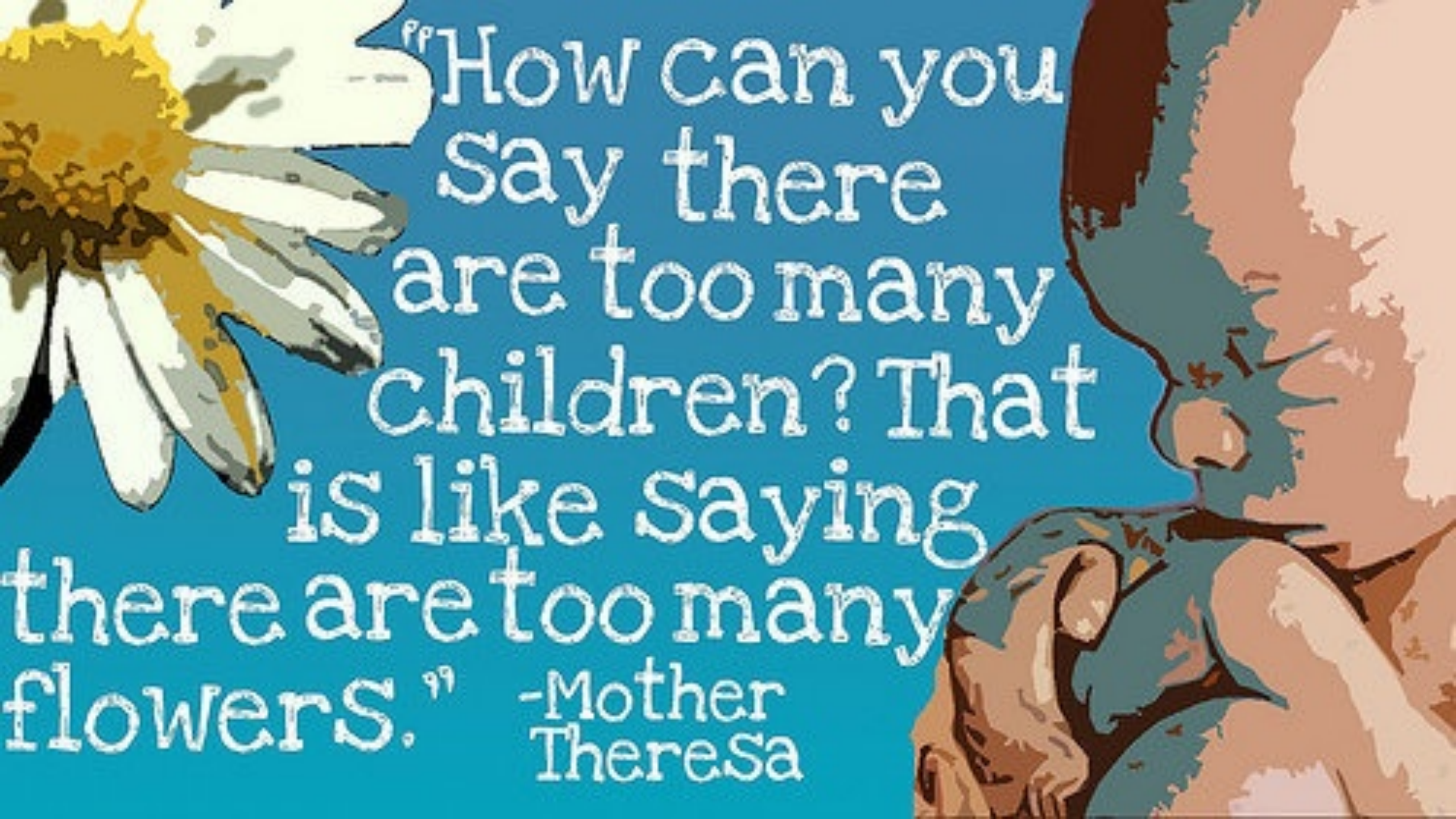
- Issues in Law and Medicine http://issuesinlawandmedicine.com/
- American Academy of Prolife Ob Gyns (AAPLOG) http://aaplog.org/
  - Annual Bullfinch Meeting
    - September 29, 30 and October 1, 2017
    - The Center for Bioethics and Human Dignity
    - Trinity International University Campus
- American College of Pediatrics https://www.acpeds.org/
- HUSH http://hushfilm.com/

"Additional risk factors for preterm birth reported in the medical literature are uterine and cervical abnormalities, smoking, alcohol consumption, illicit drug use during pregnancy and **the performance of dilation and evacuation abortions.**

"According to Chapter 10 of the medical textbook "A Clinician's Guide to Medical and Surgical Abortion," the US reports the highest rate of dilation and evacuation abortions of anywhere in the world. Dilation and evacuation abortions are generally considered to be second and third trimester procedures (used when the baby is larger and the cervix needs to be dilated wider). However, state statistics show thousands of first trimester dilation and evacuations reported in Maine, Pennsylvania and other states during the past two decades."

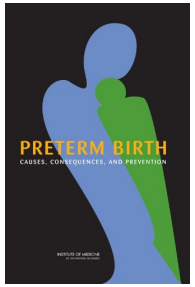
https://worcestermag.com/2014/05/22/epidemic-preterm-births/23540 Last accessed April 5, 2017.

“And that’s as it should Be”
If Abortions Were Bananas…


"How can you say there are too many children? That is like saying there are too many flowers."
-Mother Theresa

IOM Report on Preterm Birth: Causes, Consequences, and Prevention

- "The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine."
- "This study was supported by Contract No. N01-OD-4-2139, Task Order No. 145 between the National Academy of Sciences and the National Institute for Child Health and Human Development, Centers for Disease Control and Prevention, Health Resources and Services Administration, Environmental Protection Agency, and NIH Office of Research on Women's Health."



Institute of Medicine, National Academy of Science, Preterm Birth: Causes, Consequences, and Prevention, National Academies Press, Washington DC, 2006.

Zhou: Risk Factors for PPROM in Chinese Women from Urban Cities.

History of adverse pregnancy outcomes	34-36 Weeks	P Value	28-33 Weeks	P Value	< 28 Weeks	P Value
1 induced abortion	1.03 (0.93–1.16)	0.504	1.08 (0.93–1.26)	0.323	1.65 (1.05–2.57)	0.029
2 induced abortions	1.17 (1.07–1.29)	0.221	1.21 (1.01–1.33)	0.163	2.66 (1.78–3.96)	< 0.001
≥ 3 induced abortions	1.27 (1.11–1.47)	0.051	1.37 (1.12–1.67)	0.002	2.75 (1.66–4.56)	< 0.001

Zhou Q et al. Risk factors for preterm premature rupture of membranes in Chinese women from urban cities. Int J Gynaecol Obstet. 2014 Dec;127(3):254-9.

Zhou: Risk Factors for PPROM (< 37 Weeks) in Chinese Women from Urban Cities.

- Population-based, prospective study was undertaken in 14 cities in China 2011-2012. Women recruited at their first prenatal-care visit
- 112,439 women included in analyses, 3077 (2.7%) had PPROM
- Did not discriminate between medical and surgical abortion but
- "A possible explanation for the association could be a tendency for increased systemic inflammation and stimulation of the infection pathway in women who have had an induced abortion."
- Likely at least half of Chinese abortions now medical

1. Zhou Q et al. Risk factors for preterm premature rupture of membranes in Chinese women from urban cities. Int J Gynaecol Obstet. 2014 Dec;127(3):254-9.
2. Xia W[1], She S, Lam TH. Medical versus surgical abortion methods for pregnancy in China: a cost-minimization analysis. Gynecol Obstet Invest. 2011;72(4):257-63.