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SIGNATURE Articles

Evidence on: Advanced Maternal Age

People who are pregnant at age 35 or older are often referred to as "advanced maternal age." They may be told that they should have a labor induction or C-section at 39 weeks, solely because of their age.

In this Evidence Based Birth® article, we will cover how many people give birth over the age of 35, the risks of pregnancy over the age of 35, and the history, guidelines, and research on induction and planned Cesarean for advanced maternal age.

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Why is this important?

Over the past four decades, there has been a dramatic increase in the number of women having their babies at age 35 and older. In the U.S., this increase started in the mid-1970s and has continued to steadily rise over time. Today, 15% of birthing people are 35 and older, up from 11% in 2002 and 8% in 1990 (Mathews and Hamilton 2014; Martin, Hamilton et al. 2003; Martin, Hamilton et al. 2015).

There has also been an increase in the number of *first* babies born to women who are 35 or older. These increases have been seen across all ethnic groups in the U.S. (Mathews and Hamilton 2014).

Today, 10% of babies in the U.S. were born to first-time mothers age 35 or older. The average age at first birth is now 26 years of age—a record high for the U.S.! Meanwhile, in 2013, both the teen birth rate and the birth rate for women in their twenties hit record lows (Martin, Hamilton et al. 2015).

Figure 1 (Page 16) shows the Increase in Pregnancy Rates among People Age 30 and Older

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Why is parenthood being delayed?

The trend to delay parenthood is happening all around the world. The availability of birth control is partly responsible for women postponing parenthood. However, birth rates in younger women have also gone down in countries that do not use birth control, so we can't isolate birth control as the main reason. It's thought that, worldwide, there are other social and cultural factors that play a bigger role than contraception in the increasing age of pregnant people (Mills, Rindfuss et al. 2011).

Reasons people delay pregnancy and parenthood include:

- Women are reaching higher educational levels (Mills, Rindfuss et al. 2011)
- More women in male-dominated fields that are not as understanding or supportive of motherhood (Mills, Rindfuss et al. 2011)
- Cultural and value shifts have led towards more women not feeling "ready" to have a child yet (Cooke, Mills et al. 2010)
- Lack of childcare, low benefit levels, and workplace policies that signal to women that they cannot be both a wage earner and a mother (Mills, Rindfuss et al. 2011)
- Divorce, going through multiple partners before settling down, and living together before marriage leads some people to delay parenthood (Mills, Rindfuss et al. 2011)
- Economic or housing uncertainty, unemployment, temporary work, or unstable labor markets (Mills, Rindfuss et al. 2011)

Fertility treatments are another reason that people are getting pregnant later in life.

Parents, doctors, and research scientists have been working together to overcome infertility since the late 1880s. As scientists got closer to success, a 1969 Harris poll showed that the majority of Americans believed in vitro fertilization (IVF) was against God's will.

But by 1978, the year of the first "test tube baby," another Harris poll found that the majority of Americans supported IVF and would be willing to try it under the right circumstances. And by 2004, more than half a million babies had been born by IVF.

So in summary, a combination of fertility treatment options, birth control options, and social and cultural factors have all come together to lead a rise in the rate of women who have babies at age 35 or older.

Figure 2 (Page 16) shows Why Women are Delaying Parenthood.

Terms

Advanced maternal age is sometimes defined as being 35 or older, and sometimes as being 40 or older. Since the 1950s and possibly earlier, the ages of 35 and 40 were used by researchers to label women as being *advanced maternal age* (AMA).

In addition to the term AMA, people who are 35 or older and pregnant for the first time have been referred to as an *elderly primigravida* or *elderly primipara*. Primigravida means a person who is "pregnant for the first time." Primipara means a person who is "giving birth for the first time." Nulliparous is another term that you may see, and this refers to a person who has not yet carried a pregnancy beyond 20 weeks.

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Because the terms "elderly" and "advanced age" have negative connotations and (understandably) may be seen as insulting to some people, for the rest of this article we will simply refer to pregnant and birthing people in this category as being "35 or older".

Chances of getting pregnant at 35 or older

As a female ages, her fertility—the chance she will get pregnant—is reduced. On average, this decline begins slowly in the early thirties and speeds up in the late thirties and forties. When a female is born, she is born with all of the eggs she will ever have. It's thought the decline in fertility with age is due to a decrease in the number of eggs remaining and a decrease in the quality of eggs (Rowe 2006).

In 1986, researchers carried out a classic study to find out how likely it is for people to get pregnant as they age. They looked at people who were receiving artificial insemination with donor sperm. This study design was important because some people argue that lowered fertility is related to a decrease in the amount of sex people have as they age. However, with this study, there is no way that frequency of sex could explain findings, since the male partners were sterile (Schwartz and Mayaux 1982).

Participants received artificial insemination once a month for up to one year, or until they became pregnant. Most (74%) of those under the age of 31 were pregnant within one year, but that number went down to 62% of people between 31 and 34, and 54% of people aged 35 and older.

Male fertility declines with age as well. Researchers have found strong evidence that as men age, they can expect a decline in sperm counts, semen volume, sperm motility, and the number of normal sperm. Older females with older male partners who are trying to get pregnant may experience the combination of female and male age-related fertility decline (Johnson, Dunleavy et al. 2015).

What are the risks of being pregnant at an older age?

Genetic Risks

Certain genetic risks are also more common in pregnancies of older pregnant people. One risk is that the embryo will have Down syndrome, which happens when there is an extra copy of Chromosome 21. The rate of having a baby with Down syndrome increases with the mother's age—this has been seen in large studies of women, as well as in studies with embryos conceived with IVF (Haddow, Palomaki et al. 2009).

These are the rates of an embryo having Down syndrome at 10 weeks of pregnancy:

- 1 in 1,064 at age 25
- 1 in 686 at age 30
- 1 in 240 at age 35
- 1 in 53 at age 40
- 1 in 19 at age 45

These are the rates of having a baby with Down syndrome at term:

- 1 in 1,340 at age 25
- 1 in 939 at age 30
- 1 in 353 at age 35
- 1 in 85 at age 40
- 1 in 35 at age 45

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The rates of having baby with Down syndrome at term are not as high as the chances at 10 weeks, mostly because these pregnancies have higher rates of miscarriage and stillbirth and won't all reach the term period.

Risk of Miscarriage

The rate of spontaneous miscarriage climbs gradually with age, from a 9% miscarriage rate among 22-year olds, to ~18% among 30 year olds, ~20% at age 35, ~40% at age 40, and 84% at age 48 (Nybo Andersen, Wohlfahrt et al. 2000).

High rates of miscarriage in older females are more related to egg quality than the physical ability to stay pregnant. We know this because older females who use donor eggs from younger females do not have such high rates of miscarriage.

Risk of Stillbirth

There are two ways to find out the risk of stillbirth in people who are 35 or older. One way is to look at the *absolute risk*; this is the actual rate of stillbirth among women of a certain age group. This means you can say something like "Among women over 35 years, X number of babies out of every 1,000 births are stillborn."

The other way is to look at the *relative risk*. This means that you compare the risk of stillbirth among older women to the risk experienced by younger women. This approach will give us a result like, "Compared to people in their twenties, those over 35 are X% more likely to experience stillbirth."

With relative risk, if a risk is "50% higher," this does not mean that an older woman has a 50% chance (1 in 2 chance) of having a stillbirth. For example, if someone who is 20-24 years old has a 0.65 out of 1,000 risk of stillbirth at 38-39 weeks, and someone who is 35 years old has a risk of 1.1 per 1,000, then that is a roughly 50% increase in risk.

In 2008, Huang et al published a systematic review of all the studies from the previous ten years that looked at the risk of stillbirth with increasing age. They looked at 37 studies, and the overall quality of these studies was good. Participants in these studies gave birth any time between the years 1959 to 2003, so some of the studies took place a long time ago, and some were more recent. Most of the studies were very large, with an average of 78,000 births per study (Huang, Sauve et al. 2008).

The results?

In Huang's systematic review, researchers in 24 out of 31 studies found that older women are more likely to have a stillbirth than younger women.

When they only looked at studies from developed countries, the risk of having a stillbirth was about 1.2 to 2.23 times higher among older women when compared to younger women.

The increased risk of stillbirth with age was not due to other known risk factors for stillbirth, including smoking, medical problems, prenatal care, body mass index, education level, and whether this was a woman's first baby or not.

Limitations of the Huang review

Usually, the authors of these types of reviews try to combine the data from many different studies to

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get a single number describing the increase in risk. However, Huang et al. were unable to combine the results, because the way the studies were carried out varied so widely.

The studies inside the Huang review differed in many important ways, such as which pregnant people they included (healthy or high-risk), how they defined older maternal age (35 years, 40 years, or another number), how they took into account other risk factors for stillbirth (such as illnesses or high body mass index), and even how they defined stillbirth. In addition, many of the studies included data that were over 20 years old, meaning that the study populations and the care they received may have been very different than how women are cared for today.

Also, 29 of the 31 studies in the Huang et al. review picked an arbitrary age (usually 35 or 40 years) and compared the stillbirth rates between two groups, either above or below the cut-off point. It would have been better if they had also reported how the risk increases year by year so that we could see the trajectory. The results from Huang et al.'s review, lumped into one of two groups, make it seem like there is a drastic increase in risk at age 35. However, in fact, the risk likely increases gradually each year.

In spite of the fact that each of the studies was so different and took place in such different time periods, Huang et al. found that, overall, the study results were consistent in that almost every one found an increased risk of stillbirth in older mothers.

But what is the actual risk of stillbirth in pregnant people who are 35 or older?

So we know that the risk of stillbirth is higher in people who are 35 or older. But what are the actual numbers? If a woman is 35 or older, what is her chance of having a stillbirth?

In doing the research for this article, my co-authors and I systematically searched PubMed to look for research studies that were: 1) published in the last 20 years, 2) took place in high-income countries, 3) controlled for other risk factors, and 4) gave the actual rates of stillbirth in women age 35 or older. The reason we chose these factors was because we wanted to look at research that would best apply to people in the U.S., Canada, the U.K., and Australia, who are the most frequent readers of Evidence Based Birth®.

In 2000, Jolly et al. looked at the medical records of 358,120 women who gave birth at 18 hospitals in the United Kingdom between the years 1988 and 1997 (Jolly, Sebire et al. 2000). The authors controlled for age, body mass index, ethnic group, medical problems, and whether or not the mother was giving birth to her first child. However, the authors did not specify their definition of stillbirth. This means that the babies could have been stillborn starting at any gestational age after 20 to 28 weeks. In the United States, stillbirths are typically defined as pregnancy losses that take place at 24 weeks or later; before 24 weeks the pregnancy loss is typically called a miscarriage.

The researchers in the United Kingdom found:

- Women aged 18 to 34 had a stillbirth rate of 4.7 per 1,000, or 0.47%
- Women between 35 and 40 years old had a stillbirth rate of 6.1 per 1,000, or 0.61%
- Women 40 and older had a stillbirth rate of 8.1 per 1,000, or 0.81%

In another study published in 2004, researchers looked at rates of perinatal death in different maternal age groups in Sweden (Jacobsson, Ladfors et al. 2004). *Perinatal death* was defined as stillbirth or newborn death up until 28 days of age. They included 909,228 births that occurred between 1987 and

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2001. The authors compared the rates of perinatal death among infants born to women aged 20 to 29 and women older than 40. Unfortunately, they did not include people ages 30-39 in their study.

In this study, the authors made sure to take into account whether the woman was having her first pregnancy, as well as marital status, congenital defects, smoking, maternal disease, and multiple pregnancies.

The researchers in Sweden found:

- Women in their 20s had a perinatal death rate of 6.0 per 1,000, or 0.6%.
- Women aged 40 to 44 had a perinatal death rate of 10.8 per 1,000, or 1.08%.
- Women aged 45 and older had a perinatal death rate of 16.6 per 1,000, or 1.66%

Overall, the results of these two studies in the United Kingdom and Sweden were pretty similar. However, the U.K. study looked only at stillbirth rates, while the Sweden study looked at perinatal death rates (combined stillbirth plus newborn death rates), which explains why the death rates in Sweden look slightly higher.

Do the risks increase for EVERYONE, or just for people giving birth for the first time at or past 35?

In 2006, Reddy et al. used U.S. birth certificate data from 2001 to 2002 to look at maternal age, stillbirth rates, and whether or not the risk was higher for people having their first baby. They included information from 5.5 million pregnancies in which women were pregnant with a single baby with no birth defects (Reddy, Ko et al. 2006).

As you can see in the table below, the rates of stillbirth are higher for everyone who is having their first baby compared to subsequent babies, no matter the mother's age. But the rates are even higher in first-time moms who are also 35 or older. Also, people who are having a baby at the age of 40 or older and have given birth before, have a lower stillbirth risk than those giving birth for the first time who are under the age of 35.

Table 1 (Page 18) shows Stillbirth rates for people of different ages giving birth for the first time.

For pregnant people 35 or older, does the risk of stillbirth increase as they get closer to their due date?

Many women 35 or older are told they should be induced as they get closer to their due dates due to the risk of stillbirth. Because of this, it's important for us to know the rates of stillbirth towards the end of pregnancy—not just the overall rate of stillbirth.

Our team found two studies that looked at this question:

In 2006, Reddy et al. looked at gestational age and risk of stillbirth among pregnant people in the U.S. This was the same study listed above, where they looked at 5.5 million birth certificates from singleton pregnancies without birth defects.

When women of all ages were grouped together, the highest risk of stillbirth occurred around 41 weeks, followed by 20-23 weeks. But when they separated women by age, women 35 and older had the largest increase in risk of stillbirth starting at around 39 weeks.

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Between 39 and 40 weeks, about 1 out of 1,000 women younger than 35 had a stillbirth, compared to 1.4 out of women age 35 to 39, and 2 per 1,000 out of women 40 and older.

The figure below shows the risk of stillbirth going up with gestational age among 3 groups: people less than 35, those aged 35 to 39, and those 40 or older. You can see that for pregnant people 40 and older, the largest jump in risk happened between 38 and 39 weeks.

Figure 3 (Page 17) shows details on USA's Gestational age and risk of Stillbirth (2001-2002)

In 2010, Haavaldsen et al. published a paper looking at the risk of stillbirth by gestational age among younger and older women (Haavaldsen, Sarfraz et al. 2010). The researchers looked at more than 2.1 million pregnancies in the Medical Birth Registry of Norway between the years 1967 and 2006. To be included in the study, people had to give birth to a child at 16 weeks gestation or later. They found that, overall, people 35 and older had higher rates of stillbirth throughout pregnancy as compared to younger people, but the risk was higher at 40, 41, 42, and 43 weeks. The table below shows the stillbirth rates from the entire time period, including the 1960s and 1970s. Keep reading below this table to learn the more current stillbirth rates!

Table 2 (Page 18) shows the Number of stillbirths per 1,000 ongoing pregnancies, using data from years 1967 to 2006

However, you have to remember that this table included women who gave birth as long as 30 to 50 years ago.

When the authors broke down the data into two separate time periods, they found very different results! Haavaldsen et al. divided their data set into two sections: 1) studies from 1967 to 1986 and 2) studies from 1987 and 2006. In the more recent studies, there is still a higher relative risk of stillbirth at the end of pregnancy among people age 35 and older, but the risk is much, much lower than it used to be. For example, it used to be that the risk of stillbirth at 42 weeks in women 40 years and older was 12.37 per 1,000… and now it's 2.64 per 1,000.

Table 3 (Page 19) shows the Number of stillbirths per 1,000 ongoing pregnancies, using data from years 1987 to 2006

The takeaway point from this study is that it's really important to have current information about stillbirth rates. So much about maternity care has changed in the past few decades! Old data do not give us an accurate picture of the risks of being pregnant at age 35 or older.

But what if someone is healthy and over the age of 35? Do they still have a higher risk of stillbirth?

Reddy et al. (2006) also looked at this question in their study of 5.5 million U.S. birth certificates. When they compared healthy people (no diabetes, no high blood pressure, no preeclampsia, no kidney/heart/lung disease) to the overall sample, they found that the healthy people had a lower risk of stillbirth, but the risk still went up with age.

In other words, being healthy lowers your risk of stillbirth, but if you are 35 or older, your risk as a healthy older woman is still higher when compared to a healthy younger woman.

Figure 4 (Page 17) shows the Overall sample vs. healthy people only

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Why does the risk of stillbirth increase with maternal age?

Researchers don't know why there is an increased risk of stillbirth in pregnant people as they age. Some have guessed that maybe older women are at greater risk of uteroplacental insufficiency, caused by aging blood vessels in the uterus (Huang et al. 2008). However, there is not good evidence for this theory. If placental problems were responsible for the increase in stillbirths, we would also expect to see higher rates of intrauterine growth restriction (IUGR) in older women. But that's not the case!

After controlling for other risk factors, researchers have found that IUGR happens at the same rate in younger mothers as it does in mothers 35 and older (Miller 2005). Mothers 35 and older had slightly higher rates of fetal distress (5.7% vs. 4.1%) and Cesarean for fetal distress (4.0% vs. 2.4%), but there were no significant differences in the other clinical markers of an aging placenta (stillbirth, IUGR, low amniotic fluid, meconium staining, or low Apgar score).

In another study of babies who were stillborn, there was no difference in the rate of growth restriction between those born to mothers over 35 and those born to younger people (Froen, Gardosi et al. 2004).

Yet another study done in Lebanon with women aged 40 and older found that two-thirds of the stillborn babies did not have any risk factors besides maternal age (Seoud, Nassar et al. 2002). This further undermines the uteroplacental insufficiency hypothesis.

Some think that the increased risk of stillbirth may be related to other health problems that are more likely to occur with aging, such as high blood pressure, gestational diabetes, and other chronic medical problems. However, as we already talked about with the Huang et al. (2008) study, it looks like these problems are not the cause of the increased risk of stillbirth—because even when we remove these risk factors, healthy people 35 and older still have an increased risk of stillbirth.

Again, at this time, the reason for the increased risk of stillbirth in these families is unknown.

Are there any other risks?

Besides stillbirth, researchers have found small increases in a number of other childbirth risks in people 35 and older. One large study using data from 385,120 singleton pregnancies in the United Kingdom (between the years 1988 and 1997) compared the rates of pregnancy complications between women aged 18 to 34, 35 to 40, and over 40 (Jolly et al. 2000). Most risks were found to increase with age. The one piece of good news in here is that breastfeeding rates are higher in people 35 and older than in the younger group.

Table 4 (Page 19) compares the risk of pregnancy and birth complications in pregnant people of various age groups.

Another large, high-quality study used data from the Swedish Medical Birth Register collected between 1987 and 2001 (Jacobsson et al. 2004). In this study, the authors looked at 909,228 births and compared outcomes between groups of women aged 20 to 29, 40 to 44, and 45 and older. They did not look at the 35-to-39 age group. This study found similar results as the Jolly study (see Table 4).

Importantly, Jacobsson et al. 2004 found that the risk of the mother dying (maternal mortality) increased with age. During the 15 years of the study, there were 21 maternal deaths in the more than 900,000 births. When maternal death rates were separated out by age group, they found a maternal death rate of 1.4 per 100,000 for women aged 20 to 29, 22 per 100,000 for women aged 40 to 44, and

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166 per 100,000 for women 45 and older. Unfortunately, the researchers did not offer any explanation or describe the causes of these deaths, which primarily occurred in the 1980s-1990s.

In summary, there are small increases in risk of many health problems as a pregnant person ages, even after controlling for other risk factors that increase with age. Some differences are fairly small and can only be seen with large sample sizes. Other risks, such as the risk of Cesarean, increase more dramatically.

Important Note: Care provider perception is a variable here that is hard to measure. With interventions like Cesarean, it's possible that perception can be a self-fulfilling prophecy. If you'll recall, we found with "suspected big baby" that the #1 risk was not the big baby itself, but the care provider's *perception* of a big baby. With people who are 35 or older, the care provider's perception that a person is "high risk" because they are older might lead to a higher chance of them having an intervention, regardless of the actual need for the intervention. It is not always clear whether interventions occur as a result of an actual health risk or the perception of risk.

How many pregnant people 35 or older are induced or have Cesareans?

In reviewing the Centers for Disease Controls Vital Statistics, the only way to find information on how many people have inductions and Cesareans by age group is to run statistics through the VitalStats website. We took the time to find these numbers from 2014 for you!

Induction rates do not seem to increase with age when you look at birth certificate data. The overall induction rates are: 23.6% (people age 25 to 29), 21.7% (age 30 to 34), 20.7% (age 35 to 39), 21.8% (age 40 to 44), and 20.7% (45 and older).

Cesarean rates, however, climb steadily with age. Cesarean rates are 29.5% (age 25 to 29), 33.0% (age 30 to 34), 38.5% (age 35 to 39), 45.0% (age 40 to 44), and 57.1% (age 45 and older).

What is the evidence for electively inducing labor in people who are 35 or older?

The 35/39 Trial

We now have brand new information about whether or not inducing labor early results in better health for mothers who are 35 and older. A new randomized clinical trial was recently published in the New England Journal of Medicine (Walker, Bugg et al. 2016).

During the years 2012 to 2015, about 600 women from 42 hospitals in the United Kingdom were randomly assigned (like flipping a coin) to either inducing labor between 39 weeks 0 days and 39 weeks 6 days, or not inducing at 39 weeks and instead waiting up until 41-42 weeks before being induced.

Women could be in the study if they would be 35 years or older on their due date, and were pregnant with a single baby in head-first position. Women were not included if they had gestational diabetes or were pregnant with the help of in vitro fertilization from donor eggs.

The group that that was not induced in the 39th week did not receive any special fetal testing or monitoring before 42 weeks, unless it was the usual practice of the individual physician. The researchers did not tell the doctors what type of induction methods women should receive—any inductions were done per hospital protocol. Most hospitals tended to use prostaglandin gel to ripen the cervix, followed by Pitocin and artificial breaking of the waters.

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Most of the women in the induction group (78%) were actually induced, while only about half the women in the not-induced at 39 weeks group went into labor on their own (46%), while the other half (49%) were induced. The most common reasons for induction in the waiting-for-labor group included: reaching 41 weeks, the water breaking before labor at term, reduced fetal movements, and request of the mother.

The results? There was no difference in Cesarean rates between the induction at 39 weeks group and the not-induced-at-39-weeks groups. The Cesarean rates were about 32-33% in both groups, and the rates went up with the mother's age. There was no difference in any complication rates for mothers, including placental abruption, cord prolapse, postpartum hemorrhage, shoulder dystocia, need for blood transfusion, or infections. There were also no differences in the mothers' birth satisfaction scores.

As far as the results for babies, there were no deaths or stillbirths in either group. There were also no differences between groups in average birth weight, Apgar scores, umbilical cord pH levels, NICU admissions, low blood oxygen, or need for interventions such as tube feeding or oxygen.

Overall, this study was simply too small to tell if induction can decrease the risk of stillbirth or newborn death. There were 600 participants, and zero deaths. The authors state that if another study was done to look at this issue, it would need to be extremely large.

You can learn more about the 35/39 trial at their website here (http://bit.ly/2dVHchf), and you can download a PowerPoint presentation about their study here (http://bit.ly/2pqYDMi).

More info about elective induction in people 35 and older

In 2006, researchers published a chart review study about induction for people 35 or older (Nicholson, Kellar et al. 2006). This study looked at the birth records of 15,036 low-risk women who gave birth at the Hospital of the University of Pennsylvania between 1995 and 2003. All of the women in the study were pregnant at term with a single baby in head-first position. They were considered good candidates for a vaginal birth and did not have prior Cesareans.

The authors were interested in figuring out the "best" time to give birth for people 35 or older. For births that occurred at each gestational age, they figured out the rates of NICU admission, Cesarean, third- or fourth-degree tear, and low 5-minute Apgar score.

The gestational age at which all of these risks were lowest was between 38 weeks and 5 days and 39 weeks and 6 days, leading the authors to conclude that this is the best time window for birth to occur in people 35 or older. The authors did not control for other known risk factors for Cesarean section or NICU admission, and they stated that the accuracy of their database could not be validated.

In a different paper published by the Royal College of Obstetricians and Gynecologists (or RCOG, the United Kingdom's equivalent of the American College of Obstetricians and Gynecologists, or ACOG), they stated that it is possible induction may decrease the risk of stillbirth in older women. Using data from the United Kingdom, the authors estimated that if all pregnant people in the U.K. age 40 and older were induced at 39 weeks instead of 41 weeks, it would prevent 17 stillbirths per year. It would take 9,350 inductions at 39 weeks to prevent one stillbirth, and 4,750 inductions at 40 weeks to prevent seven stillbirths. (RCOG, 2013).

Waiting for labor to start on its own has its benefits (see our Due Dates article here), but research has also shown that if people choose to wait, and then end up needing an induction for going post-term (≥42

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weeks), they may have a greater risk of Cesarean. However, the 35/39 trial authors found that waiting for labor up until 41 weeks did not increase the risk of Cesarean.

In 2010, Roos et al. used the Swedish Medical Birth Register to look at more than 1.1 million births to people who had single babies at term or post-term during the years 1992 to 2006.

People who had elective Cesareans or elective inductions before 42 weeks were not included in the study (Roos, Sahlin et al. 2010). The researchers looked at what factors increased the risk of having a pregnancy go past 42 weeks, as well as the risk factors for failed induction.

They found that women 35 or older were more likely to experience post-term pregnancy—their rates of post-term pregnancy were 10.4%, compared to 7.8% in women age 20 to 24. Rates of post-term pregnancy were also higher in first-time mothers.

Being 35 or older was also a risk factor for failed induction, with maternal age ≥35 more than doubling the risk of a Cesarean if a woman was induced for post-term pregnancy. The "doubling" refers to an increase in relative risk. Unfortunately, the researchers did not report the actual or absolute risk numbers for the increase in Cesareans.

Is there any other evidence?

For more information on induction vs. waiting for labor to start on its own in people of all ages, see the Evidence Based Birth® article all about due dates here.

Elective Cesarean

There are no studies that answer the question of whether a planned Cesarean birth is better or not for people 35 or older.

In an ACOG (American College of Obstetricians and Gynecologists) committee opinion about elective Cesareans, the authors suggest that any short-term benefits from an elective Cesarean may actually lessen for women who are older or are heavy/overweight (2013).

For example, there is typically a lower risk of hemorrhage and fewer surgical complications with an elective Cesarean compared to unplanned Cesarean, and fewer cases of urinary incontinence. However, the author thinks that these benefits may decrease with advancing maternal age and increased body mass index. If this is true, it might alter the risk/benefit calculation of this decision for older women.

To read more about the pros and cons of Cesarean, I recommend the Childbirth Connection resources here (http://bit.ly/1lHcXai).

Out-of-Hospital Birth

The only study I could find that specifically looked at out-of-hospital birth in people 35 and older was within the Birthplace in England study. The Birthplace in England study was a large study looking at the birth outcomes of nearly 80,000 people who were at least 37 weeks along, planned a vaginal birth, and received care from a midwife during labor during the years 2008 to 2010. The researchers broke down that group further to compare outcomes for "older" people giving birth outside of a hospital setting.

For this particular analysis, researchers looked at about 63,000 people out of the total group—participants who were "low risk" and between 37 weeks 0 days and 42 weeks and 0 days. Out of these,

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there were 12,078 people who were 35 or older, of whom 4,581 planned a birth at home, 1,923 planned a birth in a freestanding birth center, and 2,506 planned a birth in an "alongside midwifery unit" (midwifery birth center located in the hospital, but separate from labor and delivery). The rest planned a birth in a traditional hospital labor and delivery unit.

To watch a video tour of an alongside midwifery unit in the United Kingdom, click here (http://bit.ly/2pTBN2E).

All of the midwifery-led locations (home, birth center, and alongside midwifery units) were combined and compared as a whole to the traditional hospital labor and delivery (obstetric) environment. For the purposes of this section, I will refer to that home, birth center, and alongside midwifery unit group as "midwifery-led," since that is common to the three groups.

The researchers found that older women had similar newborn outcomes whether they gave birth in a midwifery-led setting or inside a hospital labor and delivery unit, while women giving birth in a midwifery-led setting outside the traditional labor and delivery (obstetric) unit had fewer interventions (Li et al. 2014). That included lower rates of augmentation, vacuum, or forceps, and fewer adverse outcomes requiring an obstetrician's intervention, such as unplanned Cesareans and 3rd or 4th degree tears.

As an example, 42% of first-time mothers age 35 to 39 had Pitocin augmentation in a planned hospital birth, while only 23% of first-time mothers the same age had Pitocin in a planned midwifery-led setting. Similarly, only 5% of women 40 or older had a 3rd or 4th degree tear in a midwifery-led setting, compared to 11% of similarly aged women in an obstetric unit.

Table 5 (Page 20) shows Rates in first time "low risk" mothers who gave birth in England in traditional obstetric units (hospitals) versus midwifery-led settings (including home birth, freestanding birth centers, and "alongside" midwifery units)

There were more perinatal outcome events in the 40+ age group who gave birth in a hospital labor and delivery unit, which were probably related to higher rates of NICU admissions in this group.

What about fetal testing?

Because of fears about stillbirth, many providers recommend that people 35 years and older have fetal monitoring or testing towards the end of pregnancy, in the hopes of identifying any babies that are at risk for stillbirth.

To our knowledge, only one study has specifically looked at fetal testing or monitoring at the end of pregnancy for women who are 35 and older. In their chart review, Fox et al. (2013) compared 1,541 women who were 35 and older to 2,928 women who were younger than 35. The standard in their practice for women 35 and older is to perform the ultrasound part of a biophysical profile (BPP) test weekly, starting at 36 weeks, and to "deliver" the baby no later than 41 weeks (Fox, Rebarber et al. 2013).

The *Biophysical profile* is a 5-part test that was first used in the year 1980. It consists of a nonstress test and an ultrasound that looks at large fetal movements, fetal muscle tone, fetal breathing, and amniotic fluid volume. The BPP is scored out of 10 points, with 2 points awarded for presence of each feature, and 0 for the absence. A score of 8 or 10 is normal, a score of 6 is questionable and calls for further testing or delivery, and a score of 4, 2, or 0 is abnormal and usually calls for delivery. Many

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providers today do not perform a nonstress test if the ultrasound part of the BPP is normal; it is thought that the nonstress test does not add any predictive power to the BPP (Lalor, Fawole et al. 2008).

The researchers found there was no statistical difference in the rate of stillbirth between older and younger groups. Women who were 35 and older had a higher rate of induction (18.5% vs. 15.8%), and gave birth 3 days earlier, on average (38.4 weeks vs. 38.9 weeks).

The authors of this study argued that their policy of routine BPP tests starting at 36 weeks and a policy of "delivery" (by induction or Cesarean) at no later than 41 weeks brought the stillbirth rate of women 35 and older down to the same rate as younger women. However, because of the study design (using a chart review to look backwards in time), we cannot say with any certainty if their fetal monitoring was the cause of the low stillbirth rates.

In another paper published by Fretts et al. (2004), researchers used a mathematical model to try and estimate the potential effects of fetal monitoring. Their math analysis was based on stillbirth rates collected by McGill University in Canada. The results from Fretts et al.'s math model suggested that if first time mothers 35 and older had weekly fetal monitoring starting at 37 weeks, and were induced by 41 weeks, that it would take 863 fetal tests, 71 inductions, and 14 Cesareans to avoid 1 stillbirth (Fretts, Elkin et al. 2004).

What do the guidelines say?

In a 2012, the Society for Maternal and Fetal Medicine published an opinion that encouraged women and care providers to weigh the risks and benefits to decide whether to perform fetal testing or electively induce labor in mothers 35 and older. They also recommend that when mother and baby are healthy, induction should not take place before 39 weeks. They state that there is insufficient evidence to show that fetal testing for advanced maternal age can reduce the risk of stillbirth, and that care providers and women should weigh the pros and cons of such testing. To read the opinion statement, click here (http://bit.ly/2qSA4ll).

Neither ACOG nor ACNM (American College of Nurse Midwives) give official recommendations about caring for pregnant people who are 35 and older.

The Royal College of Obstetricians and Gynecologists (RCOG) published a scientific paper about AMA that you can read here. In their paper, RCOG does not make specific recommendations, but they do state that "Women ≥ 40 years of age having a similar stillbirth risk at 39 weeks of gestation to women in their mid-20s at 41 weeks of gestation, at which stage the consensus is that induction of labour should be offered to prevent late stillbirth."

The current UpToDate recommendation for women aged 40 and older is to give birth at 39 weeks. This recommendation is based on Grade 2C evidence. UptoDate states that Grade 2C is essentially an expert opinion; a weak recommendation based on very low-quality evidence.

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What is the bottom line?

- Delaying pregnancy is more common today, but it can lead to more difficulties getting pregnant and a greater chance of miscarriage.
- There is a higher risk of stillbirth at the end of pregnancy in people who are 35 or older, but that risk has gotten lower over the past few decades, and it is also lower among people who are healthy and/or have given birth before.
- It's important for pregnant people and their care providers to look at the "big picture." Does the woman have additional risk factors for stillbirth, aside from age? (Such as giving birth for the first time, or Type II diabetes). If so, these factors should be factored into decision-making as well.
- There are increases in the rates of many childbirth problems as a person ages. Some increases in risk are very small and other rates, like Cesarean rates, increase more dramatically.
- In England, midwifery-led care—as opposed to care delivered by obstetricians—has been shown to decrease the rate of interventions with no increased risk to the baby.
- The only randomized trial on induction at 39 weeks versus not inducing labor at 39 weeks (and instead waiting until 41-42 weeks) in women 35 or older found that the two options had similar results in terms of Cesarean rates. There were zero stillbirths in this study and it was too small to measure that risk.
- There is no consensus among researchers and obstetrical/midwifery organizations on the best way to care for a person at the end of pregnancy when they are 35 or older. As we gain more research on this topic, perhaps we will have better guidance.

Final Thoughts

For women who are trying to decide if they should delay pregnancy or not, they may want to consider the decline in fertility and increase in miscarriage rates with age, as well as the increased risk of problems at the time of birth. Stillbirths are rare today compared to previous decades, but there are slightly higher stillbirth rates throughout pregnancy in older women compared to younger women, and these rates go up at the end of pregnancy.

However, the good news is that the vast majority of people 35 and older who make it to term will have a healthy baby. Intervention rates for this group may be further lowered by using a midwifery-led model of care, as a large English study showed excellent outcomes and fewer interventions for people who were 35 and older and planned a birth with the midwifery-led model of care.

Acknowledgment

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Figure 1: Increase in Pregnancy Rates among People Age 30 and Older

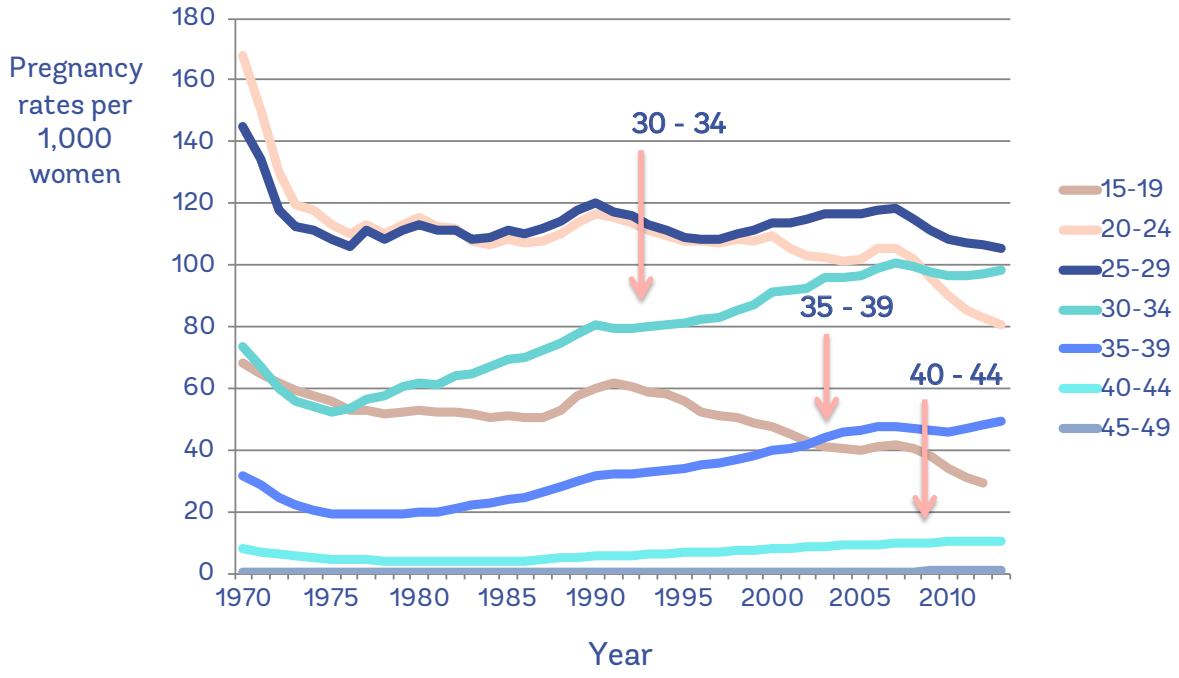

Figure 2: Why are Women Delaying Parenthood?

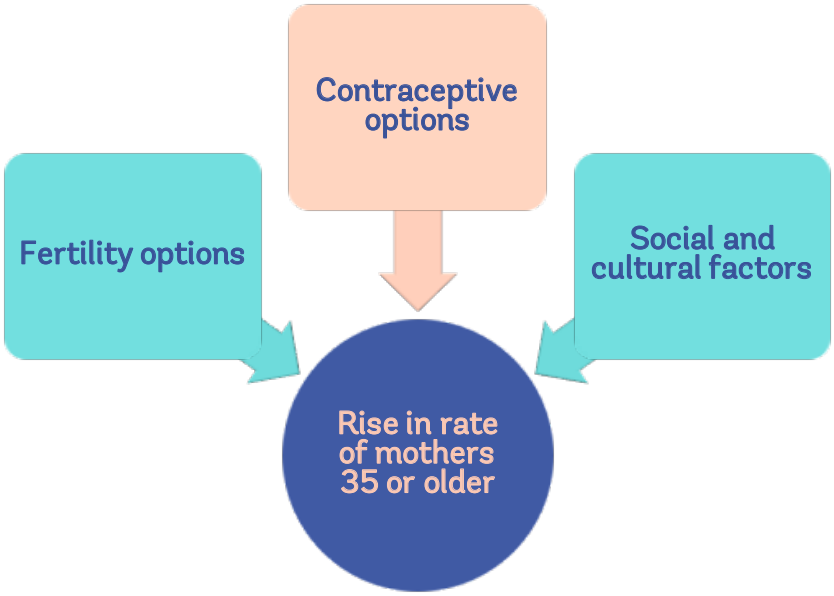

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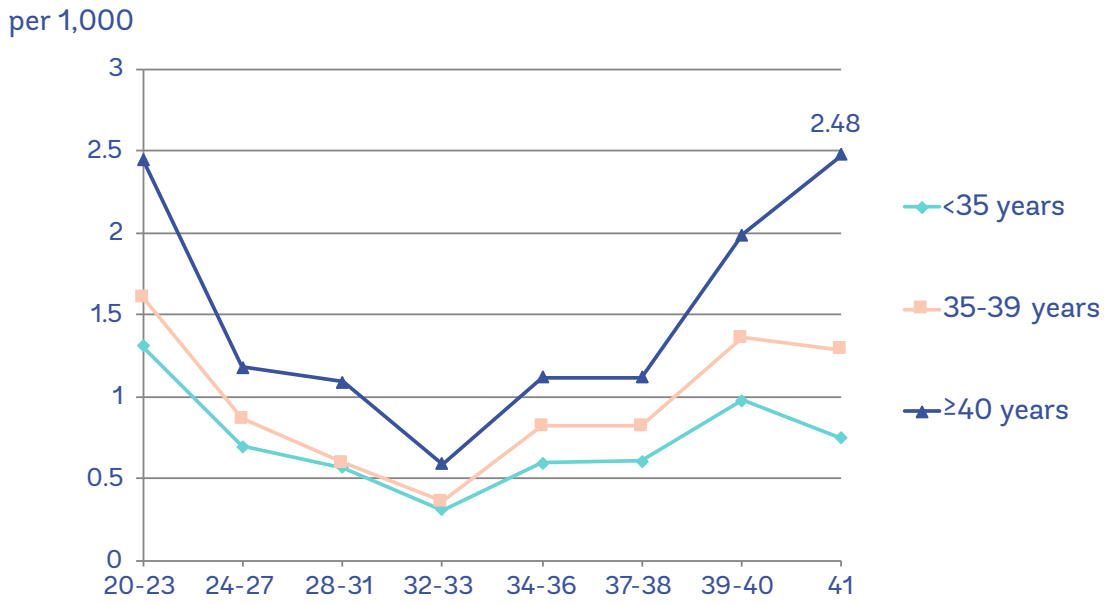
Figure 3: U.S. Gestational Age and Risk of Stillbirth (2001-2002)



*Data from Reddy et al. (2006). AJOG 195, 764-70.

Figure 4: Overall sample vs. healthy people only (dashed lines)

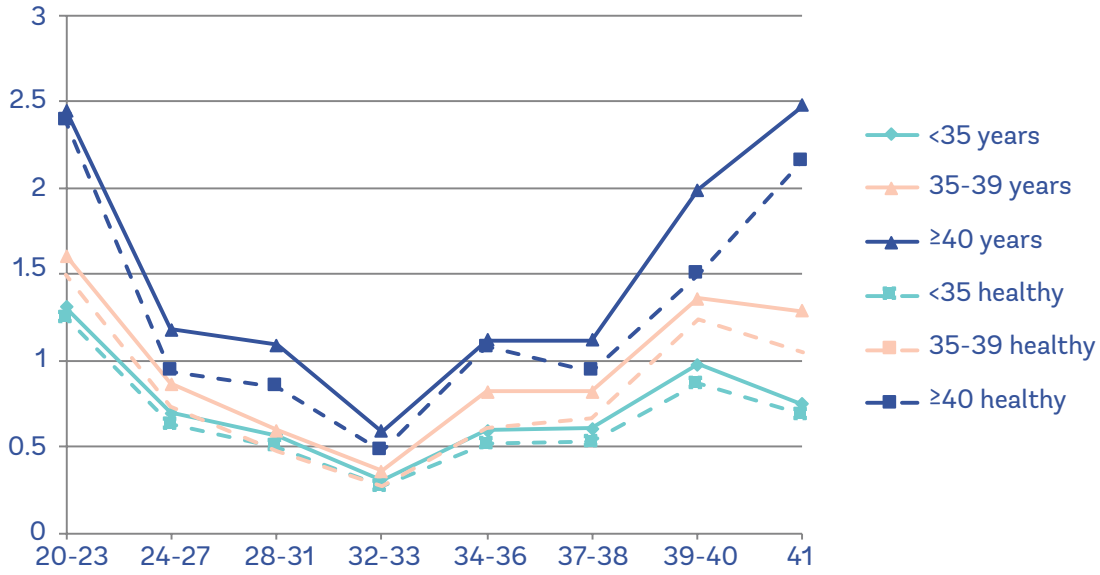


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Table 1: Stillbirth rates for people of different ages giving birth for the first time

Age groups	Women giving birth for the first time	Women who have given birth before
Under the age of 35	3.72	1.29
Between 35-39	6.41	1.99
40 years and older	8.65	3.29

*All stillbirth rates are per 1,000 ongoing pregnancies; Data from Reddy, Ko et al. 2006.

Table 2: Number of stillbirths per 1,000 ongoing pregnancies, using data from years 1967 to 2006*

	Age 20 - 24	Age 35 - 39	Age 40 and older
16 weeks 0 days to 22 weeks 6 days	2.1	4.75	7.07
23 weeks 0 days to 29 weeks 6 days	2.31	2.53	3.44
30 weeks 0 days to 36 weeks 6 days	2.51	3.25	5.72
38 weeks 0 days to 39 weeks 6 days	1.16	1.53	2.93
40 weeks 0 days to 41 weeks 6 days	1.62	2.59	4.17
42 weeks 0 days to 43 weeks 6 days	2.82	5.8	12.37

*Data from Haavaldsen et al., 2010.

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Table 3: Number of stillbirths per 1,000 ongoing pregnancies, using data from years 1987 to 2006*

	Age 20 - 24	Age 35 - 39	Age 40 and older
38 weeks 0 days to 39 weeks 6 days	0.65	1.1	1.39
40 weeks 0 days to 41 weeks 6 days	0.84	1.91	1.61
42 weeks 0 days to 43 weeks 6 days	1.77	3.79	2.64

*Data from Haavaldsen et al., 2010.

Table 4: The risk of pregnancy and birth complications in pregnant people of various age groups (data from Jolly et al. 2000)

Outcome	18 - 34 years old	35 - 40 years old	> 40 years old
Gestational diabetes	1%	2.85%	4.56%
Placenta previa	0.26%	0.56%	0.97%
Breech position	2.61%	3.66%	4.57%
Elective Cesarean	4.37%	8.6%	12.67%
Emergency Cesarean	8.65%	11.05%	14.24%
Postpartum hemorrage > 1,000 mL	1.46%	2.19%	3.1%
Preterm birth	6%	6.63%	8.17%
Low birth weight < 5th %	5.81%	6.13%	7.63%
High birth weight > 90th %	10.06%	12.32%	11.96%
Ever breastfed	61.14%	70.08%	66.24%

*Data from Jolly et al. 2000.

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Table 5: Rates in first time "low risk" mothers who gave birth in England in traditional obstetric units (hospitals) versus midwifery-led settings (including home birth, freestanding birth centers, and "alongside" midwifery units)

	Obstetric Unit	Midwifery-Led Setting
Augmentation		
Age 30 - 34	31.4%	18.8%
Age 35 - 39	34.8%	21.1%
Age 40+	40.2%	22.6%
Vacuum or Forceps		
Age 30 - 34	25.3%	16.8%
Age 35 - 39	28.9%	19.3%
Age 40+	26.9%	20.7%
Unplanned Cesarean		
Age 30 - 34	15.8%	8.3%
Age 35 - 39	18.3%	10.1%
Age 40+	25.6%	8.8%
Combined perinatal outcome*		
Age 30 - 34	3.7%	2.5%
Age 35 - 39	1.8%	2.1%
Age 40+	7.8%	2.4%

*The study was really too small to look at stillbirths or newborn deaths alone. So instead, the researchers created a "combined perinatal outcome," which combines the events of admission to a NICU within 48 hours of birth, a stillbirth after labor began, or early newborn death. Because there were so few deaths, this measure mostly indicates NICU admissions.; Data from Li et al. 2014.

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