



What Science Reveals About Fetal Pain

2015 Edition

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A growing body of science reveals an undisputable fact: unborn babies can feel pain by 20 weeks post-fertilization,¹ and most likely even earlier. As the medical community continues to increase its understanding of fetal pain, there have also been increasing legislative efforts to protect the unborn child from cruel suffering.

Pain (nociception) is an aversive response to a physically harmful or destructive stimulus. The National Institutes of Health define pain as “a basic bodily sensation that is induced by a noxious stimulus, is received by naked nerve endings, is characterized by physical discomfort (as pricking, throbbing, or aching), and typically leads to evasive action.”²

Unborn babies 20 weeks post-fertilization not only have the anatomy to process pain but also the neurobiology to transmit painful sensations to the brain and perceive pain. Dr. Jean A. Wright, testifying at a Congressional subcommittee hearing summarized it best:

After 20 weeks of gestation [18 weeks post-fertilization], an unborn child has all the prerequisite anatomy, physiology, hormones, neurotransmitters, and electrical current to “close the loop” and create the conditions needed to perceive pain... The development of the perception of pain begins at the sixth week of life. By 20 weeks [18 weeks post-fertilization], and perhaps even earlier, all the essential components of anatomy, physiology, and neurobiology exist to transmit painful sensations from the skin to the spinal cord and to the brain.³

There is no question, biologically speaking, about whether an unborn child can feel pain by 20 weeks post-fertilization. By 18 weeks post-fertilization, nerves link pain receptors to the brain’s thalamus (the pain processing center). By 18 weeks post-fertilization, the cerebral cortex (the region of the brain associated with higher mental functions) has acquired a full complement of neurons, meaning all of the neurons are present, though not all the connections in the cortex are fully developed until later. EEG activity, a recording of electrical activity in the brain, appears for the first time at 18 weeks post-fertilization, showing the integrity of the circuitries of the cortex and the thalamus.⁴

Some scientists take an agnostic position on whether the unborn child consciously experiences pain by 20 weeks post-fertilization and they argue this based on a theory that a mature cerebral cortex is necessary for the conscious perception of pain. However, a mature cerebral cortex is not necessary in order for the unborn child to feel pain, as evidenced by scientific studies and observations that both children and adults who are born with no or minimal cerebral cortex, do in fact still perceive pain.

The instruction of medical textbooks and accepted common medical practice is to administer fetal anesthesia before an in-utero surgery on the unborn child around 20 weeks post-fertilization. The common practice is based on the science of fetal development and the observation that unborn children who are not given anesthesia elicit a hormonal stress response to painful stimuli, which is alleviated by the effects of anesthesia as it is in adults.

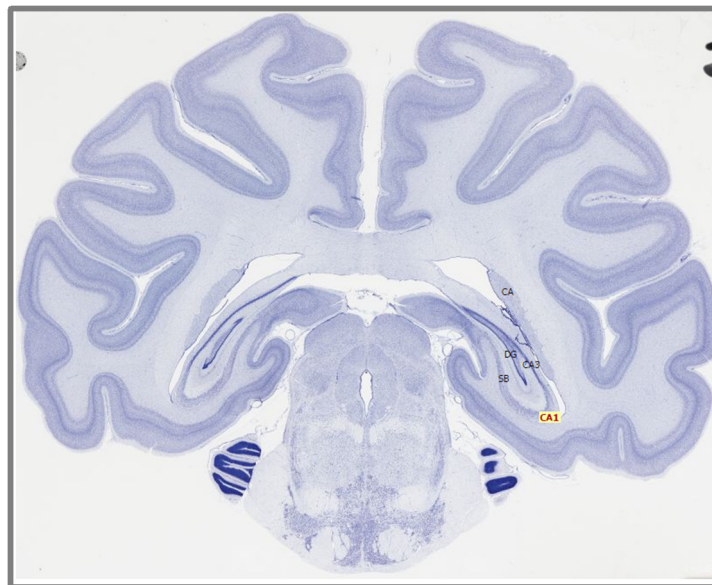
Legislation that addresses fetal pain must be based on the indisputable biology, scientific data, and physical evidence of fetal pain and not on political, religious, theoretical, or philosophical ideas about self-consciousness or self-awareness. The bottom line is that an unborn child can and does feel pain by 20 weeks post-fertilization. Fetal pain mechanisms are in place at that time.

Polling shows that the majority of Americans agree on setting abortion bans, such as the Pain-Capable Unborn Child Protection Act, to protect the almost 13,000 American pain-capable unborn children who die from late abortion each year.⁵

Definitions

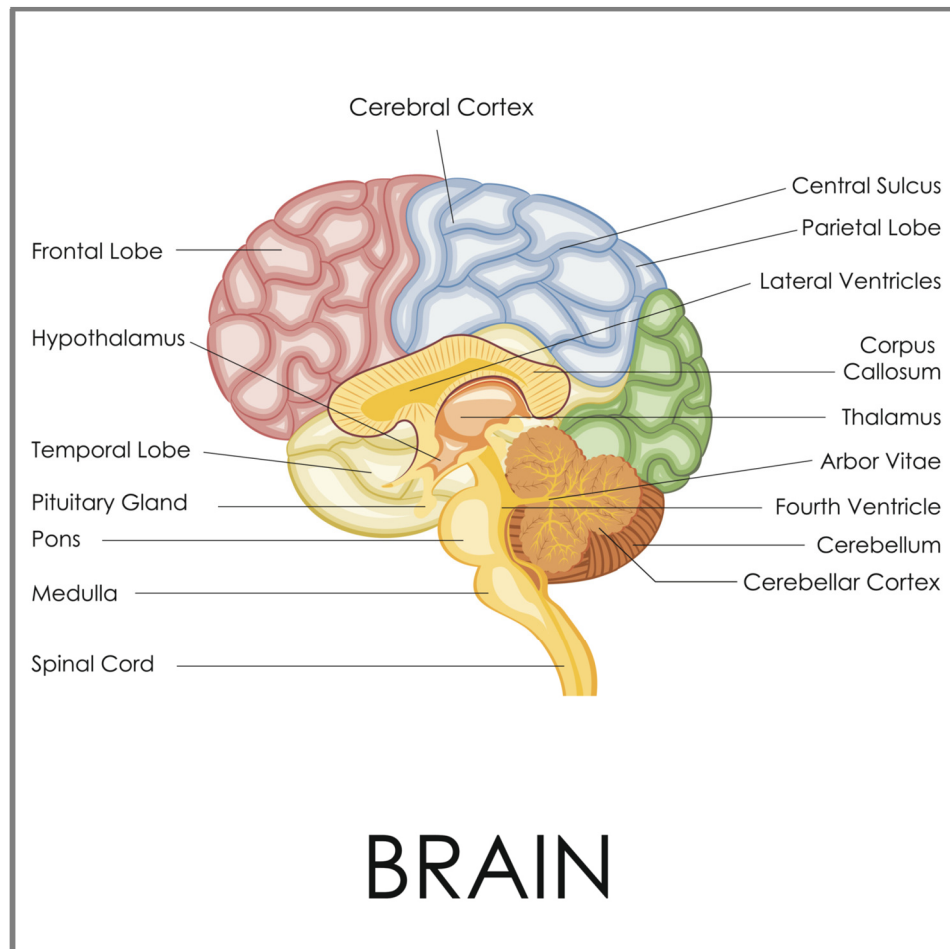
Some basic biological definitions must be addressed in order to understand the neurological and brain development that takes place in the unborn child.

- **Cerebral Cortex:** The cerebral cortex, which includes the neocortex, is the cerebrum's (brain) thin outer layer of neural tissue in humans and other mammals. It serves as the center of higher mental functions for humans, such as thought, perception, and memory, advanced motor function, language, and problem solving. It starts developing at 6 weeks and has a full complement of neurons by 18 weeks post-fertilization.⁶



A macaque monkey cerebral cortex is shown in the dark purple outline.⁷

- **Thalamus:** The thalamus is located above the brain stem between the cerebral cortex and the midbrain with nerve connections to both. The thalamus, which translates neural impulses going from the spinal cord to the cortex into appropriate sensations (including pain), develops between 8 and 16 weeks post-fertilization.⁸ The Oxford Dictionary defines its function as “relaying sensory information and acting as a center for pain perception.”⁹



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- **Subcortical Plate (Subplate zone):** A temporary waiting compartment for afferent nerve fibers, which carry nerve impulses (including painful nerve impulses) to the cortex. Thalamic nerve fibers reach subplate zone by 18 to 20 weeks post fertilization.¹⁰ One study noted that the first axons appear in the cortical plate by 18 to 20 weeks post-fertilization.¹¹

The Development of the Nervous System and the Brain in the Unborn Child

The unborn child has a well-developed nervous system by 20 weeks post-fertilization. Neurological and anatomical structures needed to perceive pain are in place well before that developmental time. Various embryology textbooks, scientific testimonies, and studies shed light on the biology of fetal brain and nervous system development, the unborn child’s reaction

to painful stimuli, and the unborn child's capacity to perceive pain. The following are some of the findings.¹²

The Development of the Nervous System

- The basic organization of the nervous system is established by 28 days (four weeks) post-fertilization.¹³
- The earliest neurons are formed at 4 weeks post-fertilization in the neocortex.¹⁴
- The earliest function of the neocortex as a network begins in the seventh week post-fertilization.¹⁵
- "The first essential requirement for nociception is the presence of sensory receptors, which develop first in the perioral area [around the mouth] at around 7 weeks gestation [5 weeks post-fertilization]. From here, they develop in the rest of the face and in the palmar surfaces of the hands and soles of the feet from 11 weeks [9 weeks post-fertilization]. By 20 weeks [18 weeks post-fertilization], they are present throughout all of the skin and mucosal surfaces."¹⁶
- "Sensory receptors... develop in the perioral area at approximately 7 weeks gestation [5 weeks post-fertilization] and are diffusely located throughout the body by 14 weeks [12 weeks post-fertilization]."¹⁷
- "Pain receptors appear around the mouth 4 to 5 weeks post-fertilization, followed by the development of nerve fibers, which carry stimuli to the brain. Around 6 weeks post-fertilization, the unborn child first responds to touch. By 18 weeks post-fertilization, pain receptors have appeared throughout the body."¹⁸
- "Immature skin nociceptors are probably present by 10 weeks [8 weeks post-fertilization] and definitely present by 17 weeks [15 weeks post-fertilization]."¹⁹

The Development of the Thalamus and Subcortical Plate

Nerves connect pain receptors to the brain's thalamus and subcortical plate by no later than 20 weeks.

- "The connection between the spinal cord and the thalamus (an obligatory station through which nearly all sensory information must pass before reaching the cortex) starts to develop from 14 weeks onwards and is finished at 20 weeks."²⁰
- "Connections to the thalamus begin at 14 weeks [12 weeks post-fertilization] and are completed by 20 weeks [18 weeks post-fertilization], and thalamocortical connections are present from 13 weeks [11 weeks post-fertilization] and are more developed by 26 to 30 weeks [24 to 28 weeks post-fertilization]."²¹
- "Most incoming pathways, including nociceptive ones, are routed through the thalamus and, as stated above, penetrate the subplate zone from about 17 weeks... These monoamine fibres start to invade the subplate zone at 13 weeks and reach the cortex at about 16 weeks."²²
- "Thalamic afferents begin to reach the somatosensory subplate at 18 weeks [post fertilization]... These afferents appear morphologically mature enough to synapse with subplate neurons."²³
- "Peripheral nerve receptors develop between 7 and 20 weeks gestation [5 and 18 weeks post-fertilization] ... Spinothalamic fibres (responsible for transmission of pain) develop between 16 and 20 weeks gestation [14 to 18 weeks post-fertilization], and

thalamocortical fibres between 17 and 24 weeks gestation [15 and 22 weeks post-fertilization]."²⁴

- "Peripheral receptors develop from the 5th week post-fertilization. By 18 weeks post-fertilization, these receptors are present in the whole body. From 11 weeks post-fertilization the afferent system of the spinal cord starts developing. Connections between the spinal cord and the thalamus start to develop from 12 weeks post-fertilization and are complete by 18 weeks post-fertilization. Connections between the thalamus and the cortex are present from 15 weeks post-fertilization and completely developed at 24-28 weeks post-fertilization. From 14 weeks post-fertilization pain transmission from a peripheral receptor to the cortex is possible and completely developed by 24 weeks post-fertilization."²⁵

The Unborn Child's Reaction to Painful Stimuli

In the unborn child, application of painful stimuli is associated with a child's withdrawal from the source of pain and significant increases in stress hormones resulting in a stress response and elevated heart rate. An unborn child will avoid tissue injury from pain-causing stimuli during an invasive procedure.

An unborn baby between 20 and 30 weeks post-fertilization will feel pain more intensely than even a newborn or adult because during this age the unborn baby has more pain receptors per square inch of skin than at any other time and the mechanisms (a separate set of nerves in a feedback loop) that inhibit pain have not been established.

First Reaction to Painful Stimuli

Sometime between 5.5 and 8 weeks post-fertilization, an unborn baby will withdraw from painful stimuli:

- "The earliest reactions to painful stimuli motor reflexes can be detected at 7.5 weeks of gestation [5.5 weeks post-fertilization]."²⁶
- "As early as 8 weeks gestation [6 weeks post-fertilization], the fetus exhibits reflex movement during invasive procedures via spinal reflex pathway."²⁷
- The neural circuits responsible for the first basic response to pain are established by 8 weeks post-fertilization. This is the earliest point at which the fetus experiences pain and can respond by withdrawing from painful stimuli.²⁸

Hormonal Stress Response

Numerous studies show that an unborn baby will react with a hormonal stress response to a painful stimulus before 20 weeks post-fertilization:

- "Invasive fetal procedures clearly elicit a stress response..."²⁹
- "Human fetal endocrine responses to stress have been demonstrated from as early as 18 weeks gestation [16 weeks post-fertilization]."³⁰
- "A significant body of evidence has grown to suggest the importance of mitigating the fetal stress response to enhance fetal outcome and possibly limit preterm labor. It is clear that the fetus is capable of mounting a physiochemical stress response to noxious stimuli as early as 18 weeks' gestation."³¹
- "Fetuses have been observed to exhibit hormonal stress responses to painful stimuli from as early as 16 weeks of gestation [14 weeks post-fertilization]."³²

- “Another stage of advancing neural development takes place at 18 weeks, when it has been demonstrated that the fetus will launch a hormonal stress response to direct noxious stimulation.”³³
- “Fetal stress in response to painful stimuli is shown by increased cortisol and β -endorphin concentrations, and vigorous movements and breathing efforts... This independent stress response in the fetus occurs from 18 weeks gestation [16 weeks post-fertilization].”³⁴
- “Fetuses at 20 weeks post fertilization have an increase in stress hormones in response to painful experiences.”³⁵
- “Multiple studies show that ‘the human fetus from 18-20 weeks elaborates pituitary-adrenal, symphatho-adrenal, and circulatory stress responses to physical insults.’”³⁶
- “Fetuses undergoing intrauterine invasive procedures, definitely illustrative of pain signaling, were reported to show coordinated responses signaling the avoidance of tissue injury.”³⁷
- “Studies of brain activation using near-infrared spectroscopy in preterm neonates responding to a painful stimulus to the heel have shown increased signals over the contralateral cortex which implies a specific pattern of response to pain rather than a non-specific activation seen with autonomic arousal.”³⁸
- “Other interventions may require that a needle be inserted into the fetus, which may elicit a noxious stimulus and possibly even cause pain. Open procedures can produce significant noxious stimuli.”³⁹
- “Perception and processing of pain is controversial, but noxious stimuli will elicit a physiologic response in the human fetus, as evidenced by increases in cortisol, β -endorphin, and decreases in the pulsatility index of the fetal middle cerebral artery.”⁴⁰

Premature Babies and Pain

Premature babies not only show pain-related behaviors, but the younger they are, the stronger their response to pain will be:

- “Premature infants, delivered as early as 23 weeks show clear pain-related behaviors.”⁴¹
- “Of note, the earlier infants are delivered, the stronger their response to pain.”⁴²

Why Babies at 20 Weeks Post-Fertilization Will Feel More Pain than Adults

Pain is sensed more acutely by babies 20-30 weeks post-fertilization because the pain receptors are present and close to the surface, but the mechanisms that inhibit pain do not develop until 32-34 weeks post-fertilization:

- Between 20 and 30 weeks post-fertilization, an unborn child has more pain receptors per square inch of skin than at any other time in his or her life, with only a very thin layer of skin for protection, leaving nerve fibers closer to the surface.⁴³
- Mechanisms that inhibit or moderate the experience of pain do not begin to develop until 32 to 34 weeks post-fertilization. Any pain the unborn child experiences before these pain inhibitors are in place is likely more intense than the pain an older infant or adult experiences when subjected to similar types of injury.⁴⁴
- “Descending inhibitory pathways such as the dorsolateral funiculus that would modulate pain develop postnatally. This would suggest that neonates and preterm infants may have a more hyperresponsiveness to pain than older infants who have the ability to modulate pain via a more mature nervous system.”⁴⁵

Not only does the unborn child elicit a direct stress response after subjection to painful stimuli, but such stimuli are associated with long-term harmful neuro-developmental effects. These effects range from altered sensitivity to pain to the possibility of emotional, behavioral, and learning disabilities later in life.⁴⁶ “There is also evidence to suggest that infants have the ability to form memory of pain.”⁴⁷

Use of Fetal Anesthesia

It is common practice for doctors to administer fetal anesthesia before performing in-utero surgeries. First, the mother is generally given anesthesia for the operation, which then goes through her system and anesthetizes the baby. In addition, the baby may also directly be given anesthesia.

When administered, fetal anesthesia decreases stress hormones when compared to their level when painful stimuli are applied without anesthesia. Observations of fetal behavior and physiology have resulted in a “clear consensus among professional anesthesiologists” for the use of anesthesia in prenatal surgery.⁴⁸

Fetal Anesthesia and Current Medical Practice

These studies reveal information about current medical practice regarding in-utero surgeries and the effects of anesthesia on the unborn child:

- “Despite ongoing debate regarding fetal capacity for pain perception, fetal anesthesia and analgesia are warranted for fetal surgical procedures.”⁴⁹
- “It has also been shown that fetuses feel pain from week 18. This has given rise to the practice of using fetal anesthesia for surgery or invasive diagnostic procedures in utero.”⁵⁰
- “Therefore, it has been suggested that pain relief has to be provided during in utero interventions on the fetus from mid-gestation (20 weeks) on.”⁵¹
- “As with any procedure, the provision of analgesia depends on the likely severity of pain associated with the intervention. However, analgesia is recommended for: (i) endoscopic, intrauterine surgery on placenta, cord, and membranes; (ii) late termination of pregnancy; (iii) direct surgical trauma to the fetus.”⁵²
- “The administration of anesthesia directly to the fetus is critical in open fetal surgery procedures. Fetal pain response with bradycardia [slow heart rate] should make us consider that the fetus is not adequately anesthetized.”⁵³
- “Given the state of current knowledge, it is impossible to know exactly when the fetus first becomes capable of experiencing pain, although most agree that the gestational age range in which this occurs is between 20 and 30 weeks. It so happens that this range coincides with the gestational ages during which most fetal interventions occur. For these reasons, most practitioners provide fetal anesthesia or analgesia of some sort during both open and minimally invasive procedures.”⁵⁴
- “Strategies must be in place for failed procedures or fetal distress.”⁵⁵

Pain Relievers Decrease the Hormonal Stress Levels

Pain-relievers, once administered to the unborn baby, lessen the stress response and decrease hormone levels:

- “As early as 18 weeks, stress hormones are released by the unborn child injected by a needle, just as they are released when adults feel pain. Hormone levels in those babies decrease as pain-relievers are supplied.”⁵⁶
- “Studies of neonates who received deep anesthesia with sufentanil had significantly reduced stress responses, complications, and mortality rates to surgery compared to neonates who received lighter anesthesia.”⁵⁷
- “Fisk and others have shown that fetuses can mount a stress and physiologic response to invasive procedures. Significant rises in cortisol and β -endorphin as well as redistribution of blood flow to the brain have been demonstrated in fetuses undergoing needle insertion into the hepatic vein. The stress response can be attenuated by administering fentanyl to the fetus.”⁵⁸
- “Anaesthetized patients do not show increases in stress hormones during surgery.”⁵⁹

The Unborn Child as a Patient

The unborn child is medically considered a *patient* in cases where the parent or parents want to preserve the child’s life and, as a result, he or she is given fetal anesthesia before an in-utero surgery. The unborn child, who in this case the doctors aim to save, may be the same age as one who could legally be killed by abortion and who has the same capacity for perceiving pain. The following studies use language reflecting the humanity of the unborn child and her status as a patient in discussing treatment protocols for in-utero surgery:

- “Fetal therapy is the logical culmination of progress in fetal diagnosis. In other words, the fetus is now a patient.”⁶⁰
- “Fetal surgery pushes the limits of knowledge and therapy beyond conventional paradigms by treating the developing fetus as a patient.”⁶¹

A Functioning Cerebral Cortex is Not Necessary to Feel Pain, Only the Thalamus

Some scientists argue that a functioning cerebral cortex is necessary to perceive pain. However, substantial recent evidence shows that children born missing all or most of the cerebral cortex, conditions known as anencephaly and hydranencephaly, do in fact perceive pain. Furthermore, in adults, stimulation or removal of the cerebral cortex does not alter pain perception, while stimulation or removal of the thalamus does. If activity of the cortex is not a necessary criterion for pain perception in children or adults, neither should it be one for unborn babies.

- “According to some physicians, the earlier development of the thalamus and lower brain stem is sufficient for pain perception. Based on evidence obtained by observing anencephalic and hydranencephalic infants who have no or minimal cortex development, these experts assert that pain perception does not depend upon established connections from the thalamus to the cortex and can exist after the thalamus establishes its connection with the sensory network.”⁶²
- “Despite total or near-total absence of the cortex, these children [with hydranencephaly] clearly possess discriminative awareness. They distinguish familiar from unfamiliar

people and environments and are capable of social interaction, visual orienting, musical preferences, appropriate affective responses, and associative learning... Multiple lines of evidence thus corroborate that the key mechanism of consciousness or conscious sensory perception are not dependent on cortical activity. Consistent with this evidence, the responses to noxious stimulation of children with hydranencephaly are purposeful, coordinated, and similar to those of intact children."⁶³

- "My impression from this first-hand exposure to children with hydranencephaly confirms... These children are not only awake and often alert, but show responsiveness to their surroundings in the form of emotions or orienting reactions to environmental events... They express pleasure by smiling and laughter, and aversion by 'fussing,' arching of the back and crying (in many gradations), their faces being animated by these emotional states."⁶⁴
- "As such, it would seem these children [with hydranencephaly] demonstrate that anatomic development or functional activity of the cortex may not be required for conscious sensory perception. They may, and do in fact, respond to painful or pleasurable stimuli in what may easily be argued to be a conscious, coordinated manner, similar to intact children."⁶⁵
- "Indeed, there is evidence that hydranencephalic children respond to painful and pleasurable stimuli in a coordinated manner similar to other children."⁶⁶
- "Clinical data show that ablation or stimulation of the thalamus *alone* [emphasis added] is sufficient to alter pain perception in adults."⁶⁷
- "In keeping with this evidence, we should consider that if cortical activity is not a prerequisite for pain perception in adults, then by analogy neither would it be a necessary criterion for fetuses."⁶⁸

Fetal Structures of Pain Perception Differ From Adult Structures

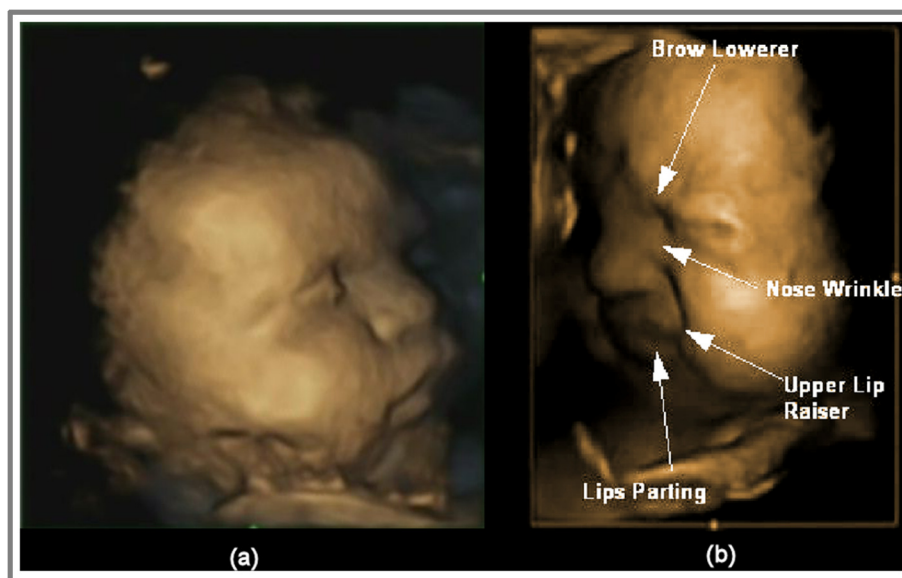
Fetal structures of pain perception are not the same as adult structures of pain perception, and as such they should not be directly compared. The unborn child's ability to feel pain depends on complex pain processing mechanisms and neural pathways that change with each stage of development.

- "Clinical and animal research shows that the fetus or neonate is not a 'little adult,' that the structures used for pain processing in early development are unique and different from those of adults, and that many of these fetal structures and mechanisms are not maintained beyond specific periods of early development. The immature pain system thus uses the neural elements available during each stage of development to carry out its signaling role."⁶⁹
- "*[P]ain perception during fetal and neonatal development does not necessarily involve the same structures involved in pain processing as those in adults, meaning that the lack of development of certain connections is not sufficient to support the argument that fetuses cannot feel pain until late gestation. Some say even that the structures used for pain processing in the fetus are completely different from those used by adults and that many of these structures are not maintained beyond specific periods of early development [italics added]."*⁷⁰
- "Newborn infants show strong pain behaviour [*sic*], but the study of the development of nociceptive pathways shows that their pain involves functional signaling pathways that are not found in the mature nervous system in healthy individuals."⁷¹

Observation of Fetal Facial Expressions Using 4-D Ultrasound Technology

A 2013 study used 4-D ultrasound scans to measure facial movements in healthy unborn children 22 to 34 weeks post-fertilization.⁷² Its aim was to examine whether complex fetal facial movements formed recognizable facial expressions of pain and distress. The unborn children showed various facial movements that expressed pain and/or distress, although the study's authors shied away from attributing facial *expressions* of pain with the actual perception of pain. It is impossible for any person to know what any other human being "experiences," but using scientific observation and our common human experience we can attribute similar reactions to pain to a genuine perception of pain.

Although 10 and 18 week post-fertilization scans of these unborn children were also taken, a shortcoming of this study is that the authors did not publish information encompassing the earlier gestational scans. They should consider releasing all of the scans and others should consider further studying fetal facial movements in 4-D scans of unborn children 20 weeks post-fertilization and younger. Nevertheless, this study does provide an observable and scientifically-measurable visual tool of the pain an unborn child is able to feel.



Photograph of an unborn child at 30 weeks post-fertilization: (a) Showing an example of neutral face, and (b) a "pain/distress" facial expression with complex combinations of facial movements (Public Library of Science One, 2013).

Another study published in September 2014 observed fetal facial expressions at 22 to 26 weeks post-fertilization.⁷³ This study found:

- After 14 weeks post-fertilization, muscles involved in fetal facial expressions have fully formed.
- Mouthing movement was the most common facial expression at 18–32 weeks post-fertilization.
- Yawning was most frequent at 22 weeks post-fertilization.

- The frequency of sucking remained unchanged between 18 and 32 weeks post-fertilization.
- Data from the present study and previous investigations showed that the frequency of smiling increased with advancing gestational age between 18 and 32 weeks post-fertilization.

Both of these studies bring to mind the humanity of the unborn child whose facial muscles have fully formed after 14 weeks post-fertilization and is already capable of using them to make complex facial expressions, including ones that indicate pain or distress.

The Development of Babies Born At Around 20 Weeks Post-Fertilization

Ultrasound technology can do much to inform us about fetal development, but images of children around this age outside of the womb are even more powerful in depicting the development of the child at this age.

In January 2014, a Pennsylvania mother by the name of Alexis Fretz who miscarried her baby at 19 weeks gestation [17 weeks post-fertilization], bravely shared photographs of her son Walter online. The images and story of the Fretz family went viral. The grieving wife and mother shared: “I am so very glad that Joshua [(her husband) took the photos]. At first I did not want any photos, but they are the only thing I have to look back on now’...’I held him, cuddled him, while his heart was beating I held him to my heart, I counted his toes and kissed his tiny head. I will always cherish those memories that I have of him.”⁷⁴

In these photographs, we can see a tiny, fully formed Walter with translucent skin and nerves very close to the surface.



(dailymail.co.uk)

In another case, a couple from Great Britain, Rachel Crockett and Craig Walkow, shared the story in October of 2014 of their premature son, Connor, who was born at 23 weeks gestation [21 weeks post-fertilization] weighing only 1 lb. He survived and celebrated his first birthday.



Connor was born at 21 weeks post-fertilization, weighing 1lb 2oz on October 8, 2013. His temperature was regulated by being held in a bag similar to a freezer bag (dailymail.co.uk).



Connor spent the first 75 days of his life on a ventilator, but celebrated his first birthday in October 2014 (dailymail.co.uk).

After her experience Connor's mother shared, "I think the abortion limit should be lowered to 20 weeks – especially considering what happened with Connor."⁷⁵

A third family, Sylvia and Thomas Moore and their son Lucas have a similar story. Like Connor, Lucas was born at 23 weeks gestation [21 weeks post-fertilization] weighing 1lb 1oz at birth and he celebrated his first year also in October 2014.⁷⁶



Lucas Moore being held in his father's hands when he was just a few hours old at 21 weeks post-fertilization (SWNS.com).



Lucas with his parents on his first birthday (SWNS.com).

These stories depict the complex development of children born around 20 weeks post-fertilization. As medical technology continues to improve, more children like Connor will be able to be saved following a premature delivery. Scientific data, common medical practice and observation of the child show that the development of the child by 20 weeks post-fertilization is sufficient for pain perception.

The Pain-Capable Unborn Child Protection Act

In light of this information, the Family Research Council (FRC) supports state and federal efforts to pass such laws as the Pain-Capable Unborn Child Protection Act, a bill that protects unborn babies 20 weeks post-fertilization and older from abortion because they can feel pain. States have a compelling interest in protecting the lives of pre-born children from the stage at which substantial medical evidence indicates that these children are capable of feeling pain.

In poll after poll, Americans overwhelmingly agree on setting abortion bans for pain-capable unborn children. For example, a July 2013 *Huffington Post* poll found that by a two-to-one margin, respondents said they would favor a federal law banning abortion after 20 weeks of pregnancy [18 weeks post-fertilization].⁷⁷ In March 2013, the Polling Company poll found in a nationwide poll that 64 percent would support a law such as the Pain-Capable Unborn Child Protection Act prohibiting abortion after 20 weeks. Women voters were split 63 percent to 31 percent in support of such a law.⁷⁸

In a November 18-23, 2014 Quinnipiac University Poll, registered voters were asked the following question: "As you may know, in 2013, the House of Representatives approved legislation that would ban virtually all abortions nationwide after 20 weeks of pregnancy, except in cases of rape and incest that are reported to authorities. Would you support or oppose such legislation?" In fact, 60% indicated support for such legislation; 33% said they would oppose; and 7% said they were unsure/no answer.⁷⁹

Despite this overwhelming support for late abortion restrictions of pain-capable babies, abortion at any stage of development and for any reason is still legal in many states. Some doctors in many states even perform late abortion using methods such as "Dilation and Evacuation" (D&E), in which the baby is ripped apart limb from limb before crushing her skull to remove it. In Justice Kennedy's dissent in *Stenberg v. Carhart*, he quoted late term abortionist Dr. Carhart's description of a D&E abortion: "The fetus, in many cases, dies just as a human adult or child would: It bleeds to death as it is torn from limb from limb."⁸⁰ A late abortion can be excruciatingly painful for the unborn child, be it via suction, dilation and curettage, D&E, or any other abortion method. Late abortion should not be a legally sanctioned procedure.

The Pain-Capable Unborn Child Protection Act would prevent late abortion nationwide after 20 weeks post-fertilization. It contains exceptions to save the life of the mother and in cases of rape and incest. The bill prescribes criminal fines of up to five years in jail for an abortionist who performs an abortion after 20 weeks post-fertilization, yet it protects a woman who has an abortion from any prosecution.

Current Fetal Pain Laws

Currently, commercial livestock in a slaughterhouse and animals in a laboratory have more legal protection from pain than do unborn children.⁸¹ Almost 13,000 American unborn babies who are 19 weeks post-fertilization and older die each year due to late abortion.

According to the latest numbers from the Guttmacher Institute's brief on "State Policies on Later Abortions" published on January 1, 2015, 12 states have passed laws to ban abortion at 20 weeks post-fertilization based on fetal pain:

- Alabama, Arkansas, Georgia*, Idaho*, Indiana, Kansas, Louisiana, Mississippi, Nebraska, North Dakota, Oklahoma and Texas.⁸²

According to the Guttmacher Institute's brief on "Counseling and Waiting Periods for Abortion" published January 1, 2015, 12 states include information about the ability of the unborn child to feel pain:

- Alaska, Arkansas, Georgia, Indiana, Kansas, Louisiana, Minnesota, Missouri, Oklahoma, South Dakota, Texas, and Utah.⁸³

Conclusion

An abundance of peer-reviewed scientific studies show that the early brain structures and neurological development of the unborn child are sufficient for the perception of pain by 20 weeks post-fertilization.

By 18 weeks post-fertilization, when the connection between the spinal cord and the thalamus is complete, painful stimuli elicit a stress response in the unborn child and the child can perceive severe pain. By 18 weeks post-fertilization, the cerebral cortex has also acquired a full complement of neurons, and by 20 weeks post-fertilization even greater development has taken place. Even so, strong evidence shows that a functioning cortex is not necessary for the unborn child to feel pain.

We should stop late abortions because, as Dr. Sunny Anand stated in his testimony, "based on evidence suggesting that the types of stimulation that will occur during abortion procedures, very likely most fetuses at 20 weeks after conception will be able to perceive that as painful, unpleasant, noxious stimulation."⁸⁴

FRC urges the passage of the Pain-Capable Unborn Child Protection Act and similar laws that protect the lives of unborn children who can feel pain.

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¹ Fetal age can be given as age "post-fertilization" meaning the time from conception, or gestational age meaning the time since the last menstrual period (LMP), which is usually easier to determine and occurs approximately two weeks before ovulation and fertilization. Thus gestational age will be 2 weeks older than post-fertilization age, *i.e.*, 22 weeks gestation = 20 weeks post-fertilization.

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- ² See definition “b” at: Merriam-Webster Medical Dictionary, accessed on May 12, 2014, <http://www.merriam-webster.com/medlineplus/pain>.
- ³ Dr. Jean A. Wright, professor and chair of Pediatrics at Mercer School of Medicine, in a testimony before the House of Representatives. Committee on the Judiciary. Pain of the Unborn: Hearing Before the Subcommittee on the Constitution. 109th Cong., 1st Sess., 2005.
- ⁴ S. Vanhatalo and O. van Nieuwenhuizen, “Fetal Pain?,” *Brain & Development* 22(2000): 145-150.
- ⁵ “Induced Abortion in the United States,” Guttmacher Institute, July 2014, accessed January 17, 2015, http://www.guttmacher.org/pubs/fb_induced_abortion.html.
- ⁶ Vanhatalo and van Nieuwenhuizen, “Fetal Pain?,” 145-150.
- ⁷ “Nissi, coronal, histo, Whole-Brain, adult,” Brainmaps.org, accessed January 17, 2015, <http://brainmaps.org/ajax-viewer.php?datid=20&sname=n25&hname=cornu%20ammonis%201%20of%20hippocampus&hlabel=CA1>.
- ⁸ Susan Tucker Blackburn, *Maternal, Fetal, & Neonatal Physiology: A Clinical Perspective 2nd Edition* (Philadelphia: Elsevier Inc., 2003). Blackburn, *Maternal, Fetal, and Neonatal Physiology*.
- ⁹ “Thalamus,” Oxford Dictionaries, accessed January 14, 2015 at http://www.oxforddictionaries.com/definition/american_english/thalamus.
- ¹⁰ C.L. Lowery, M.P. Hardman, N. Manning, B. Clancy, R.W. Hall, K.J.S. Anand, “Neurodevelopmental Changes of Fetal Pain,” *Seminars in Perinatology* 31, no. 5 (2007): 275-282.
- ¹¹ Vanhatalo and van Nieuwenhuizen, “Fetal Pain?,” 145-150.
- ¹² For more scientific documentation on fetal pain, see “Fetal Pain: The Evidence,” Doctors on Fetal Pain, accessed on May 12, 2014, <http://www.doctorsonfetalpain.com/>.
- ¹³ Thomas W. Sadler, *Langman’s Medical Embryology, 11th Edition*, (Baltimore: Lippincott Williams and Wilkins, 2009), Chapters 5 and 6.
- ¹⁴ “Testimony of Maureen L. Condic, Ph.D.,” Priests for Life, May 23, 2013, accessed on May 12, 2014, <http://www.priestsforlife.org/legislation/hr-1797-condic.pdf>.
- ¹⁵ Ibid.
- ¹⁶ R. Brusseau, “Developmental Perspectives: Is the Fetus Conscious?” *International Anesthesiology Clinics* 46, no. 3 (2008): 11-23.
- ¹⁷ L.B. Myers, L.A. Bulich, “Fetal endoscopic surgery: indications and anaesthetic management,” *Best Practice & Research Clinical Anaesthesiology* 18, no. 2 (2004): 231-258.
- ¹⁸ Blackburn, *Maternal, Fetal, and Neonatal Physiology*.
- ¹⁹ M.D. Rollins and M.A. Rosen, “Anesthesia for Fetal Intervention and Surgery,” *Gregory’s Pediatric Anesthesia, ed. 5*, Edited by George A. Gregory and Dean B. Adropoulos, (West Sussex: Wiley-Blackwell, 2012), 444-474.
- ²⁰ P.N.A. Van Scheltema, S. Bakker, F.P.H.A. Vandenbussche, D. Oepkes, “Fetal Pain,” *Fetal and Maternal Medicine Review* 19, no. 4 (2008): 311-324.
- ²¹ Lowery et al., “Neurodevelopmental Changes of Fetal Pain,” 275-282.
- ²² V. Glover and N.M. Fisk, “Fetal pain: implications for research and practice,” *British Journal of Obstetrics and Gynecology* 106, (1999): 881-886.
- ²³ S.J. Lee, H.J.P. Ralston, E.A. Drey, J.C. Partridge, and M.A. Rosen, “A Systematic Multidisciplinary Review of the Evidence,” *Journal of the American Medical Association* 294, no. 8, (2005): 947-954. Note: Lee et al. believe that pain requires conscious cortical processing, which they don’t think is likely until 29 or 30 weeks. Even so, they acknowledge this finding.
- ²⁴ R. Gupta, M. Kilby, and G. Cooper, “Fetal surgery and anaesthetic implications,” *Continuing Education in Anaesthesia, Critical Care & Pain* 8, no. 2 (2008): 71-75.
- ²⁵ Marc Van de Velde and Frederik De Buck, “Fetal and Maternal Analgesia/Anesthesia for Fetal Procedures,” *Fetal Diagnosis and Therapy* 31, no. 4, (2012): 201-209.
- ²⁶ Aida Salihagić Kadić and Maja Predojević, “Fetal neurophysiology according to gestational age,” *Seminars in Fetal & Neonatal Medicine* 17, no. 5 (2012): 256-260.
- ²⁷ Y. Ohashi, K. Terui, K. Tainura, M. Tanaka, and K. Baba, “Success rate and challenges of fetal anesthesia for ultrasound guided fetal intervention by maternal opioid and benzodiazepine administration,” *Journal of Maternal-Fetal Neonatal Medicine* 26, no. 2 (2013): 158-160.
- ²⁸ “Testimony of Maureen L. Condic, Ph.D.”
- ²⁹ K.M. Tran, “Anesthesia for fetal surgery,” *Seminars in Fetal & Neonatal Medicine* 15, (2010): 40-45.
- ³⁰ Myers et al., “Fetal endoscopic surgery,” 231-258.
- ³¹ R. Brusseau and A. Mizrahi-Arnaud, “Fetal Anesthesia and Pain Management for Intrauterine Therapy,” *Clinics in Perinatology* 40, no. 3, (2013): 429-442.
- ³² “Expert Report of Kanwaljeet S. Anand, M.B.B.S., D.Phil.” National Right to Life, January 15, 2014, accessed January 18, 2015, <http://www.nrlc.org/uploads/fetalpain/AnandPainReport.pdf>.

-
- ³³ S.W. Derbyshire, "Fetal Pain: Do We Know Enough to Do the Right Thing?," *Reproductive Health Matters* 16, no. 31, (2008): 117-126.
- ³⁴ Gupta, Kilby, and Cooper, "Fetal surgery and anaesthetic implications," 71-75.
- ³⁵ N.M. Fisk, R. Gitau, J.M. Teixeira, X. Giannakouloupolous, A.D. Cameron, and V.A. Glover, "Effect of direct fetal opioid analgesia on fetal hormonal and hemodynamic stress response to intrauterine needling," *Anesthesiology* 95, no. 4, (2001): 828-835.
- ³⁶ "Testimony of Maureen L. Condic, Ph.D."
- ³⁷ Lowery et al., "Neurodevelopmental Changes of Fetal Pain," 275-282.
- ³⁸ Christine Greco and Soorena Khojasteh, "Pediatric, Infant and Fetal Pain," *Case Studies in Pain Management*, edited by Alan David Kaye and Rinoo V. Shah, (Cambridge: Cambridge University Press, 2014), 379.
- ³⁹ Brusseau and Mizrahi-Arnaud, "Fetal Anesthesia and Pain Management for Intrauterine Therapy," 429-442.
- ⁴⁰ E.E. Lin and K.M. Tran, "Anesthesia for fetal surgery," *Seminars in Pediatric Surgery* 22, no. 1, (2013): 50-55 .
- ⁴¹ S. Gibbins, B. Stevens, J. Beyene, P.C. Chan, M. Bagg, and E. Asztalos, "Pain behaviours in extremely low gestational age infants," *Early Human Development* 84, no. 7, (2008): 451-458.
- ⁴² L.K. Badr, B. Abdallah, M. Hawari, S. Sidani, M. Kassar, P. Nakad, and J. Breidi, "Determinants of Premature Infant Pain Responses to Heel Sticks," *Pediatric Nursing* 36, no. 3, (2010): 129-136.
- ⁴³ "Expert Report of Kanwaljeet S. Anand."
- ⁴⁴ Ibid.
- ⁴⁵ Greco and Khojasteh, "Pediatric, Infant and Fetal Pain," 379.
- ⁴⁶ For more information, see "Doctors on Fetal Pain," accessed January 18, 2015, <http://www.doctorsonfetalpain.com/fetal-pain-the-evidence/4-documentation/#.VLVqzSvF9gg>.
- ⁴⁷ Greco and Khojasteh, "Pediatric, Infant and Fetal Pain," 379.
- ⁴⁸ "Testimony of Maureen L. Condic, Ph.D."
- ⁴⁹ Rollins and Rosen, "Anesthesia for Fetal Intervention and Surgery," 444-474.
- ⁵⁰ L. Giuntini and G. Amato, "Analgesic Procedures in Newborns," *Neonatal Pain* 73 (Giuseppe Buonocore & Carlo V. Bellieni ed.), 2007.
- ⁵¹ M. Van de Velde, D. Van Schoubroeck, L.E. Lewi, M.A.E. Marcus, J.C. Jani, C. Missant, A. Teunkens, and J.A. Deprest, "Remifentanyl for Fetal Immobilization and Maternal Sedation During Fetoscopic Surgery: A Randomized, Double-Blind Comparison with Diazepam," *Anesthesia & Analgesia* 101, no. 1, (2005): 251-258.
- ⁵² Gupta, Kilby, and Cooper, "Fetal surgery and anaesthetic implications," 71-75.
- ⁵³ M.J. Mayorga-Buiza, J. Mata, M. Rivero-Garvia, G. Antinolo, J. Marquez-Rivas, and M.L. Marenco, "Management of fetal pain during invasive fetal procedures. Lessons learned from a sentinel event: 11AP4-9," *European Journal of Anaesthesiology* 31 (2014): 88-89.
- ⁵⁴ Brusseau and Mizrahi-Arnaud, "Fetal Anesthesia and Pain Management for Intrauterine Therapy," 429-442.
- ⁵⁵ Lin and Tran, "Anesthesia for fetal surgery," 50-55.
- ⁵⁶ A.T. Bhutta, S. Garg, and S. Rovnaghi, "Fetal Response to Intra-Uterine Needling: Is It Pain? Does It Matter?" *Pediatric Research* 51, no. 1 (2002): 2.
- ⁵⁷ Greco and Khojasteh, "Pediatric, Infant and Fetal Pain," 379.
- ⁵⁸ Ibid.
- ⁵⁹ C.V. Bellieni and G. Buonocore, "Is fetal pain a real evidence?" *The Journal of Maternal-Fetal and Neonatal Medicine* 25, no. 8, (2012): 1-6.
- ⁶⁰ N.S. Adzick, "Prospects for fetal surgery," *Early Human Development* 89, (2013): 881-886.
- ⁶¹ Lin and Tran, "Anesthesia for fetal surgery," 50-55.
- ⁶² T.S. Collett, "Previability Abortion and the Pain of the Unborn," *Washington and Lee Law Review* 71, no. 2, (2014): 1222-1231.
- ⁶³ K.S. Anand and Barbara Clancy, "Fetal Pain?," *Pain: Clinical Updates* 14, no. 2, (2006).
- ⁶⁴ B. Merker, "Consciousness without a cerebral cortex: A challenge for neuroscience and medicine," *The Behavioral and Brain Sciences* 30, no. 1, (2007): 63-81.
- ⁶⁵ Brusseau, "Developmental Perspectives: Is the Fetus Conscious?," 11-23.
- ⁶⁶ R. Brusseau and L. Myers, "Developing consciousness: fetal anesthesia and analgesia," *Seminars in Anesthesia, Perioperative Medicine and Pain* 25, no. 4, (2006): 189-195.
- ⁶⁷ Van Scheltema et al., "Fetal Pain," *Fetal and Maternal Medicine Review* 19, no. 4 (2008): 311-324.
- ⁶⁸ Brusseau, "Developmental Perspectives: Is the Fetus Conscious?," 11-23.
- ⁶⁹ Anand and Clancy, "Fetal Pain?," 1-4.
- ⁷⁰ Van Scheltema et al., "Fetal Pain," 311-324.
- ⁷¹ M. Fitzgerald, "The Development of Nociceptive Circuits," *Nature Reviews: Neuroscience* 6, (2005): 507-520.

-
- ⁷² Nadja Reissland, Brian Francis, James Mason, "Can Healthy Fetuses Show Facial Expressions of 'Pain' or 'Distress'?" *Public Library of Science One* 8, no. 6, (2013): e65530.
- ⁷³ M. Sato, K. Kanenishi, U. Hanaoka, J. Noguchi, G. Marumco, and T. Hata, "4D ultrasound study of fetal facial expressions at 20–24 weeks of gestation," *International Journal of Gynecology and Obstetrics* 126, no. 3, (2014): 275–279.
- ⁷⁴ Alex Greig, "Mother shares heartbreaking photos of baby son born at just 19 weeks", *Daily Mail*, January 19, 2014, accessed January 14, 2015, <http://www.dailymail.co.uk/news/article-2542212/Mother-shares-heartbreaking-photos-baby-miscarried-19-weeks.html>.
- ⁷⁵ Andrew Levy, "Baby boy born at 23 weeks after doctors told parents he would be treated as a miscarriage celebrates first birthday after 'sandwich bag' treatment saves his life," October 14, 2014, January 18, 2015, <http://www.dailymail.co.uk/health/article-2792649/baby-boy-born-23-weeks-doctors-told-parents-treated-miscarriage-celebrates-birthday-sandwich-bag-treatment-saves-life.html>.
- ⁷⁶ *Telegraph* reporter, "Thriving a year on, the boy born a week under abortion limit," *The Telegraph*, October 8, 2014, accessed January 18, 2015, <http://www.msn.com/en-gb/news/uknews/thriving-a-year-on-the-boy-born-a-week-under-abortion-limit/ar-BB87QR8>.
- ⁷⁷ Emily Swanson and Mark Blumenthal, "Abortion Poll Finds Support For 20-Week Ban," July 11, 2013, accessed January 18, 2015, http://www.huffingtonpost.com/2013/07/11/abortion-poll_n_3575551.html.
- ⁷⁸ "New Polling Show Strong Support for Prohibiting Abortion on Pain-Capable Unborn Children," National Right to Life, April 22, 2013, <http://www.nationalrighttolifenews.org/news/2013/04/new-polling-shows-strong-support-for-prohibiting-abortion-on-pain-capable-unborn-children/#.VDWhPfldVgg>.
- ⁷⁹ "Abortion and Birth Control," accessed January 18, 2015, <http://www.pollingreport.com/abortion.htm>.
- ⁸⁰ *Stenberg v. Carhart* (99-830) 530 U.S. 914 (2000) 192 F.3d 1142, affirmed," accessed January 18, 2015, <http://www.law.cornell.edu/supct/html/99-830.ZD2.html>.
- ⁸¹ Human Slaughter Act, 7 U.S.C. 1902, accessed April 16, 2014, <http://www.law.cornell.edu/uscode/text/7/1902>.
- ⁸² "State Policies on Later Abortions," Guttmacher Institute State Policies in Brief, January 1, 2015, accessed January 18, 2015, http://www.guttmacher.org/statecenter/spibs/spib_PLTA.pdf. *A new Georgia law that would ban abortion at 20 weeks post-fertilization is only being enforced against post viability abortions. An Idaho law that bans abortion at 20 weeks post-fertilization is enjoined pending the outcome of litigation.
- ⁸³ "Counseling and Waiting Periods for Abortion," Guttmacher Institute State Policies in Brief, January 1, 2015, accessed January 18, 2015, http://www.guttmacher.org/statecenter/spibs/spib_MWPA.pdf.
- ⁸⁴ From the testimony of Dr. Sunny Anand, Director, Pain Neurobiology Laboratory, Arkansas Children's Hospital Research Institute, and Professor of Pediatrics, Anesthesiology, Pharmacology, and Neurobiology, University of Arkansas College of Medicine. U.S. Congress. House of Representatives. Committee on the Judiciary. Pain of the Unborn: Hearing Before the Subcommittee on the Constitution. 109th Cong., 1st Sess., 2005, p. 38.