

Risky Business: Prenatal Substance Use and Risk of Harm under the G2i Framework

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“While science attempts to discover the universals hiding among the particulars, trial courts attempt to discover the particulars hiding among the universals.”¹

ABSTRACT

Throughout the United States, pregnant people are incarcerated for using drugs during pregnancy. The criminalization of prenatal substance use is justified by legislatures and courts on the notion that a person puts their fetus at substantial risk when they ingest drugs. But scientific literature demonstrates that this may not be true. Beyond this, scientific evidence demonstrates that racism and the conditions of living in poverty pose threats to fetal development, potentially stronger ones than those posed by drug use. The laws criminalizing prenatal substance use, and the courts enforcing them, ignore these findings. In a criminal case for fetal harm based on prenatal substance use, the question is often whether a defendant, most often a low-income person of color, caused or risked causing harm to their fetus as a result of drug use. The legal system generally assumes that the only cause of harm is drug use, ignoring that any number of other factors could result in statistically possible or actual harm to a fetus. It is impossible to distinctly discern which factor, among an intersection of influences, caused any fetal harm if it occurred at all. Yet, in prenatal substance use cases, the current practice is for courts to rely on expert testimony to prove that the drug use caused harm, though determining the actual cause of harm is often outside their expertise. This Note argues that courts can more accurately assess the scientific validity of prenatal substance use charges by adopting a mode of analysis called the G2i framework. Applying this framework to prenatal substance use cases would be novel and holds promise to ensure courts apply the proper level of scrutiny to scientific evidence presented in criminal cases writ large.

[†]This Note was written prior to the Supreme Court’s decision to revoke the constitutional right to abortion. As such, only the conclusion touches on the impact this has on the criminalization of pregnancy within the United States.

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¹ DAVID L. FAIGMAN, LEGAL ALCHEMY: THE USE AND MISUSE OF SCIENCE IN THE LAW 69 (2000).

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INTRODUCTION

In November 2006, Rennie Gibbs suffered a stillbirth; the umbilical cord had been wrapped around the baby's neck.² Within days, the stillbirth was ruled a homicide. The medical examiner hired to perform the baby's autopsy had found a cocaine byproduct in Gibbs' bloodstream.³ As a result, Gibbs, a Black teenager, was charged with "depraved heart murder."⁴ This charge rested on the theory that, by smoking crack during pregnancy, she caused the death of her baby.⁵ She faced a sentence of life in prison for this charge.⁶

The medical examiner employed by the prosecution in Gibbs' case was "highly controversial."⁷ He has been repeatedly hired by the state of Mississippi and other states to perform autopsies "[d]espite never having completed his certification test for the American Board of Pathology"⁸ and having been accused of "being sloppy, exaggerating his credentials, and leaping to conclusions that sometimes had no basis in science."⁹ Gibbs argued, in her defense against the charge of depraved heart murder, that the medical examiner did not order tests to rule out other common causes of stillbirth.¹⁰ In 2014, the charges against Gibbs were dismissed without prejudice.¹¹ Soon after, however, the prosecutor vowed to re-indict Gibbs, this time for manslaughter,¹² which comes with a penalty of up to 20 years in prison.¹³

Though there are many stories like that of Rennie Gibbs throughout the United States, such stories are rarely told at trial; most criminal charges of

² Nina Martin, *A Stillborn Child, A Charge of Murder and the Disputed Case Law on 'Fetal Harm'*, PROPUBLICA (Mar. 18, 2014, 12:00 PM), <https://www.propublica.org/article/still-born-child-charge-of-murder-and-disputed-case-law-on-fetal-harm>, archived at <https://perma.cc/9T5Z-SDP4>.

³ Jessica Mason Pieklo, *Murder Charges Dismissed in Mississippi Stillbirth Case*, REWIRE NEWS GROUP (Apr. 4, 2014, 2:43 PM), <https://rewirenewsgroup.com/2014/04/04/murder-charges-dismissed-mississippi-stillbirth-case/>, archived at <https://perma.cc/X85A-ZF9K>.

⁴ *Id.*

⁵ Martin, note 2.

⁶ *Id.*

⁷ Amanda Marcotte, *Teen Mom Used Cocaine While Pregnant. Her Baby Died. Mississippi Charged Her With Murder.*, SLATE (Mar. 19, 2014, 11:48 AM), <https://slate.com/human-interest/2014/03/rennie-gibbs-case-mississippi-charges-black-teenager-with-murder-for-using-cocaine-while-pregnant-after-her-baby-dies.html>, archived at <https://perma.cc/RU6W-P88K>.

⁸ *Id.*

⁹ Martin, *supra* note 2.

¹⁰ *Id.*

¹¹ Pieklo, *supra* note 3.

¹² *See id.*

¹³ *See* Nina Martin, *Judge Throws Out Murder Charge in Mississippi Fetal Harm Case*, PROPUBLICA (Apr. 4, 2014, 2:00 PM), <https://www.propublica.org/article/judge-throws-out-murder-charge-in-mississippi-fetal-harm-case>, archived at <https://perma.cc/8KYP-8RP8>.

prenatal substance use result in a guilty pleas.¹⁴ Those who have gone to trial, were convicted, and later appealed their convictions, however, have largely seen those convictions overturned.¹⁵ Of the successful appeals, most center on how criminal statutes are interpreted,¹⁶ turning on whether the word “child” in the relevant statute includes a fetus (often finding it does not).¹⁷ Some successful appeals have won on questions of due process or privacy, with courts finding that the prosecution violated one of these constitutional commands.¹⁸ However, courts rarely consider the scientific validity of prenatal substance use charges. In particular, few courts have been concerned with, at least as a primary matter, whether the pregnant person actually caused or posed substantial risk of harm to the fetus by ingesting drugs. But it is vital that courts do focus on, or at least consider, whether the criminal charges are scientifically valid. While a legislature determines a state’s criminal code and a prosecutor enforces it, it is courts that must ensure that a person charged with a crime has been found guilty beyond a reasonable doubt before being convicted. Without addressing whether ingesting a substance, such as cocaine, actually harms a fetus in the specific case at hand, courts are failing to perform their central function in establishing that a conviction is based on evidence beyond a reasonable doubt.

The laws criminalizing prenatal substance use, and the courts enforcing them, ignore evidence of factors other than drug use that may cause fetal harm. In a criminal case for fetal harm based on prenatal substance use, the question is whether a defendant caused harm to their fetus as a result of drug use. Often, the mere act of drug use is solely considered as the potential cause of harm. That analysis ignores the substantial evidence demonstrating that socioeconomic status and racial group are strongly associated with adverse birth outcomes, and the majority of those arrested for prenatal substance use are low-income women and women of color. In the large proportion of cases, any number of factors other than drug use could result in statistically possible or actual harm to a fetus. By ignoring other potential causes of harm to the fetus prosecutors fail to establish defendants’ guilt beyond a reasonable doubt, and courts sanction it. This Note considers the impact poverty has on harming a fetus. Specifically, this Note argues that the presence of other potentially harmful factors to a fetus creates a degree of reasonable doubt that is nearly impossible to overcome. Thus, prenatal substance use prosecutions threaten incarceration for one action (drug use), even

¹⁴ See Myrisha S. Lewis, *Criminalizing Substance Abuse and Undermining Roe v. Wade: The Tension Between Abortion Doctrine and the Criminalization of Prenatal Substance Abuse*, 23 WM. & MARY J. WOMEN & L. 185, 193 (2017).

¹⁵ See Dorothy E. Roberts, *Unshackling Black Motherhood*, 95 MICH. L. REV. 938, 939 (1997); see also Cara Angelotta & Paul S. Applebaum, *Criminal Charges for Child Harm from Substance Use in Pregnancy*, 45 J. AM. ACAD. PSYCHIATRY L. 193, 200 (2017).

¹⁶ See *id.* at 940.

¹⁷ See *id.*

¹⁸ See *id.*

though a fetus could be predisposed to the same alleged harm due to other circumstances, such as poverty, thereby often criminalizing the fact of being pregnant while poor.

In prenatal substance use cases, the current practice is for courts to rely strongly on expert testimony, such as that of the medical examiner in Gibbs' case. Experts can offer general statements about the impacts of drug ingestion on pregnancy, based on "aggregate data across groups of individuals,"¹⁹ but courts and juries are tasked with deciding the outcome of a case by determining whether a specific defendant harmed their fetus when they ingested cocaine. In this regard, criminal prosecutions are intended to be fact-specific to each case at issue.

This Note contends that courts can accurately assess the scientific validity of prenatal substance use charges by adopting a mode of analysis called the G2i framework, which has been proposed by academics for courts to understand causation in toxic tort cases.²⁰ The G2i framework aims to mitigate challenges that arise when decision-makers rely on group data (G) to make decisions about individuals (i).²¹ The G2i framework addresses these challenges head-on, providing three steps for courts to follow. Under this framework, courts would analyze prenatal substance use charges by: 1) correctly diagnosing the condition; 2) determining whether the perceived cause of prenatal substance use can possibly cause the condition, known as "ruling in" or establishing "general causation;" and 3) eliminating alternative causes, known as "ruling out" or establishing "specific causation." Applying this framework to prenatal substance use cases would be novel and holds promise to ensure courts apply the proper level of scrutiny to scientific evidence presented in criminal cases writ large.

This Note will proceed in three parts. Part I contextualizes the criminalization of prenatal substance use, addresses the question of causation, and reviews the scientific literature concerning drug use and fetal harm. Part II reviews three statutes used to prosecute prenatal substance use, and describes how, in cases brought under those statutes, scientific evidence is currently evaluated by courts. Part III argues that courts should utilize the G2i framework to evaluate whether harm to the fetus was actually caused by prenatal substance use to a reasonable degree of confidence. As this Note will reveal, fetal harm is rarely the result of a single factor, but rather is based on a combination of factors. Applying this framework, this Note concludes that when harm to the fetus can be attributed to multiple factors—and not solely to drug use—a court cannot find beyond a reasonable doubt that a defendant caused fetal harm or death because of their drug use.

¹⁹ David L. Faigman et al., *G2i Knowledge Brief: A Knowledge Brief of the MacArthur Foundation Research Network on Law and Neuroscience*, MACARTHUR FOUND. RES. NETWORK ON L. & NEUROSCIENCE 1, 1 (2017).

²⁰ See generally Joseph Sanders, et al., *Differential Etiology: Inferring Specific Causation in The Law from Group Data in Science*, 63 ARIZ. L. REV. 851 (2021).

²¹ See Faigman et al., *supra* note 19.

I. CONTEXTUALIZING THE CRIMINALIZATION OF PRENATAL SUBSTANCE USE

The criminalization of prenatal substance use is one of many means employed by the state to police pregnancy.²² In fact, pregnant people's²³ bodies are policed to the extent of being treated as "property of the state."²⁴ In the United States, 1 in 160 pregnancies will result in a stillbirth.²⁵ This may sound like a small risk, but "[m]ore babies die as a result of stillbirth than of all other causes of infant deaths combined."²⁶ Around 10 to 20% of pregnancies will end in miscarriage, though estimates are up to thirty to fifty percent when including those who miscarry prior to knowing they are pregnant;²⁷ preterm birth affects roughly ten percent of infants and up to approximately fourteen percent for Black pregnancies;²⁸ and about one in twelve babies, or eight percent, are born with low birth weight.²⁹ These adverse

²² See generally MICHELE GOODWIN, *POLICING THE WOMB: INVISIBLE WOMEN AND THE CRIMINALIZATION OF MOTHERHOOD* (2020). Most recently, Texas' S.B.8 established a bounty system, deputizing any person, anywhere, to sue any person involved in performing abortions or supporting an individual in obtaining an abortion. "Vigilante plaintiffs" can collect \$10,000 plus legal fees if they are successful in their lawsuits, but bear no penalty if they lose. Alan Feuer, *The Texas Abortion Law Creates a Kind of Bounty Hunter. Here's How It Works.*, N.Y. TIMES (Oct. 7, 2021), <https://www.nytimes.com/2021/09/10/us/politics/texas-abortion-law-facts.html>, archived at <https://perma.cc/6H3U-TLKE>.

²³ This Note often switches between the terms "pregnant people" and "pregnant women." To clarify, this Note aims to be gender-neutral and therefore uses the term "people" rather than "women." However, many of the sources cited by this Note refer exclusively to women. When referencing those sources, this Note adopts their gendered terminology.

²⁴ Katha Pollitt, *The long fight for reproductive rights is only getting harder*, WASH. POST (May 13, 2020, 6:00 AM), https://www.washingtonpost.com/outlook/the-long-fight-for-reproductive-rights-is-only-getting-harder/2020/05/12/2fda9f2a-8326-11ea-878a-86477a724bdb_story.html, archived at <https://perma.cc/C3NS-2LUG>.

²⁵ *Management of Stillbirth*, AM. COLL. OF OBSTETRICIANS & GYNECOLOGISTS 110, 110 (2020).

²⁶ Joanne Cacciatore & Suzanne Bushfield, *Stillbirth: A Sociopolitical Issue*, 23 J. WOMEN & SOC. WORK 378, 380 (2008).

²⁷ See Gabriela Weigel, Laurie Sobel, & Alina Salganicoff, *Understanding Pregnancy Loss in the Context of Abortion Restrictions and Fetal Harm Laws*, KAISER FAMILY FOUND. (Dec. 4, 2019), <https://www.kff.org/womens-health-policy/issue-brief/understanding-pregnancy-loss-in-the-context-of-abortion-restrictions-and-fetal-harm-laws/>, archived at <https://perma.cc/8GPZ-YMQU>; accord Kirsten Weir, *Healing the wounds of pregnancy loss*, 49 AM. PSYCHOLOGICAL ASS'N 26 (2018); Cf. Judy Slome Cohain, Rina E. Buxbaum, & David Mankuta, *Spontaneous first trimester miscarriage rates per woman among parous women with 1 or more pregnancies of 24 weeks or more*, 17 BMC Pregnancy and Childbirth (Dec. 22, 2017), <https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-017-1620-1>, archived at <https://perma.cc/MU9U-EJF3> (finding that 43% of the studied population reported a history of one or more miscarriage in the first trimester).

²⁸ *Preterm birth*, CTRS. FOR DISEASE CONTROL AND PREVENTION, <https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pretermbirth.htm>, archived at <https://perma.cc/S9S8-7SGJ>.

²⁹ *Birthweight and Gestation*, CTRS. FOR DISEASE CONTROL AND PREVENTION, <https://www.cdc.gov/nchs/fastats/birthweight.htm>, archived at <https://perma.cc/NCJ5-2PYJ>; *Low Birthweight*, MARCH OF DIMES, <https://www.marchofdimes.org/complications/low-birth-weight.aspx#:~:text=About%201%20in%2012%20babies,is%20born%20with%20low%20birthweight>, archived at <https://perma.cc/N6NP-TD8P>.

pregnancy outcomes happen for a variety of reasons that do not reflect an intent to terminate or harm the pregnancy. Yet, pregnant people are often criminalized for common situations that may result in harm to the fetus.³⁰ In all of these cases, the state imposes criminal penalties for a person's behavior, decisions, or circumstances during pregnancy.

Unfortunately, there is limited data available on arrests for prenatal substance use. This leaves a scattershot view, but the available data reveals that arrests for prenatal substance use are pervasive.³¹ One national study found that between 1973 and 2005, 348 women were arrested for drug use during pregnancy.³² Another study determined that in Alabama alone, there have been around 500 prosecutions of new or expecting mothers since 2006.³³ Those prosecuted for prenatal substance use have faced a variety of charges, from child abuse or endangerment to homicide in certain cases involving stillbirth,³⁴ such as Rennie Gibbs. The charges also concern a range of drugs: cocaine,³⁵ methamphetamine,³⁶ marijuana,³⁷ opiates,³⁸ and valium,³⁹ among others. This Note will focus on prenatal cocaine use due to its historical overrepresentation in arrests for prenatal substance use⁴⁰ and its relation to

³⁰ As two examples, Christine Taylor was charged with attempted feticide for tripping while pregnant. See Michele Goodwin, *Fetal Protection Laws: Moral Panic and the New Constitutional Battlefront*, 102 CALIF. L. REV. 781, 806–08 (2014); Melissa Rowland was charged with murder for refusing a Cesarean delivery. See generally Howard Minkoff & Lynn M. Paltrow, *Melissa Rowland and the Rights of Pregnant Women*, 104 OBSTETRICS & GYNECOLOGY 1234 (2004).

³¹ It is impossible to determine the full extent of the criminalization of prenatal substance abuse mainly due to the lack of comprehensive data. We therefore must draw conclusions from the data that is available.

³² See Lynn M. Paltrow & Jeanne Flavin, *Arrests of and Forced Interventions on Pregnant Women in the United States, 1973–2005: Implications for Women's Legal Status and Public Health*, 38 J. HEALTH POL. POL'Y & L. 299, 310 (2013).

³³ See Nina Martin, *Take a Valium, Lose Your Kid, Go to Jail*, PROPUBLICA (Sept. 23, 2015), <https://www.propublica.org/article/when-the-womb-is-a-crime-scene>, archived at <https://perma.cc/ZF3U-QDB3>. This count begins in 2006 because it is the year Alabama enacted its chemical endangerment law.

³⁴ Child abuse and endangerment charges are the most common charges brought. See Paltrow & Flavin, *supra* note 32, at 311 (stating that of 354 documented cases brought under existing statutes, 204 cases were concerned abuse/endangerment and 48 cases concerned homicide); see also Angelotta & Applebaum, *supra* note 15, at 194 (demonstrating a similar distribution).

³⁵ Paltrow & Flavin, *supra* note 32, at 310.

³⁶ *Id.*

³⁷ *Id.*

³⁸ *Id.*

³⁹ See Martin, *supra* note 33.

⁴⁰ See Paltrow & Flavin, *supra* note 32, at 310 (stating that of 348 documented cases, 282 cases were based on cocaine ingestion); See also Angelotta & Applebaum, *supra* note 15, at 194 (demonstrating that cases concerning cocaine were the most represented). As described in the next section, the War on Drugs placed specific emphasis on crack use and inspired the “crack baby” panic described herein. Cocaine use therefore has played a specific role in the historic criminalization and policing of Black people. For more information on the way the War on Drugs was used to police pregnancy, see National Advocates for Pregnant Women, *Policing Pregnancy Through the War on Drugs*, YOUTUBE (Apr. 26, 2021), <https://www.youtube.com/watch?v=2MCkQmII0>, archived at <https://perma.cc/PS6G-3Z2R>.

state control of Black bodies; however, the arguments made herein apply similarly to other substances.⁴¹

A. *The Historical Focus On Black People Using Drugs: A Review Of Systemic Oppression*

Drug use has been criminalized as a result of systemic oppression and racism. Drug use during pregnancy, and outside of pregnancy for that matter, does not reflect any individual or group moral failing. Rather, it is a symptom of larger forces targeting marginalized and poor communities. The War on Drugs and mass incarceration embody such forces.⁴² By identifying, grappling with, and pushing against these unjust systemic forces, it is possible to shift the false narrative that marginalized and poor communities disproportionately use drugs and illustrate that drug use can be a symptom of systemic oppression.

Government actors have long created and enforced racist policies that criminalize marginalized and poor communities. For example, in 1971, then-President Richard Nixon announced the War on Drugs. He declared that “America’s public enemy number one . . . is drug abuse. In order to fight and defeat this enemy, it is necessary to wage a new, all-out offensive.”⁴³ Many argue that “the War on Drugs” failed, pointing to the increase in drug use,⁴⁴ while others argue that it functioned exactly according to its actual plan: to criminalize Black people for using drugs, and to incarcerate them for it.⁴⁵ Nixon’s domestic policy advisor, John Ehrlichman, admitted in a 1994 interview that the War on Drugs was entirely motivated by animus toward Black people and the anti-war Left:

⁴¹ It is similarly argued that, like the arguments made herein regarding cocaine, none of these substances used to criminalize pregnancy are teratogens. See *Pregnancy and Drug and Alcohol Use*, NAT’L ADVOCATES FOR PREGNANT WOMEN, <https://www.nationaladvocatesforpregnantwomen.org/issues/pregnancy-and-drug-and-alcohol-use/>, archived at <https://perma.cc/LYA5-9SP6>.

⁴² See generally Nkechi Taifa, *Race, Mass Incarceration, and the Disastrous War on Drugs*, BRENNAN CTR. FOR JUSTICE (May 10, 2021), <https://www.brennancenter.org/our-work/analysis-opinion/race-mass-incarceration-and-disastrous-war-drugs>, archived at <https://perma.cc/BY8U-FZQG>.

⁴³ Conor Friedersdorf, *The War on Drugs Turns 40*, THE ATLANTIC (June 15, 2021), <https://www.theatlantic.com/politics/archive/2011/06/the-war-on-drugs-turns-40/240472/>, archived at <https://perma.cc/A9QC-6XV3>.

⁴⁴ See, e.g., Krystina Murray, *US Drug Use Peaks After 50 Year War on Drugs*, ADDICTION CTR. (July 7, 2021), <https://www.addictioncenter.com/news/2021/07/drug-use-peaks-after-50-year-war-on-drugs/>, archived at <https://perma.cc/X6BU-23HG>. The United Nations estimates that between 1998 and 2008, global annual cocaine consumption increased 27% and opiate consumption increased 34.5%. See Global Commission on Drug Policy, *War on Drugs: Report of the Global Commission on Drug Policy* 1, 4 (2011).

⁴⁵ See LZ Granderson, *Column: The ‘war on drugs’ was always about race*, LOS ANGELES TIMES (July 21, 2021, 9:58 AM), <https://www.latimes.com/opinion/story/2021-07-21/the-war-on-drugs-was-always-about-race>, archived at <https://perma.cc/W7ZB-V5R4>.

“We knew we couldn’t make it illegal to be either against the war or black, but by getting the public to associate the hippies with marijuana and blacks with heroin, and then criminalizing them both heavily, we could disrupt those communities. We could arrest their leaders, raid their homes, break up their meetings, and vilify them night after night on the evening news. Did we know we were lying about the drugs? Of course we did.”⁴⁶

If the goal, as stated here, was to increase incarceration for Black Americans, then the War on Drugs has been a success. Between 1972 and 2009, the U.S. prison population grew nearly 700%.⁴⁷ Moreover, Black Americans are incarcerated more than five times the rate of white Americans, according to 2018 data from the Bureau of Justice Statistics.⁴⁸

The story of the War on Drugs is largely one of racially disproportionate incarceration. Take, for example, the sentencing disparity between convictions for possessing crack and powder cocaine, both of which are forms of cocaine. The Omnibus Anti-Drug Abuse Act of 1988 created a five-year mandatory minimum and a twenty-year maximum sentence for possessing five or more grams of crack cocaine. In contrast, the penalty for possession of any amount of powder cocaine was a maximum sentence of one year in prison.⁴⁹ The U.S. Sentencing Commission found that, among federal convictions for crack cocaine distribution in 1993, 88.3% were Black people and 4.1% were white people.⁵⁰ In contrast, the racial breakdown for powder cocaine distribution offenses in 1993 was 32% white people and 27.4% Black people.⁵¹ The prioritization of policing crack cocaine use was therefore purposeful: in the 1990s, “[p]ublic opinion tend[ed] to associate the country’s drug crisis, specifically its perceived ‘crack problem,’ with Black, inner-city neighborhoods.”⁵² Contrary to this popular belief, though, a sur-

⁴⁶ Erik Sherman, *Nixon’s Drug War, An Excuse To Lock Up Blacks And Protesters, Continues*, FORBES (Mar. 23, 2016, 6:00 AM), [https://www.forbes.com/sites/eriksherman/2016/03/23/nixons-drug-war-an-excuse-to-lock-up-blacks-and-protesters-continues/](https://www.forbes.com/sites/eriksherman/2016/03/23/nixons-drug-war-an-excuse-to-lock-up-blacks-and-protesters-continues/?sh=5f9370a242e8)?sh=5f9370a242e8, archived at <https://perma.cc/5CLJ-3RTA>.

⁴⁷ Nazgol Ghandnoosh, *U.S. Prison Population Trends: Massive Buildup and Modest Decline*, SENTENCING PROJECT 1, 1 (Sept. 17, 2019), <https://www.sentencingproject.org/publications/u-s-prison-population-trends-massive-buildup-and-modest-decline/>, archived at <https://perma.cc/PF95-NEL5>.

⁴⁸ See E. Ann Carson, *Prisoners in 2018*, BUREAU OF JUSTICE STATISTICS, 1, 9 (April 2020), <https://bjs.ojp.gov/content/pub/pdf/p18.pdf>, archived at <https://perma.cc/NZZ2-KBCK> (finding that in 2018, the imprisonment rate of Black U.S. residents was 1,134 per 100,000 compared to 218 per 100,000 for white U.S. residents, yielding a rate roughly 520% higher for Black people).

⁴⁹ Deborah J. Vagins & Jesselyn McCurdy, *Cracks in the System: Twenty Years of Unjust Federal Crack Cocaine Law*, AM. CIVIL LIBERTIES UNION 1, 2 (Oct. 2006), https://www.aclu.org/sites/default/files/field_document/cracksinsystem_20061025.pdf, archived at <https://perma.cc/FHS9-3XVB>.

⁵⁰ UNITED STATES SENTENCING COMMISSION, *Cocaine and Federal Sentencing Policy*, at Table 13 (1995).

⁵¹ *Id.*

⁵² *Id.* at 38.

vey⁵³ from the same time period by the National Institute on Drug Abuse found that the majority of those reporting powder cocaine or crack use were white people.⁵⁴

The War on Drugs oppresses marginalized communities, and then faults these communities for the outcomes of this oppression.⁵⁵ As recently as 2016, “Black people were still getting arrested at more than twice the rate that white people were for cocaine offenses.”⁵⁶ The 2015 National Survey on Drug Use and Health found similar rates of cocaine use among Black and white populations for lifetime use, use in the past year, and use in the past month.⁵⁷ For lifetime use specifically, 16.8% of white respondents reported cocaine use compared to 10.3% of Black respondents.⁵⁸

The prosecution of pregnant people for prenatal substance use is an outgrowth of the War on Drugs, and specifically the “crack baby” panic that this “war” produced.⁵⁹ The panic was instigated by a study conducted by Dr. Ira Chasnoff, which was based on a sample size of only 23 babies and lacked any control group.⁶⁰ Dr. Chasnoff concluded that *in utero* crack exposure caused some babies to be born with brain damage.⁶¹ The study incited political and media hysteria. A “consensus of narratives among journalists” arose “prophes[ying] that ‘crack babies’ would grow up to be ‘joyless,’ their futures would be ‘bleak,’ and schools were destined to be overwhelmed by their presence in the classroom.”⁶² A former director of the National Center on Child Abuse termed these children the “bio-underclass.”⁶³ The scientific and media focus on crack cocaine use, as opposed to powder cocaine, was intentional: it fed into the War on Drugs narrative that Black people are the

⁵³ National Household Survey on Drug Abuse (NHSDA) is a self-report survey that produces estimates of drug use among household members aged twelve years and older. *Id.* at 32.

⁵⁴ NAT'L. INST. DRUG ABUSE, *National Household Survey on Drug Abuse: Main Findings* 1991, at 56 (1993).

⁵⁵ This societal response can be contrasted with that of the opioid epidemic. The opioid epidemic most heavily impacts white people. Looking at opioid overdose deaths between 1997 and 2017, “approximately 323,939 total deaths were attributed to White, Non-Hispanics, while 75,291 were attributed to all other ethnicities.” Jasmine Drake, Creaque Charles, Jennifer W. Bourgeois, Elycia S. Daniel, & Melissa Kwende, *Exploring the impact of the opioid epidemic in Black and Hispanic communities in the United States*, 6 DRUG, SCIENCE, POLY AND L. 1, 1 (2020). The opioid crisis “has highlighted the need to treat drug addiction as a public health issue, [while] that framing has not extended to other highly criminalized drugs.” *Race and the War on Drugs*, NAT'L ASS'N OF CRIMINAL DEFENSE LAWYERS (May 21, 2021), <https://www.nacdl.org/Content/Race-and-the-War-on-Drugs>, archived at <https://perma.cc/27WY-FYR9>.

⁵⁶ *Race and the War on Drugs*, *supra* note 55.

⁵⁷ *Results from the 2015 National Survey on Drug Use and Health: Detailed Tables*, SUBSTANCE ABUSE AND MENTAL HEALTH SERVICES ADMIN. 1, 253 (Sept. 8, 2016), <https://www.samhsa.gov/data/sites/default/files/NSDUH-DefTabs-2015/NSDUH-DefTabs-2015/NSDUH-DefTabs-2015.pdf>, archived at <https://perma.cc/9MW2-XZYH>.

⁵⁸ *Id.*

⁵⁹ See Goodwin, *supra* note 30, at 845.

⁶⁰ See *id.* at 846.

⁶¹ See *id.*

⁶² GOODWIN, *supra* note 22, at 18.

⁶³ Roberts, *supra* note 15, at 949.

only ones who use crack cocaine. “[T]he media left the impression that the pregnant addict is typically a Black woman. . . . the pregnant crack addict was the latest embodiment of the bad Black mother.”⁶⁴ This rhetoric “made brutes out of people of color.”⁶⁵ Though the “crack baby” has proven to be a myth,⁶⁶ its role in devaluing Black motherhood is anything but.⁶⁷

Drug use during pregnancy is by no means exclusive to Black women, but they are the most criminalized for it. One study from 1990 found that though Black and white women used drugs during pregnancy at approximately the same rates,⁶⁸ Black women were reported to law enforcement for drug use at *ten times* the rate of white women.⁶⁹ What’s more, both private doctors and public health facilities have been found to be more likely to report Black women to law enforcement than white women.⁷⁰ Subsequent studies have replicated these findings: Paltrow and Flavin found that 52% of those arrested for using drugs while pregnant were Black and 71% were indigent.⁷¹ They also found that Black women were 19.7% more likely to be charged with felonies for using drugs during pregnancy than white women.⁷² By mid-1992, 75% of prenatal substance use prosecutions were brought against women of color.⁷³ Historically, these prosecutions have been focused on women of color. But as Michele Goodwin predicted, “fetal protection prosecutions [jumped] the so-called color line,”⁷⁴ with prosecutions in Ala-

⁶⁴ *Id.* at 950.

⁶⁵ Vann R. Newkirk II, *What the ‘Crack Baby’ Panic Reveals About The Opioid Epidemic*, THE ATLANTIC (July 16, 2017), <https://www.theatlantic.com/politics/archive/2017/07/what-the-crack-baby-panic-reveals-about-the-opioid-epidemic/533763/>, archived at <https://perma.cc/C3ES-M6RQ>.

⁶⁶ See, e.g., Lynn M. Paltrow & Kathrine D. Jack, *Pregnant Women, Junk Science, and Zealous Defense*, 34 CHAMPION 30, 31 (2010) (“Throughout almost 20 years of research, none of us has identified a recognizable condition, syndrome or disorder that should be termed ‘crack baby.’”).

⁶⁷ See Roberts, *supra* note 15.

⁶⁸ See Ira J. Chasnoff, Harvey J. Landress, & Mark E. Barrett, *The Prevalence of Illicit Drug or Alcohol Use During Pregnancy and Discrepancies in Mandatory Reporting in Pinellas County, Florida*, 322 NEW ENG. J. MED. 1202, 1204 (1990) (“[I]n the population we surveyed the frequency of positive results on toxicologic testing of urine samples obtained at the first prenatal visit was similar for white women (15.4 percent) and black women (14.1 percent).”). But see CTR. FOR BEHAVIORAL HEALTH STATISTICS AND QUALITY, *SUBSTANCE USE DURING PREGNANCY VARIES BY RACE AND ETHNICITY* (2010) 1, 1, <https://www.samhsa.gov/data/sites/default/files/Spot062PregnantRaceEthnicity2012/Spot062PregnantRaceEthnicity2012.pdf>, archived at <https://perma.cc/6YDF-VZAZ> (stating that 7.7% of Black women use drugs during pregnancy compared to 4.4% of white women).

⁶⁹ Chasnoff, *supra* note 68, at 1204; This does not hold in Alabama, where 73% of chemical-endangerment defendants who were pregnant or new moms have been white. See Nina Martin & Amy Yurkanin, *Special report: Alabama leads nation in turning pregnant women into felons*, AL.COM (Sept. 23, 2015), https://www.al.com/news/2015/09/when_the_womb_is_a_crime_scene.html, archived at <https://perma.cc/EK9S-Y9VJ>.

⁷⁰ See Roberts, *supra* note 15, at 948.

⁷¹ Paltrow & Flavin, *supra* note 32, at 310. This calculation is based on the data provided in Table 2.

⁷² See *id.* at 313.

⁷³ See Roberts, *supra* note 15, at 938.

⁷⁴ GOODWIN, *supra* note 22, at 14.

bama centering on low-income white women.⁷⁵ As such, with regard to the criminalization of prenatal substance use, “Black women were simply the euphemistic canaries in the coal mine.”⁷⁶

Policy actors and the media driven sensation may be responsible for disproportionately policing drug use among Black women, but courts have played a critical role by legitimating it. No fact pattern exemplifies this quite like that in the Supreme Court case *Ferguson v. City of Charleston*.⁷⁷ In 1988, a nurse (“Nurse Brown”) at the Medical University of South Carolina heard on the news that police in Greenville, South Carolina were arresting pregnant people using cocaine for child abuse.⁷⁸ Nurse Brown discussed what she heard on the news with the hospital’s general counsel, who then reached out to the City Solicitor to offer the hospital’s cooperation in prosecuting mothers who tested positive for cocaine at the time that their children were born.⁷⁹ Nurse Brown was “integral to [the policy’s] everyday implementation” within the hospital.⁸⁰ Medical staff tested mothers’ urine to screen for drugs⁸¹ without informing them or obtaining a warrant.⁸² When cocaine use was detected after a baby’s birth,⁸³ the hospital notified police “without delay” and the patient was “promptly arrested.”⁸⁴ Some women were arrested “while still bleeding, weak and in pain from having just given birth.”⁸⁵ As a result of Nurse Brown’s intervention and in a clear indication of racial bias, twenty-nine of the thirty women arrested were Black.⁸⁶ Nurse Brown admitted to calling the Solicitor’s office to “request another ‘chance’ on behalf of a white patient who should have been arrested under the Policy’s terms.”⁸⁷ And as to the one white woman arrested, there is evidence to indicate that the arrest was also motivated by racial bias. Nurse Brown noted on

⁷⁵ See Katherine Koster, *Alabama’s Chemical Endangerment Laws: Where the War on Drugs Meets the War on Women*, HUFFPOST (Sep. 25, 2015 at 12:35 PM), https://www.huffpost.com/entry/alabamas-chemical-endange_b_8193196, archived at <https://perma.cc/8RMN-WVXP>. (“Nationally, research indicates that women of color are disproportionately criminalized or subject to DCFS intervention for drug use during pregnancy. In Alabama, however, white-majority counties have used the chemical endangerment act to prosecute pregnant women most frequently.”)

⁷⁶ GOODWIN, *supra* note 22, at 14.

⁷⁷ *Ferguson v. City of Charleston*, 532 U.S. 67, 67–86 (2001).

⁷⁸ *Id.* at 70.

⁷⁹ *See id.* at 70–71.

⁸⁰ Brief for Petitioners at 13, n.10, *Ferguson v. City of Charleston*, 532 U.S. 67 (2001) (No. 99–936), 2000 WL 728149.

⁸¹ *See Ferguson*, 532 U.S. at 70.

⁸² *See generally* Brief for Petitioners, *Ferguson v. City of Charleston*, 532 U.S. 67 (2001) (No. 99–936), 2000 WL 728149.

⁸³ If a mother was screened for drug use prior to birth, and tested positive, “police were to be notified (and the patient arrested) “only if the patient tested positive for cocaine a second time or if she missed an appointment with a substance abuse counselor.” *Ferguson*, 532 U.S. at 72.

⁸⁴ *Id.*

⁸⁵ Goodwin, *supra* note 30, at 826.

⁸⁶ *Id.* at 825.

⁸⁷ *Id.* at 826, n.255.

her medical chart: “Patient live[s] with . . . a Negro” and stated in court that she believed interracial relationships were against “God’s way.”⁸⁸ Relatedly, Nurse Brown “raised the option of sterilization for [B]lack women . . . but not for white women.”⁸⁹

The Court notably failed to touch on the racism underlying both the policy and its application, even though Ferguson’s attorneys briefed the Court on the issue of overt racial discrimination. In their brief, the appellants argued that the discretion granted to the hospital through its search policy “resulted in a protocol that disproportionately targeted indigent, African-American women for search and then arrest.”⁹⁰ The brief also noted that the hospital’s policy was designed “to focus on cocaine to the exclusion of other illegal or legal drugs that could harm the fetus.”⁹¹ Disregarding these arguments, the Court focused instead on the “pervasive involvement of law enforcement” in the planning and execution of hospital procedures, holding that the drug testing scheme violated the Fourth Amendment.⁹² In failing to acknowledge this clear targeting of Black mothers, though, the Court implicitly condoned it.

B. *The Relationship Between Cocaine Ingestion And Fetal Harm: An Evaluation Of The Evidence*

As demonstrated in *Ferguson v. City of Charleston*, the extensive media coverage⁹³ of the “crack baby” epidemic incited widespread fear of cocaine-exposed babies and their mothers.⁹⁴ But the actual relationship between cocaine ingestion and fetal health is widely contested. In 2004, “virtually every expert” in the field of prenatal drug exposure joined an open letter lambasting the “crack baby” as a myth.⁹⁵

⁸⁸ *Id.* at 825-26.

⁸⁹ *Id.* at 826.

⁹⁰ Brief for Petitioners at 12, *Ferguson v. City of Charleston*, 532 U.S. 67 (2001) (No. 99–936), 2000 WL 728149.

⁹¹ *Id.* at 11.

⁹² *Ferguson*, 532 U.S. at 85.

⁹³ See generally Paltrow & Jack, *supra* note 66.

⁹⁴ See *id.* at 30 (“For nearly two decades, popular media was full of highly prejudicial and often inaccurate information about the effects of *in utero* cocaine exposure.”); accord Mishka Terplan & Tricia Wright, *The Effects of Cocaine and Amphetamine Use During Pregnancy on the Newborn: Myth Versus Reality*, 30 J. ADDICTIVE DISEASES 1, 2 (2010). As described above, the “crack baby” panic was a mechanism to justify the war on drug users, portraying drug use as an individual moral failing. This media-induced panic also served another, larger purpose: to advance the anti-abortion movement by creating a fetal personhood narrative, casting the pregnant drug user as “selfish[ly] neglig[en]t” or having hostility toward the “innocent” fetus. See Wendy Chavkin, *Cocaine and Pregnancy—Time to Look at the Evidence*, 285 J. AM. MED. ASS’N. 1626, 1626 (2001).

⁹⁵ See Paltrow & Jack, *supra* note 66 (“Throughout almost 20 years of research, none of us has identified a recognizable condition, syndrome or disorder that should be termed ‘crack baby.’”).

Empirically, the risks of prenatal cocaine ingestion are not nearly as severe or long-lasting as the media has portrayed them to be. A cursory review will yield an abundance of web pages—including hospitals, nonprofits, and medical media pages—listing the dangers associated with fetal cocaine exposure. But a deeper look into scientific studies reveals a more nuanced reality. In general, studies show that cocaine is a weak teratogen⁹⁶ in humans, if one at all.⁹⁷ For example, studies show that cocaine use during pregnancy can lead to babies being born smaller⁹⁸ and to an increased rate of

⁹⁶ A teratogen is an agent or factor that can cause a birth defect.

⁹⁷ See S. Robert Snodgrass, *Cocaine Babies: A Result of Multiple Teratogenic Influences*, 9 J. CHILD NEUROLOGY 227, 228 (1994); see also Terplan & Wright, *supra* note 94, at 3 (citing the “lack of evidence of teratogenicity”). Marylou Behnke, *The Search for Congenital Malformations in Newborns With Fetal Cocaine Exposure*, 107 PEDIATRICS e74, e78-79 (2001) (“Our study found no evidence for cocaine contributing to the development of gross abnormalities in humans, as have been previously reported. If cocaine does produce human malformations, it seems to do so at a very low rate or only under certain conditions, perhaps related to such events as the amount and timing of the exposure or to the simultaneous ingestion of other substances, or it requires advanced technologies for identification.”); Christian Haasen & Michael Krausz, *Myths versus Evidence with Respect to Cocaine and Crack: Learning from the US Experience*, 7 EUROPEAN ADDICTION RESEARCH 159, 159 (2001) (“[A] recent systematic review of the literature has found that there is no convincing evidence that prenatal cocaine exposure is associated with developmental toxic effects that are different in severity, scope or kind from the sequelae of multiple other risk factors. Many findings once thought to be specific effects of in utero cocaine exposure are correlated with other factors including prenatal exposure to tobacco, marijuana or alcohol, and the quality of the child’s environment.”) (internal citations omitted); accord Deborah A. Frank et al., *Growth, Development, and Behavior in Early Childhood Following Prenatal Cocaine Exposure: A Systematic Review*, 285 J. AM. MED. ASS’N 1613, 1621–24 (2001); see also Hallam Hurt et al., *Children With and Without Gestational Cocaine Exposure: A Neurocognitive Systems Analysis*, 31 NEUROTOXICOLOGY AND TERATOLOGY 334, 339 (2009) (“[W]e found no evidence of impaired [neurocognitive] function caused by gestational cocaine exposure, despite the fact that our sample size was adequate to detect a statistically and clinically significant difference . . . Our results show a strong relation between early home environment and later [neurocognitive] outcome.”); see also Marleen M. H. J. van Gelder et al., *Maternal Periconceptional Illicit Drug Use and the Risk of Congenital Malformations*, 20 EPIDEMIOLOGY 60, 66 (2001) (“The present findings showed very few positive associations between periconceptional illicit drug use and selected birth defects. Although the number of infants exposed to cocaine and stimulants was low, the statistical power of the data was sufficient to rule out 2- to 4-fold or greater increases in the risk of the selected birth defects.”); *But see generally* Bruce A. Buehler et al., *Teratogenic potential of cocaine*, 20 SEMINARS IN PERINATOLOGY 93 (1996). Note that there are studies identifying cocaine as a teratogen, but they tend to be older. As a study in the *Journal of Obstetrics and Gynecology Canada* found in its review of this older research, “Early reports by Bingol and colleagues suggested that cocaine may act as a teratogen. However, this study was limited in its assessment of confounding factors and had some methodological limitations. The contribution of other sociodemographic and environmental risk factors to the observed association was suggested as early as in 1987, amid growing fears of a potential epidemic of harm due to in utero cocaine exposure. In subsequent and more methodologically sound studies, no specific pattern of gross congenital anomalies or syndromes has been identified. Therefore, it is thought that cocaine does not act independently as a gross structural teratogen.” Alex M. Cressmen et al., *Cocaine Abuse During Pregnancy*, 36 J. OBSTETRICS AND GYNECOLOGY CANADA 628, 629 (2014) (internal citations omitted) (referencing Nesrin Bingol et al., *Teratogenicity of cocaine in humans*, 110 J. PEDIATRICS 93 (1987)).

⁹⁸ See PETER J. COHEN, “Crack Babies” and the Constitution — Testing Pregnant Women for Illegal Drugs, in *DRUGS, ADDICTION, AND THE LAW: POLICY, POLITICS, AND PUBLIC HEALTH* 147, 154 (2004).

premature births.⁹⁹ However, the overwhelming majority of babies with mothers who ingested cocaine during pregnancy are not born prematurely,¹⁰⁰ and those who are born smaller or prematurely appear to rapidly make up the growth gap.¹⁰¹ Thus, the effects of cocaine use on fetal health generally disappear after a period of months.¹⁰² In an open letter debunking the crack baby myth, experts in fetal health stated that “[s]ome of our published research finds subtle effects of prenatal cocaine exposure in selected developmental domains, while other of our research publications do not.”¹⁰³ In an op-ed, David C. Lewis, a pioneer in addiction medicine, writes that “a comprehensive research review shows no consistent negative association between maternal cocaine exposure and children’s physical growth, developmental test scores, or performance on receptive and expressive language tests. Furthermore, standardized parent and teacher reports of student behavior showed no independent effects from maternal cocaine use.”¹⁰⁴

The relationship between prenatal cocaine exposure and fetal death¹⁰⁵ similarly rests on extremely tenuous ground. The leading study on the relationship between cocaine ingestion and miscarriage¹⁰⁶ found that, among the women who experienced miscarriage, 28.9% used cocaine.¹⁰⁷ However, cocaine was also used in 20.5% of the women who did not miscarry.¹⁰⁸ An

⁹⁹ See *id.*; but see Terplan & Wright, *supra* note 94 (“[One study] found no effect of birth defects on congenital malformations or birth weight.”).

¹⁰⁰ See Barry M. Lester & Edward Z. Tronick, *The Effects of Prenatal Cocaine Exposure and Child Outcome*, 15 *INFANT MENTAL HEALTH J.* 107, 116 (1994).

¹⁰¹ See COHEN, *supra* note 98; see also Susan Okie, *The Epidemic That Wasn’t*, N.Y. TIMES (Jan. 26, 2009), <https://www.nytimes.com/2009/01/27/health/27coca.html>, archived at <https://perma.cc/Y6A2-WLNZ>.

¹⁰² See COHEN, *supra* note 98; see also Edward Z. Tronick & Marjorie Beeghly, *Prenatal Cocaine Exposure, Child Development, and the Compromising Effects of Cumulative Risk*, 26 *CLIN. PERINATOLOGY* 151, 153 (1999) (“The literature to date provides no consistent evidence for dose related cocaine effects on children’s developmental outcomes beyond the first year of life.”).

¹⁰³ Robert E. Arendt, et al., *Open Letter to the Media* (Feb. 25, 2004), <https://www.nationaladvocatesforpregnantwomen.org/wp-content/uploads/2019/10/ScienceNot-Stigma.pdf>, archived at <https://perma.cc/J8QA-3J2A>.

¹⁰⁴ David C. Lewis, *Stop perpetuating the “crack baby” myth*, BROWN UNIV. (Mar. 29, 2004), https://www.brown.edu/Administration/News_Bureau/2003-04/03-099.html, archived at <https://perma.cc/LM7P-CYNX>.

¹⁰⁵ Fetal death refers to miscarriage or stillbirth.

¹⁰⁶ Referred to in the study as “spontaneous abortion.” Miscarriage is when an embryo or fetus dies before the twentieth week of pregnancy. PLANNED PARENTHOOD, *What is a Miscarriage?*, <https://www.plannedparenthood.org/learn/pregnancy/miscarriage>, archived at <https://perma.cc/U7AC-LA5K>.

¹⁰⁷ Roberta B. Ness, et al., *Cocaine and Tobacco Use and the Risk of Spontaneous Abortion*, 340 *NEW ENGLAND J. MED.*, 333, 335 (1999). This study identified cocaine use through both a hair and a urine analysis. The numbers reflected in this note are from the hair analysis because “[h]air analysis is an extremely sensitive marker of cocaine use over a period of weeks or months, depending on the length of hair analyzed. Positive results may have been more strongly related to spontaneous abortion than positive urine analysis results because hair analysis reflects the patterns of use over a period of several months” whereas “urine tests detect only recent use of cocaine (use within 72 hours of testing), so that intermittent use may not be detected.” *Id.* at 338 (internal citations omitted).

¹⁰⁸ *Id.* at 335.

editorial in the *New England Journal of Medicine* concluded that “[t]hese results do not make an impressive case for cocaine as a cause of spontaneous abortion.”¹⁰⁹ Another scholar characterized this finding as “suggesting that cocaine was not a causative factor in [miscarriages].”¹¹⁰⁻¹¹¹

Building on the doubt that cocaine causes fetal harm, other systemic forces, like poverty and racism, are associated with the harms cocaine is alleged to cause. The living conditions that people in poverty are subjected to have been shown to be harmful to fetal development.¹¹² To begin, poverty

¹⁰⁹ James L. Mills, *Cocaine, Smoking, and Spontaneous Abortion*, 340 *NEW ENGLAND J. MED.* 380, 380 (Feb. 4, 1999). This scholar continued, writing that “[e]ven if we ignore the fact that the P values probably should have been adjusted for multiple comparisons, the result of the hair analysis is of borderline statistical significance. The lack of corroboration from the urine tests suggests that the result of the hair analysis could be a chance finding.” *Id.*

¹¹⁰ COHEN, *supra* note 98, at 155.

¹¹¹ There is one major adverse event significantly associated with cocaine, and that is placental abruption. This can cause fetal death. See Antonio Addis, et al., *Fetal effects of cocaine: an updated meta-analysis*, 15 *REPRODUCTIVE TOXICOLOGY* 341, 354 (2001). This study also listed premature rupture of membranes as having a statistically significant relationship, but many studies report finding no or very weak relationship. See e.g., Robert Andres, *The impact of tobacco and cocaine use on preterm premature rupture of the membranes (pPROM)*, 189 *AM. J. OBSTETRICS AND GYNECOLOGY* S131, S131 (2003). But unlike a usual miscarriage or stillbirth, a placental abruption is an event that a doctor can clearly identify and work to treat. It is also significantly rarer. This distinguishes it from the cases discussed in this note, which generally consist of stillbirths and miscarriages. Additionally, the association between placental abruption and cocaine is weaker than its association with smoking cigarettes or having high blood pressure, so it is not a unique reaction to cocaine ingestion. See Healthwise Staff, *Placenta Abruptio*, MICHIGAN MEDICINE, UNIV. OF MICHIGAN, <https://www.uofmhealth.org/health-library/hw180726>, archived at <https://perma.cc/GX2A-KZXD>.

It is also important to note that there is some research that finds a correlation between cocaine use and fetal death. See generally Elke H. Roland & Joseph J. Volpe, *Effect of Maternal Cocaine Use on the Fetus and Newborn: Review of the Literature*, 15 *PEDIATRIC NEUROSCIENCE* 88 (1989) (finding that cocaine use during pregnancy may be associated with increased perinatal morbidity and mortality); Lynn Ryan, Sandra Ehrlich, & Loretta Finnegan, *Cocaine abuse in pregnancy: Effects on the fetus and newborn*, 9 *NEUROTOXICOLOGY AND TERAUTOLOGY* 295 (1987) (concluding that cocaine use during pregnancy increases risk of miscarriage and fetal death, as well as lower birth weight and smaller size); Augustine J. Kposowa & Pamela J. Preston, *The Effect Of Substance Use In Pregnancy On The Risk Of Infant Mortality*, 34 *SOCIOLOGICAL FOCUS* 55 (2001) (finding higher fetal death rate among a 1988 birth cohort for those who used crack and cocaine during pregnancy); Claudia Holzman & Nigel Paneth, *Maternal Cocaine Use During Pregnancy and Perinatal Outcomes*, 16 *EPIDEMIOLOGIC REV.* 315 (1994) (finding that cocaine use during pregnancy is associated with impaired fetal growth, but less consistently associated with preterm delivery and congenital anomalies).

However, these studies tend to be older and are often contradicted in more recent research. See, e.g., Lawrence M. Berger & Jane Waldfogel, *Prenatal Cocaine Exposure: Long-Run Effects and Policy Implications*, 74 *SOCIAL SERVICE REV.* 28, 29–31 (2000) (“The impact of prenatal cocaine exposure on infants has been extensively studied. However, recent reviews of the literature show that much of the research to date has been found to be contradictory, unreliable, biased, or inconclusive . . . many of the outcomes that were once attributed solely to prenatal exposure to crack cocaine have recently been linked to both confounding variables and methodological shortcomings in the studies themselves. It now appears that previous studies have tended to overestimate the effects of prenatal exposure on newborns as well as its long-term effects on children’s growth and development.”).

¹¹² See Brian Karl Finch, *Socioeconomic Gradients and Low Birth-Weight: Empirical and Policy Considerations*, 38 *HEALTH SERV. RSCH.* 1819, 1819 (2003) (“A socioeconomic gradient for low birth-weight was discovered for an adjusted household income measure, net of all

is associated, among other things, with lack of access to prenatal care,¹¹³ lack of access to nutritious foods,¹¹⁴ increased stress,¹¹⁵ increased lead exposure,¹¹⁶

covariates in the unrestricted models.”); Shia T. Kent, et al., *Area-level risk factors for adverse birth outcomes: trends in urban and rural settings*, 13 BMC PREGNANCY AND CHILDBIRTH 1, 8 (2013) (“This study . . . found that relationships between ZIP code-level poverty and adverse birth outcomes were significant in urban areas, even after accounting for individual-level risk factors.”); Catherine Cubbin, et al., *Longitudinal measures of neighborhood poverty and income inequality are associated with adverse birth outcomes in Texas*, 245 SOC. SCI. AND MED. 1, 10 (2020) (“[B]oth absolute (poverty) and relative (income inequality) measures of neighborhood economic trajectories were associated with adverse birth outcomes.”); Jennifer F. Culhane & Irma T. Elo, *Neighborhood context and reproductive health*, 192 AM. J. OBSTETRICS AND GYNECOLOGY S22, S22 (2005) (“It is also well known that lower class women, independent of their race/ethnicity, have about a two-fold greater risk of preterm delivery compared with women in higher social classes.”); N. Tanya Nagahawatte & Robert L. Goldenberg, *Poverty, maternal health, and adverse pregnancy outcomes*, 1136 ANNALS OF THE N.Y. ACADEMY OF SCIENCES 80, 84 (2008) (“Poverty or lower SES is associated with an increase in many of the medical and behavioral risk factors associated with preterm birth and other pregnancy outcomes.”); Patricia O’Campo, et al., *Neighborhood risk factors for low birth weight in Baltimore: a multilevel analysis*, 87 AM. J. PUBLIC HEALTH 1113, 1116 (“We found that indicators of social stratification, particularly per capita income, were directly related to the risk of low birthweight in Baltimore.”); Eric M. Roberts, *Neighborhood social environments and the distribution of low birth weight in Chicago*, 87 AM. J. PUBLIC HEALTH 597, 600 (1997) (“After maternal race and ethnicity, the most substantial risk factor in the model appears to be the index of economic hardship.”); Jennifer Jardin, et al., *Adverse pregnancy outcomes attributable to socioeconomic and ethnic inequalities in England: a national cohort study*, 398 THE LANCET 1905, 1910 (2021) (“In this study of more than 1 million births in England, 24% of stillbirths, 19% of preterm livebirths, and 31% of livebirths with [fetal growth restriction] would not have occurred if all women had the same risk of adverse pregnancy outcomes as women in the least deprived socioeconomic group.”). See generally Claire Margerison-Zilko, *Beyond the cross-sectional: neighborhood poverty histories and preterm birth*, 105 AM. J. PUBLIC HEALTH 1174 (2015); see, e.g., Jay S. Kaufman, *Modeling Community-level Effects on Preterm Birth*, 13 ANNALS OF EPIDEMIOLOGY 377, 377–78 (2003); Cf. Michelle Pearl, Paula Braveman, & Barbara Abrams, *The relationship of neighborhood socioeconomic characteristics to birth weight among 5 ethnic groups in California*, 91 AM. J. PUBLIC HEALTH 1808, 1813 (“[T]he nature of the relationship between neighborhood socioeconomic characteristics and birthweights of infants born to California residents varies greatly, depending on the ethnicity of the mother and the area-level characteristic considered.”). This relationship is not confined to the United States, but is an unfortunate global phenomenon. See generally Olof Stephansson, et al., *The influence of socioeconomic status on stillbirth risk in Sweden*, 30 INT’L J. EPIDEMIOLOGY 1296 (2001), <https://academic.oup.com/ije/article/30/6/1296/651774?login=true>, archived at <https://perma.cc/87JC-JKY3>; Lizbeth Burgos Ochoa, et al., *Association of neighbourhood socioeconomic trajectories with preterm birth and small-for-gestational-age in the Netherlands: a nationwide population-based study*, 10 THE LANCET REGIONAL HEALTH – EUROPE 1, 6 (2021), [https://www.thelancet.com/journals/lanep/article/PIIS2666-7762\(21\)00182-4/fulltext](https://www.thelancet.com/journals/lanep/article/PIIS2666-7762(21)00182-4/fulltext), archived at <https://perma.cc/L853-J6C8>; Claudia Canavan, *Thousands of Adverse Pregnancy Outcomes Linked to Poverty and Ethnic Inequality*, WOMEN’S HEALTH (Feb. 11, 2021), <https://www.womenshealthmag.com/uk/health/a38123927/stillbirth-financial-ethnic-inequality/>, archived at <https://perma.cc/VLW5-49MG>; Christina Laucello & Kim Thelwell, *Understanding The Effects Of Poverty While Pregnant*, THE Borgen Project (Aug. 23, 2019), <https://borgenproject.org/effects-of-poverty-while-pregnant/>, archived at <https://perma.cc/2MUQ-P6JL>.

¹¹³ See, e.g., Debra Kalmuss & Katherine Fennelly, *Barriers to Prenatal Care Among Low-Income Women in New York City*, 22 FAM. PLAN. PERSP. 215, 215 (1990) (“[M]any women, particularly those who are young, nonwhite, poorly educated, uninsured or single, receive prenatal care late or not at all. The common factor underlying the various characteristics associated with inadequate prenatal care is poverty.”) (internal citations omitted).

¹¹⁴ See, e.g., Faareha Siddiqui, et al., *The Intertwined Relationship Between Malnutrition and Poverty*, 8 FRONT. PUB. HEALTH 453, 454–55 (2020), <https://www.frontiersin.org/articles/>

increased likelihood of eviction,¹¹⁷ and poor quality housing,¹¹⁸ all of which are known to cause harm to a pregnancy and impact the fetus.¹¹⁹ As an exam-

10.3389/fpubh.2020.00453/full#:~:text=poverty%20leads%20to%20financial%20constraints, but%20nutritional%20quality%20becomes%20compromised, archived at <https://perma.cc/P738-GVMK> (“Poverty leads to financial constraints that in turn lead to the consumption of cheap, high-energy staple foods, primarily carbohydrates, and fats rather than nutritionally dense food. Through the consumption of carbohydrates and fats, energy levels spike; but nutritional quality becomes compromised. The consequence of this is reduced nutritional quality and nutrient deficiencies.”).

¹¹⁵ See, e.g., Martha E. Wadsworth & Shauna L. Rienks, *Stress as a mechanism of poverty’s ill effects on children: Making a case for family strengthening interventions that counteract poverty-related stress*, AM. PSYCHOLOGICAL ASS’N (July 2012), <https://www.apa.org/pi/families/resources/newsletter/2012/07/stress-mechanism>, archived at <https://perma.cc/G9CP-K6JG> (“The stress of poverty is not simply worries about money—poverty creates a “context of stress,” in which conflict, family violence, food insecurity and residential mobility (to name a few) are also commonplace . . . [i]n addition . . . poverty amplifies the negative effects of all types of stress.”).

¹¹⁶ See generally Bethany M. Wood & Catherine Cubbin, *Neighborhood Poverty in Combination with Older Housing Is Associated with Adverse Birth Outcomes: A Study on Ubiquitous Lead Risk among 1 Million Births in Texas*, 19 INT’L. J. ENV’T. RSCH. PUB. HEALTH 1578, 1578–79 (2022) (“[F]etal exposure to the heavy metal lead (Pb), a known toxicant, precipitates several adverse birth outcomes, including preterm labor and small-for-gestational-age births. . . . Currently, the main source of ubiquitous lead exposure is through inhalation or ingestion of lead-based paint and dust contaminated by lead in housing, followed by the presence of Pb in contaminated water.”); CNTRS. FOR DISEASE CONTROL AND PREVENTION, *Picture of America Report: Reproductive Outcomes Fact Sheet*, https://www.cdc.gov/pictureofamerica/pdfs/picture_of_america_reproductive_outcomes.pdf, archived at <https://perma.cc/96DL-W5DP> (“Maternal exposure to lead is associated with preterm birth. Other adverse birth outcomes that may be linked with maternal or paternal lead exposure include low birthweight and spontaneous fetal loss.”).

¹¹⁷ See Carl Romer, Andre M. Perry, & Kristen Broady, *The coming eviction crisis will hit Black communities the hardest*, BROOKINGS INST. (Aug. 2, 2021), [https://www.brookings.edu/research/the-coming-eviction-crisis-will-hit-black-communities-the-hardest/#:~:text=Again%2C%20this%20expectation%20holds%20true,the%20eviction%20filing%20rate%20decreases](https://www.brookings.edu/research/the-coming-eviction-crisis-will-hit-black-communities-the-hardest/#:~:text=Again%2C%20this%20expectation%20holds%20true,the%20eviction%20filing%20rate%20decreases,), archived at <https://perma.cc/ZUY3-7ZNX> (“Eviction, or forced relocation, is a critical and understudied mechanism that drives residential mobility, particularly in inner-city neighborhoods among low-income families.”); accord Tom Carroll & Grace Yi, *Evictions and Suburban Poverty: Two Sides of the Same Coin*, NAT’L LEAGUE OF CITIES, <https://www.nlc.org/article/2021/04/09/evictions-and-suburban-poverty-two-sides-of-the-same-coin/#:~:text=recently%2C%20sociologists%20have%20demonstrated%20evictions,of%20their%20home%20or%20apartment>, archived at <https://perma.cc/6ZZS-8LRZ> (“Recently, sociologists have demonstrated evictions are as much a cause of poverty as a result of it.”).

¹¹⁸ See generally Wood & Cubbin, *supra* note 116.

¹¹⁹ Studies conclude that access to nutritious foods are associated with adverse birth outcomes. See generally Calvin Hobel & Jennifer Culhane, *Role of psychosocial and nutritional stress on poor pregnancy outcome*, 133 J. NUTRITION 1709S (2003); Eileen R. Fowles, *Prenatal Nutrition and Birth Outcomes*, 33 J. OBSTETRIC, GYNECOLOGIC, & NEONATAL NURSING 809 (2004). Increased stress levels during pregnancy are also associated with adverse birth outcomes. See generally Ann E. Bryant Borders, *Chronic stress and low birth weight neonates in a low-income population of women*, 109 OBSTETRICS AND GYNECOLOGY 331 (2007); Michael T. Kinsella & Catherine Monk, *Impact of Maternal Stress, Depression & Anxiety on Fetal Neurobehavioral Development*, 52 CLINICAL OBSTETRICS AND GYNECOLOGY 425 (2009); Christine Dunkel Schetter, *Psychological science on pregnancy: stress processes, biopsychosocial models, and emerging research issues*, 62 ANNUAL REV. PSYCHOLOGY 531 (2011); Pablo A. Nepomnaschy, et al., *Cortisol levels and very early pregnancy loss in humans. Proceedings of the National Academy of Sciences of the United States of America*, 103 PROCEEDINGS OF THE NAT’L ACAD. SCI. 3938 (2006). Increased lead exposure is linked in adverse birth outcomes. See generally Mohsen Vigeh, et al., *Blood lead at currently acceptable levels may*

ple, lack of prenatal care is associated with premature delivery, fetal growth restriction, low birth weight, preeclampsia, congenital malformations, stillbirth, maternal mortality, and infant mortality.¹²⁰ Some social science researchers argue that reproductive outcomes are rooted in social and economic inequalities.¹²¹ One empirical study of neighborhood¹²² context and its effect on reproductive health concludes that individual level characteristics fail to account for the gaps in adverse birth outcomes between racial and social classes. It summarized:

The availability of such [goods and services, such as access to quality health care, grocery stores, recreational facilities, and police and fire protection,] is likely to be affected by the degree of political organization that influences the residents' ability to demand public services and recruit private service providers to their neighborhoods. Poor public and private services may have a direct and indirect impact on an individual's health by making residents more susceptible to . . . injuries. Finally, the quality of the physical environment, which includes exposure to toxicants, noise and air

cause preterm labour, 68 OCCUPATIONAL AND ENVTL. MEDICINE 231 (2010); L.L. Jelliffe-Pawlowski, et al., *Effect of magnitude and timing of maternal pregnancy blood lead (Pb) levels on birth outcomes*, 26 J. PERINATOLOGY 154 (2006). Similarly, increased likelihood of evictions is linked to adverse birth outcomes. See, e.g., Gracie Himmelstein & Matthew Desmond, *Association of Eviction With Adverse Birth Outcomes Among Women in Georgia, 2000 to 2016*, 175 JAMA PEDIATRICS 494, 497–98 (2021), <https://jamanetwork.com/journals/jamapediatrics/fullarticle/2776776>, archived at <https://perma.cc/C6D8-MF6X> (“Eviction actions during pregnancy, as opposed to eviction actions at any other time, were associated with worse birth outcomes, including reduced birth weight, shorter gestation, increased probability of being classified as LBW or premature, and a trend toward increased infant mortality.”). Finally, poor quality housing is associated with adverse birth outcomes. See generally Wood & Cubbin, *supra* note 116.

¹²⁰ See Cristiane Quadrado da Rosa, Denise Silva da Silveira, & Juvenal Soares Dias da Costa, *Factors associated with lack of prenatal care in a large municipality*, 48 REVISTA DE SAÚDE PÚBLICA 977, 980–81 (2014) (“The deprivation of prenatal care can lead to premature pregnancy, intrauterine growth retardation, low weight at birth, and maternal and child mortality as a result of infections in the perinatal and postnatal periods.”); Andrew Smith & Erin Bassett-Novoa, *Late Presentation to Prenatal Care*, 92 AM. FAM. PHYSICIAN 391, 395 (2015) (“Late presentation to prenatal care has also been associated with increased rates of preterm delivery, low birth weight, and congenital malformations, compared with initiation of care in the first trimester.”); Min Kyoung Kim, et al., *Socioeconomic status can affect pregnancy outcomes and complications, even with a universal healthcare system*, 17 INT’L J. FOR EQUITY IN HEALTH 2, 3 (2018) (“Inadequate prenatal care is associated with poor obstetric outcomes, including preterm delivery, preeclampsia, and stillbirth, and women with low SES are less likely to receive prenatal care. In fact, the risk of preterm delivery, preeclampsia, and gestational diabetes increases with both inadequate prenatal care and low SES.”).

¹²¹ See, e.g., Culhane & Elo, *supra* note 112, at S22.

¹²² Neighborhoods are often chosen to study the relationship between poverty and adverse birth outcomes because economically disadvantaged areas generally have lower access to nutritious food, employment, education, high-quality housing, and political power, in addition to increased exposure to violence, housing instability, toxicants, and stress. See Cubbin et al, *supra* note 112, at 2; Culhane & Elo, *supra* note 112, at S23; Roberts, *supra* note 112, at 600.

pollution, and quality of the housing stock and public space, could have direct effects on health.¹²³

Studies such as this document that poverty, neighborhood deprivation of services, or socioeconomic status, have a significant association with adverse birth outcomes.¹²⁴ The adverse birth outcomes include low-birth weight, preterm birth, and stillbirth.¹²⁵ Pregnant people of lower socioeconomic status also face increased risk of miscarriage.¹²⁶ The studies that focus on socioeconomic status and neighborhood identify an even higher prevalence of adverse birth outcomes among pregnant people of color. Black people's pregnancies have at least twice the rate of low-birth weight babies,¹²⁷ three times as likely to be very low birth weight,¹²⁸ and twice as likely the rate of preterm births.¹²⁹ These statistics account for socioeconomic status. In general, Black mothers experience stillbirth at twice the rate of white or Hispanic mothers,¹³⁰ are at increased risk for preterm birth and low birth weight,¹³¹ are nearly twice as likely to miscarry after ten weeks of pregnancy,¹³² and are three to four times more likely to die from pregnancy-related complications than white women.¹³³ Race and socioeconomic status,

¹²³ Culhane & Elo, *supra* note 112, at S22.

¹²⁴ *See, e.g., id.*

¹²⁵ *See* Cubbin et al., *supra* note 112, at 2 (citing associations between neighborhood poverty and preterm birth, lower birth weight, and gestational size); Culhane & Elo, *supra* note 112 (noting a higher risk of preterm birth for pregnant women in low socioeconomic status); Nagahawatte & Goldenberg, *supra* note 112, at 84 (finding an association between poverty and increased risk of preterm birth); O'Campo, et al., *supra* note 112, at 1116 (finding that income levels had an association with low birthweight); Amber A. Vos, et al., *Deprived neighborhoods and adverse perinatal outcome: a systematic review and meta-analysis*, 93 ACTA OBSTETRICIA ET GYNECOLOGICA SCANDINAVICA 727, 732 (2014) (finding that neighborhood deprivation is associated with preterm birth, gestational size, and stillbirth); Zhong-Cheng Luo, Russell Wilkins, & Michael S. Kramer, *Effect of neighbourhood income and maternal education on birth outcomes: a population-based study*, 174 CANADIAN MED. ASS'N J. 1415, 1420 (2006) ("The impact of neighbourhood income is evident for stillbirth, preterm birth and the risk of [small for gestational age]."); Catherine Y. Spong, et al., *Disparities in Perinatal Medicine: Preterm Birth, Stillbirth, and Infant Mortality*, 117 OBSTETRICS AND GYNECOLOGY 948, 954 (2011) ("Risk factors associated with preterm birth, stillbirth, and infant mortality are generally consistent, including socioeconomic, social factors, access to care, and medical conditions.").

¹²⁶ *See* Jill Wieber Lens, *Miscarriage, Stillbirth, & Reproductive Justice*, 98 WASH. U. L. REV. 1059, 1072 (2021).

¹²⁷ *See* Kent et al., *supra* note 112, at 1.

¹²⁸ *See* Culhane & Elo, *supra* note 112.

¹²⁹ *See id.*; *cf.* Kent et al., *supra* note 112 (stating that the rate of preterm birth is 1.5 times greater for Black women than non-Hispanic white women).

¹³⁰ *See Black Mothers Are More Likely to Experience Stillbirth Compared to Hispanic and White Mothers*, CTR. FOR DISEASE CONTROL AND PREVENTION, <https://www.cdc.gov/ncbddd/stillbirth/features/kf-black-mothers-stillbirth.html>, archived at <https://perma.cc/44NZ-NW9A>; Spong et al., *supra* note 125, at 951.

¹³¹ *See id.* at 948–50.

¹³² *See* Sudeshna Mukherjee, et al., *Risk of Miscarriage Among Black Women and White Women in a US Prospective Cohort Study*, 177 AM. J. EPIDEMIOLOGY 1271, 1276 (2013).

¹³³ *See* *Why black women face a high risk of pregnancy complications*, HARV. T.H. CHAN SCH. OF PUB. HEALTH (2019) <https://www.hsph.harvard.edu/news/hsph-in-the-news/black-women-pregnancy-complications/>, archived at <https://perma.cc/44FZ-S7FL>.

together and independently, are associated with the same harms often attributed to cocaine.

In addition, those who argue for criminal sanctions on pregnant people using substances, out of concern for the fetus, ignore countless other environmental factors that produce the same forms of fetal harm. If the motivation to criminalize was guided by genuine public health concern, other agents causing harm to fetuses would be similarly criminalized or more regulated. Studies have shown that exposure to sulfur dioxide—80% of which is created by human-produced fossil fuel combustion—is directly correlated with low birth weight and preterm labor.¹³⁴ Yet, the industries responsible for much of the sulfur dioxide production¹³⁵ are not prosecuted for harming developing fetuses. Similarly, high levels of lead ingestion are associated with preterm birth and miscarriage.¹³⁶ In Flint, Michigan, more than 40% of water samples were measured to be above a level of lead that researchers considered an indication of a “very serious problem.”¹³⁷ While protests about water quality began in 2014, no criminal indictments related to the crisis were issued until 2021, and no charges were issued for fetal harm.¹³⁸ Finally, several studies have linked tear gas, a chemical compound banned in warfare by the Geneva Convention,¹³⁹ to miscarriages or fetal harm.¹⁴⁰ In 2020, when an uprising of peaceful protests in response to racist police killings and in support of Black lives was met with police firing tear gas on protestors,¹⁴¹ there was no outcry by the pro-life movement.¹⁴² There also

¹³⁴ Reihaneh Sarizadeh, et al., *The Association Between Air Pollution and Low Birth Weight and Preterm Labor in Ahvaz, Iran*, 12 INT’L J. WOMEN’S HEALTH 313, 313–14 (2020).

¹³⁵ See *Sulfur Dioxide*, WISCONSIN DEPT OF HEALTH SERVICES (2022), <https://www.dhs.wisconsin.gov/chemical/sulfurdioxide.htm>, archived at <https://perma.cc/2PS5-KZCG>.

¹³⁶ See *Lead Poisoning*, MARCH OF DIMES (2016), <https://www.marchofdimes.org/pregnancy/lead-poisoning.aspx>, archived at <https://perma.cc/YSV4-2JS5>.

¹³⁷ See Melissa Denchak, *Flint Water Crisis: Everything You Need to Know*, THE NAT’L RES. DEF. COUNCIL (2018), <https://www.nrdc.org/stories/flint-water-crisis-everything-you-need-know>, archived at <https://perma.cc/Z87X-4Q4Z>.

¹³⁸ See Sarah Childress & Abby Ellis, *Nine Former Michigan Officials, Including Ex-Gov. Rick Snyder, Charged in Flint Water Crisis*, FRONTLINE (Jan. 14, 2021), <https://www.pbs.org/wgbh/frontline/article/flint-water-crisis-nine-former-michigan-officials-including-ex-gov-rick-snyder-charged/>, archived at <https://perma.cc/P9DJ-V9UW>. The charges included involuntary manslaughter, official misconduct, and neglect of duty for “grossly negligent performance.” *Id.*

¹³⁹ See *Tear gas has been banned in warfare. Why do police still use it?*, THE WORLD (Jul. 21, 2019), <https://www.pri.org/stories/2019-07-31/tear-gas-has-been-banned-warfare-why-do-police-still-use-it>, archived at <https://perma.cc/8N2Z-UERZ>.

¹⁴⁰ Mari Hayman, *Chile Suspends Use of Tear Gas Amid Concerns Over Miscarriages*, LATIN AMERICA NEWS DISPATCH (May 19, 2011), <https://latindispatch.com/2011/05/19/chile-suspends-use-of-tear-gas-amid-concerns-over-miscarriages/>, archived at perma.cc/U7WX-FKN7; Craig Rothenberg, et al., *Tear gas: an epidemiological and mechanistic reassessment*, 1378 ANN. N.Y. ACAD. SCI. 96, 99 (2016) (“Circumstantial reports suggest a correlation between CS exposure and miscarriage”).

¹⁴¹ See Erin Corbett, *Why Have Pro-Lifers Been So Quiet About Tear Gas Causing Miscarriages? Because They’re Hypocrites.*, REFINERY29 (June 10, 2020), <https://www.refinery29.com/en-us/2020/06/9856264/tear-gas-causes-miscarriage-abortion-pro-life>, archived at perma.cc/7ZPT-ETWL.

have been no criminal prosecutions for the use of tear gas, even though the potential for harm to reproductive capacity and fetal development as a result of exposure to these chemical weapons has been known for decades.¹⁴³ The same impacts commonly, and often inaccurately, associated with gestational cocaine ingestion are found in the situations listed above. Yet these instances of fetal harm are not prosecuted, or in many cases, not even illegal.¹⁴⁴ There are many environmental factors that impact fetal development, but the law has not been used to address those. While I do not believe that citing fetal harm is a useful means to create more environmentally friendly laws, it is quite damning that fetal harm becomes a concern almost solely in the context of drug use.

Because pregnant people are exposed to a variety of potentially harmful conditions, the integral question regarding the criminalization of prenatal cocaine use is the relative contribution of cocaine, compared with other factors contributing to adverse pregnancy outcomes.¹⁴⁵ In other words, the question is: but for the drug use, would the fetus be harmed? Researchers studying children under the age of six found that ultimately, “there is no convincing evidence that prenatal cocaine exposure is associated with any developmental toxicity different in severity, scope, or kind from the sequelae of multiple other risk factors. Many findings once thought to be specific effects of in utero cocaine exposure are correlated with other factors.”¹⁴⁶ A 24-year-long longitudinal study conducted by Dr. Hallam Hurt, a neonatologist at the Children’s Hospital of Philadelphia, further found that “poverty is more influential on child outcomes than gestational cocaine exposure.”¹⁴⁷

¹⁴² See *id.*

¹⁴³ For example, an article in the Washington Post from 1988 alleged that Israeli use of tear gas caused miscarriages when deployed at an Arab refugee camp. See Glenn Frankel, *Israel’s Use of Tear Gas Scrutinized*, WASH. POST (May 31, 1988), <https://www.washingtonpost.com/archive/politics/1988/05/31/israels-use-of-tear-gas-scrutinized/f44fdc56-d298-4324-82a6-e4ee400fc213/>, archived at perma.cc/VQ3Q-DDGP (“[T]hese sources contend the weight of circumstantial evidence clearly indicates that tear gas is at least a significant contributing factor in deaths and miscarriages among a refugee camp population . . .”).

¹⁴⁴ It is also important to note that all of these threats are forcibly imposed on pregnant people by external sources, such as industries or police.

¹⁴⁵ See generally Snodgrass, *supra* note 97.

¹⁴⁶ Frank et al., *supra* note 97, at 1621–24; see also Hurt et al., *supra* note 97, at 339 (“[W]e found no evidence of impaired [neurocognitive] function caused by gestational cocaine exposure, despite the fact that our sample size was adequate to detect a statistically and clinically significant difference . . . Our results show a strong relation between early home environment and later [neurocognitive] outcome.”).

¹⁴⁷ Hallam Hurt, *Poverty Is Worse for Children than Gestational Cocaine Exposure*, SPOTLIGHT (May 19, 2014), <https://spotlightonpoverty.org/spotlight-exclusives/poverty-is-worse-for-children-than-gestational-cocaine-exposure/>, archived at perma.cc/3ZFS-RFKM.

II. CRIMINALIZATION OF PRENATAL SUBSTANCE USE AND RELEVANT STATUTORY PROVISIONS

When discussing prenatal substance use cases, it is important to analyze the statute under which the charge is brought to understand the required showing of guilt. Some charges are brought under laws that specifically target fetal harm, while others are brought under traditional homicide laws. Regardless, the most important distinction for the purpose of this Note is whether these laws require a showing of actual harm or risk of harm, or if they criminalize the act of ingesting drugs during pregnancy alone.

To illustrate this distinction, consider the difference between requirements to convict for a DUI charge versus a homicide charge. A DUI conviction requires proof of an act that could cause harm, even if it did not, whereas a homicide conviction requires proof of an act that actually caused death. In Oklahoma, as an example, the DUI provision states: “it is unlawful and punishable . . . for any person to drive . . . who . . . has a blood or breath alcohol concentration . . . of eight-hundredths (0.08) or more at the time of a test of such person’s blood or breath.”¹⁴⁸ A conviction for a DUI offense is only concerned with whether the blood alcohol content is above a threshold level. In order to be convicted, a person need not harm another person; the mere fact of driving while drunk is punishable. In contrast, Oklahoma notes that, with regard to manslaughter, no person can be convicted “unless the death of the person alleged to have been killed and *the fact of the killing by the accused* are each established as independent facts beyond a reasonable doubt.”¹⁴⁹ For manslaughter, it is not sufficient to just show that a person is dead. The law states that the prosecutor must prove beyond a reasonable doubt that the accused actually killed the deceased. Applying the logic of this difference to prenatal substance use, if a statute bases criminal liability on the existence of drugs present in a fetus, the proof needed for conviction functions more like a DUI conviction; but if it requires that the fetus suffer harm or be placed at a significant risk of harm, the proof needed for conviction functions more like that required for a homicide conviction.

Despite the important differences between these two theories of criminal liability, the distinction is often neglected in the context of prenatal substance use. Take, as one example, the case of Brittney Poolaw, a Comanche Nation Native woman who was 19-years-old and nearly four months pregnant when she had a miscarriage.¹⁵⁰ Upon arriving at the hospital, she in-

¹⁴⁸ OKLA. STAT. ANN. tit. 47, § 11-902 (West 2020).

¹⁴⁹ OKLA. STAT. ANN. tit. 21, § 693 (West) (emphasis added).

¹⁵⁰ See Megan Carpentier, *Native American Woman In Oklahoma Convicted Of Manslaughter Over Miscarriage*, OXYGEN (Oct. 15, 2021), <https://www.oxygen.com/crime-news/brittney-poolaw-convicted-of-manslaughter-over-miscarriage-in-oklahoma>, archived at perma.cc/R7CA-H7E2. Similar to Black women, Native women disproportionately exist in poverty, have poor access to health care, including prenatal care, and suffer from systemic racism in medicine, causing poor pregnancy outcomes. See *id.*

formed doctors that she had ingested both marijuana and methamphetamine during pregnancy; however, tests also identified evidence of a “congenital abnormality, placental abruption and chorioamnionitis.”¹⁵¹ On their own, the abnormality, abruption, or chorioamnionitis could end a pregnancy and even prove fatal to the pregnant person.¹⁵² The Oklahoma manslaughter statute requires a showing of causality, as discussed above, yet the prosecution admitted that there was no way to know with certainty that drug use caused Ms. Poolaw’s miscarriage.¹⁵³ Even though the state’s manslaughter statute requires the prosecution to prove that her actions killed the fetus, Poolaw was still convicted of first-degree manslaughter, due to her illicit drug use, after only three hours of jury deliberation.¹⁵⁴ She was sentenced to four years in prison.¹⁵⁵ In Oklahoma, Brittany Poolaw’s case is not an isolated one; prosecutions are increasingly being brought against pregnant people who suffer miscarriages or stillbirths.¹⁵⁶

The reality is that prosecutions for prenatal substance use often fail to account for textual difference in statutes. Some require proof of causal harm and others require only a showing that the act occurred. But it is vital to consider the statutory requirements, as they impact the evidentiary requirements and the analytical obligations of a given court. These distinctions are also important as they limit the applicability of the proposed framework, as explained below. The G2i framework, described in depth later in this Note, can only be applied where a statute imputes a requirement that any harm suffered be the direct result of drug use during pregnancy.

A. *Statutes Under Which Prenatal Substance Use Is Charged*

Statutes criminalizing fetal harm differ across states. Though pregnant people have been arrested in nearly every U.S. state,¹⁵⁷ three states stand out for their aggressive use of prenatal substance use statutes in arresting and

¹⁵¹ *Id.*

¹⁵² *Id.*

¹⁵³ See Kassie McClung and Brianna Bailey, *She was charged with manslaughter after a miscarriage. Cases like hers are becoming more common in Oklahoma.*, THE NORMAN TRANSCRIPT (Jan. 18, 2022), https://www.normantranscript.com/news/she-was-charged-with-manslaughter-after-a-miscarriage-cases-like-hers-are-becoming-more-common/article_917d6efe-77b9-11ec-8279-97d2fc288815.html, archived at perma.cc/MA58-SDJC (“Prosecutors told the jury though witnesses couldn’t definitively say drug use caused the pregnancy loss ‘that doesn’t mean they didn’t have an idea.’”); Li Cohen, *Manslaughter conviction of 21-year-old Oklahoma woman who suffered miscarriage sparks outcry*, CBS NEWS (Oct. 20, 2021), https://www.cbsnews.com/news/brittany-poolaw-manslaughter-miscarriage-pregnancy/?fbclid=IWAR1M4dlia9u_e1_mbOmuqYYVHmKhWSp5NAnpC8C8xH8TAhIQkiqfMqGL2mg, archived at perma.cc/FLP2-A5PJ (“[T]here was no evidence her use of the substance is what caused the miscarriage.”).

¹⁵⁴ See Carpentier, *supra* note 150.

¹⁵⁵ See *id.*

¹⁵⁶ See Carpentier, *supra* note 150.

¹⁵⁷ See Grace Howard, *The Pregnancy Police: Surveillance, Regulation, and Control*, 14 HARV. L. & POL’Y REV. 347, 351 (2020).

prosecuting pregnant persons: Tennessee, South Carolina, and Alabama.¹⁵⁸ The comparison of these three states demonstrates the different approaches states can and have taken to criminalize prenatal substance use, whether it be through enacting a law to specifically target the conduct or weaponizing existing statutes. These three approaches also show variation among the causality requirement described above.

1. *State statutes requiring harm or unreasonable risk of harm to the fetus*

a. *Tennessee*

Tennessee is the only state in the country to have enacted a law specifically criminalizing drug use during pregnancy, known as its fetal assault law.¹⁵⁹ In contrast, other states have relied on pre-existing child abuse or endangerment statutes to criminalize drug use during pregnancy. Tennessee's fetal assault law was in force between 2014 and 2016.¹⁶⁰ During those two years, over 100 women were arrested.¹⁶¹ The law stated:

Nothing in this section shall preclude prosecution of a woman for assault . . . for the illegal use of a narcotic drug . . . while pregnant, if her child is born addicted to or harmed by the narcotic drug and the addiction or harm is a result of her illegal use of a narcotic drug taken while pregnant.¹⁶²

For the purposes of this Note, there are two key components of this statute. The first is that the child must be born addicted to the drug¹⁶³ or harmed by the drug. The second is that the harm to the fetus was caused by prenatal substance use. These components are critical because they illustrate that the law explicitly requires a causal inference to be made between the ingestion of a substance by a pregnant person and any harm caused to the fetus. It is in this situation that prosecutors fail to present adequate evidence and courts fail to faithfully enforce statutory requirements.

¹⁵⁸ See Lewis, *supra* note 14, at 189.

¹⁵⁹ Angelotta & Applebaum, *supra* note 15, at 193.

¹⁶⁰ See Lewis, *supra* note 14, at 193.

¹⁶¹ See Nina Liss-Schultz, *Tennessee's War on Women Is Sending New Mothers to Jail*, MOTHER JONES (Mar. 14, 2016), <https://www.motherjones.com/politics/2016/03/tennessee-drug-use-pregnancy-fetal-assault-murder-jail-prison-prosecution/>, archived at <https://perma.cc/8KAX-TTU4>.

¹⁶² Lewis, *supra* note 14, at 195. This statute was additionally limited in its scope: prosecutions under the amendment could only occur if the child was born. See *id.*

¹⁶³ Technically, a baby cannot be born "addicted" to drugs. See Paltrow & Jack, *supra* note 66 ("By definition, babies cannot be 'addicted' to crack or anything else.").

b. South Carolina

The state of South Carolina uses a statute for “unlawful conduct toward a child” to criminalize pregnant people using drugs. In 1997, it was the first state supreme court to interpret the use of the word “child” in the statute to extend to fetuses,¹⁶⁴ indicating that criminal laws intended to prohibit conduct toward children could also be used to prohibit that conduct as it relates to fetuses. The South Carolina law used to prosecute pregnant people using substances states:

- (A) It is unlawful for a person . . . who is the parent . . . of a child . . . to:
- (1) place the child at unreasonable risk of harm affecting the child’s life, physical or mental health, or safety;
 - (2) do or cause to be done unlawfully or maliciously any bodily harm to the child so that the life or health of the child is endangered or likely to be endangered.¹⁶⁵

On its face, this statute requires the prosecution to prove that the fetus was subjected to an “unreasonable risk of harm” or actual “bodily harm” for a person to be convicted of unlawful conduct toward a child. For the sake of this argument, I will assume that proving an “unreasonable risk of harm” requires demonstrating a strong causal relationship between the drug and the possible harm to the fetus. This assumption can be inferred from the statutory text because it states that it is unlawful for a parent to “place” the child in harm’s way or “do or cause to be done” any harm. It therefore connects the parental action directly to the harm.

c. Alabama

Alabama criminalizes fetal harm through its chemical endangerment law. This law was initially enacted to target parents who exposed children to methamphetamine labs,¹⁶⁶ but within months of its passing in 2006, “prosecutors and courts began applying the law to women who exposed their embryo or fetus to controlled substances in utero.”¹⁶⁷ Indeed, Alabama has been described as “the national capital for prosecuting women on behalf of their

¹⁶⁴ See *Whitner v. State*, 492 S.E.2d 777, 778 (S.C. 1997). Alabama’s state supreme court was the next to do so roughly 16 years later. Rachel Suppé, *Pregnancy on Trial: The Alabama Supreme Court’s Erroneous Application of Alabama Chemical Endangerment Law in Ex parte Ankrom*, 7 HEALTH L. POL’Y BRIEF 49, 57 (2014) (“This Alabama Supreme Court decision [*Ex parte Ankrom* (2013)] makes Alabama only the second state, along with South Carolina, to hold that laws designed to protect children from exposure to drugs can be used to prosecute women for using drugs during their pregnancy.”). In this way, South Carolina became a model for states seeking to criminalize conduct during pregnancy.

¹⁶⁵ S.C. CODE ANN. § 63-5-70 (2008) (emphasis added).

¹⁶⁶ See Martin, *supra* note 33.

¹⁶⁷ See *id.*

newborn children.”¹⁶⁸ Prosecution under this law is so zealous “that, in one instance, the district attorney had to drop a prosecution . . . after it was confirmed that the defendant was not even pregnant.”¹⁶⁹ A report on this statute explained that “[a] woman can be charged with chemical endangerment from the earliest weeks of pregnancy, even if her baby is born perfectly healthy. . . . The penalties are exceptionally stiff: one to 10 years in prison if her baby suffers no ill effects, 10 to 20 years if her baby shows signs of exposure or harm and 10 to 99 years if her baby dies.”¹⁷⁰ Nearly everyone charged under this statute pleads guilty.¹⁷¹

Like South Carolina, the Alabama Supreme Court has interpreted the law to apply to unborn fetuses.¹⁷² The law states:

(a) A responsible person commits the crime of chemical endangerment of exposing a child to an environment in which he or she does any of the following:

- (1) Knowingly, recklessly, or intentionally causes or permits a child to be exposed to, to ingest or inhale, or to have contact with a controlled substance, chemical substance, or drug paraphernalia. . . . A violation under this subdivision is a Class C felony.
- (2) Violates subdivision (1) *and a child suffers serious physical injury* by exposure to, ingestion of, inhalation of, or contact with a controlled substance, chemical substance, or drug paraphernalia. A violation under this subdivision is a Class B felony.

¹⁶⁸ Kathleen Adams, *Chemical Endangerment of A Fetus: Societal Protection of the Defenseless or Unconstitutional Invasion of Women’s Rights?*, 65 ALA. L. REV. 1353, 1359 (2014) (quoting Ada Calhoun, *Mommy Had to Go Away for a While*, N.Y. TIMES MAGAZINE 32 (Apr. 29, 2012)).

¹⁶⁹ Lewis, *supra* note 14, at 191.

¹⁷⁰ Martin & Yurkanin, *supra* note 69.

¹⁷¹ *See id.* (“Nearly all mothers charged with chemical endangerment end up pleading guilty. It’s a condition for a pretrial diversion or drug court, with the promise of a dismissal if a woman gets clean and stays out of trouble. ‘It’s a path of almost certain safety,’ said Morgan County attorney Brian White—irresistible even if a woman believes she did nothing wrong.”). This data was obtained through public record requests for chemical endangerment arrests in Alabama from 2006 through 2015: In order to identify which were prenatal cases, “the reporters examined thousands of pages of electronic court documents, checked news reports, and contacted prosecutors and defense lawyers. They were able to identify 479 women who had been charged with chemical endangerment for in utero drug exposure—about a quarter of all women charged under the law. Because court records do not always indicate a pregnancy, and because juvenile cases are not included, the total is likely to be an undercount.” *How We Identified Alabama Pregnancy Prosecutions*, PROPUBLICA (Sept. 23, 2015), <https://www.propublica.org/article/how-we-identified-alabama-pregnancy-prosecutions#:~:text=reporters%20Nina%20Martin%20and%20Amy,from%202006%20through%20late%20July,archived%20at%20perma.cc/Z4K7-JJ7W>.

¹⁷² *Ex parte Ankrom*, 152 So. 3d 397, 407 (Ala. 2013).

- (3) Violates subdivision (1) and the exposure, ingestion, inhalation, or contact *results in the death of the child*. A violation under this subdivision is a Class A felony.¹⁷³

For the Class C felony, actual harm is not required for a conviction—the prosecution need only prove that the fetus was exposed to a chemical substance.¹⁷⁴ In contrast, the Class A and B felonies require evidence of actual harm to the fetus for conviction. For a Class B felony, the fetus must be exposed and harmed, but the law does not explicitly require causation (that the exposure caused the harm). The Class A felony, however, requires a causal inference to be made. Prosecution of the Class A felony requires three factors be shown: 1) the fetus was exposed; 2) it died; and 3) its death was caused by the exposure.

2. *Federal prosecution of prenatal substance abuse*

The criminalization of prenatal substance use was confined to state-level criminal systems until 2019, when it entered the federal courts. As such, these prosecutions are no longer limited to state prosecution, and may be increasingly federally prosecuted. In *United States v. Flute*,¹⁷⁵ a Native American woman gave birth to a full-term baby who died four hours after birth. Samantha Flute told doctors that she had ingested both prescription and over-the-counter medicine before arriving at the hospital. She was subsequently arrested on allegations that she killed the baby by ingesting those medications “in a grossly negligent manner.”¹⁷⁶ She also tested positive for cocaine.¹⁷⁷ Flute was charged with involuntary manslaughter. The district court dismissed the charge, holding that the Unborn Victims of Violence Act¹⁷⁸ created a class of persons who “cannot be prosecuted under the federal criminal statutes for injury caused to an unborn child”: pregnant women, for actions with respect to their own unborn children.¹⁷⁹ The Eighth Circuit Court of Appeals reversed and reinstated Flute’s indictment,¹⁸⁰ holding that the baby fell within the class of victims protected by the manslaughter-

¹⁷³ ALA. CODE § 26-15-3.2 (emphasis added).

¹⁷⁴ The Bloomstein Firm, *What you need to know about Alabama’s chemical endangerment law*, <https://www.thebloomstonfirm.com/what-you-need-to-know-about-alabamas-chemical-endangerment-law/#:~:text=the%20chemical%20exposure%20law%20makes,up%20to%2010%20years%20in,archived%20at%20https://perma.cc/9ZL6-PDQH> (“Note that there need be no evidence of any harm to the child in order to obtain a conviction.”).

¹⁷⁵ *United States v. Flute*, 929 F.3d 584 (8th Cir. 2019).

¹⁷⁶ *United States v. Samantha Flute*, 2017 WL 11414318 (D. S.D. 2017).

¹⁷⁷ *United States v. Flute*, 929 F.3d at 586 (“Flute tested positive for cocaine and a number of prescription and over-the-counter drugs.” The court added that “she had snorted hydrocodone, which she believed to have been laced with cocaine based on the feeling it gave her.”).

¹⁷⁸ 18 U.S.C.A. § 1841 (West).

¹⁷⁹ *United States v. Flute*, No. 1:17-CR-10017-CBK, 2017 WL 5495170, at *3 (D.S.D. Nov. 14, 2017), *rev’d and remanded*, 929 F.3d 584 (8th Cir. 2019).

¹⁸⁰ *See generally* Flute, 929 F.3d.

ter statute under the definition of “human being” proffered by the Born Alive Infant Protections Act.¹⁸¹ The court further held that Flute fell within the class of defendants recognized by the manslaughter statute because the law criminalizes a person killing a “human being,” which includes a child “born alive.” The court determined that the Unborn Victims of Violence Act “has no applicability or reach beyond its own provisions,”¹⁸² and as such, its language exempting a pregnant person with respect to their own fetus could not be used to challenge the language employed in a different statute. As such, the immunity for a pregnant person is exclusive to the offenses against “unborn children” specifically added by the Act and “does not extend to offenses against born-alive children in violation of a predicate statute.”¹⁸³ The case will return to the district court for trial, where the court will have to determine, *inter alia*, “the extent to which an illegal substance, not charged in the indictment, caused the death of the child.”¹⁸⁴

This decision is highly significant, not only because it is the first time such an issue has been ruled on by a federal circuit court, but because it signals that federal courts may be willing to pick up where state jurisprudence has left off. This prediction is bolstered by Justice Clarence Thomas’ line of questioning in *Dobbs v. Jackson Women’s Health*.¹⁸⁵ In oral arguments on that case, which occurred on December 1, 2021, advocates argued about whether a state can enact abortion bans earlier in pregnancy than the viability line established in *Planned Parenthood v. Casey*.¹⁸⁶ Justice Thomas “took nearly every opportunity to discuss the case of a woman who used cocaine during her pregnancy and was prosecuted under child neglect laws.”¹⁸⁷ Thomas’ insistence on centering criminalization of pregnancy in oral arguments for a case pertaining to the merits of abortion bans suggests the current Court’s inclination to increase measures to criminalize pregnancy.

Further, in *Flute*, the Eighth Circuit interpreted the manslaughter statute so broadly that it “dramatically expand[ed] criminality to a wide range of pregnant conduct without express legislative intent.”¹⁸⁸ This interpretation

¹⁸¹ See *Flute*, 929 F.3d. at 588.

¹⁸² *Flute*, 929 F.3d at 589–90.

¹⁸³ M. Maureen Murphy, *Mom’s Prenatal Drug Abuse Sustains Federal Manslaughter Indictment in Newborn’s Death*, CONGRESSIONAL RESEARCH SERVICE 2 (Jul. 22, 2019), <https://sgp.fas.org/crs/misc/LSB10334.pdf>, archived at <https://perma.cc/4UEJ-63VY>.

¹⁸⁴ *Id.* at 3.

¹⁸⁵ Transcript of Oral Argument at 49–51, *Dobbs v. Jackson Women’s Health Org.*, 141 S. Ct. 2619 (2022).

¹⁸⁶ *Planned Parenthood of S.E. Pennsylvania v. Casey*, 505 U.S. 833 (1992).

¹⁸⁷ See Caroline Reilly, *Hey Conservative Justices, Here’s Why You Can’t Make Abortion Go Away*, REWIRE NEWS GROUP (Dec. 2, 2021, 11:50AM), <https://rewirenewsgroup.com/article/2021/12/02/hey-conservative-justices-you-cant-make-abortion-go-away/>, archived at <https://perma.cc/EJ8T-J2CB>.

¹⁸⁸ Case Comment, Eighth Circuit Upholds Manslaughter Charge Against Pregnant Woman For Death Of Baby Based On Prenatal Drug Use: *United States v. Flute*, 929 F.3d 584 (8th Cir. 2019), 133 HARV. L. REV. 1087 (2020).

will have far-reaching consequences for pregnant people, as “[t]he elastic criminalization gives unchecked discretion to prosecutors, medical providers, and courts to choose what conduct—and whose conduct—is found criminal.”¹⁸⁹ The development of prosecutions for prenatal substance use being brought to federal courts is a troubling one. Expanding the jurisdiction under which these charges can be brought signals a trend toward increasing the number of these prosecutions across the country.

B. Evidence Of Fetal Harm In Prenatal Substance Use Prosecutions

As a result of these statutory schemes, state, and now federal, prosecutors bring cases criminalizing prenatal substance use without considering the scientific validity of whether prenatal substance use actually caused fetal harm. The issue is not that courts admit zero evidence speaking to the science behind the prosecution. Rather, it is that courts accept misleading or inconclusive evidence of fetal harm as scientific fact. This sort of misleading evidence often comes into court through physician and/or law enforcement testimony.

1. Physician and law enforcement testimony on fetal harm

Because physicians are trained in diagnosing conditions, rather than determining the exact cause of specific conditions, they are rarely qualified to testify to the background causes of fetal death or harm.¹⁹⁰ Yet, in many cases, the delivering doctor or local medical examiner is permitted to testify as an expert on these issues.¹⁹¹ What’s more, police officers are sometimes permitted to testify about fetal endangerment. To demonstrate the danger that arises from the use of testimony from law enforcement officers, consider the case of Julie Starks.¹⁹² Starks, a pregnant woman, was arrested in a trailer that police believed was being, or had been, used to manufacture methamphetamine.¹⁹³ At trial, the state argued that Starks exposed her child to dangerous fumes and called the arresting officer to the stand:

[*State*]: Do you think you need a medical degree that would enable you to have an opinion that a pregnant woman should not have been in the environment that you were in [when you arrested her] . . . ?

[*Arresting officer*]: I don’t believe I need a medical degree for that, no.

¹⁸⁹ *Id.*

¹⁹⁰ Distinction is discussed *infra* Part III, Section C.

¹⁹¹ See Paltrow & Jack, *supra* note 66, at 35.

¹⁹² *In re* Unborn Child of Starks, 18 P.3d 342 (Okla. 2001).

¹⁹³ *Id.*

. . .

[*State*]: Okay. And do you have an opinion as to whether or not [Starks'] and her child's safety were placed in danger by being in that lab?

[*Arresting officer*]: I felt it was¹⁹⁴

This is not scientific evidence of fetal endangerment, and thus cannot serve to prove the legitimate risk of harm that Starks allegedly posed to the fetus, yet the officer's statements were admitted as valid testimony on the subject.

2. *Courts are currently ill-equipped to be scientific fact-finders*

For better or worse, courts can be central to scientific knowledge production.¹⁹⁵ Courts tend to make bright-line determinations where there is scientific uncertainty and establish as fact scientific concepts contrary to accepted knowledge.¹⁹⁶ When they do this, they legitimize the idea that there is a scientific finding where it may not exist. As such, courts are "purporting to be scientifically literate, and allowing in all kinds of evidence that would not make it within shouting distance of a peer-reviewed journal."¹⁹⁷ As one example, courts have sentenced individuals to prison due to saliva exposure to HIV,¹⁹⁸ though it has been proven that HIV cannot be transmitted this way.¹⁹⁹ Courts have similarly issued inaccurate bright-line pronouncements in cases concerning prenatal drug use, such as in *State v. McKnight*,²⁰⁰ which centered on a Black woman's stillbirth and her cocaine use during pregnancy. Though Regina McKnight's conviction was later overturned,²⁰¹ the South Carolina Supreme Court wrote in its opinion upholding the homicide conviction: "Given the fact that it is public knowledge that usage of cocaine is potentially fatal, we find the fact that McKnight took

¹⁹⁴ Paltrow & Jack, *supra* note 66, at 35.

¹⁹⁵ See Aziza Ahmed, *Adjudicating Risk: AIDS, Crime, and Culpability*, 2016 Wis. L. REV. 627, 640 (2016).

¹⁹⁶ See *id.*; see also Erica Beecher-Monas, *Lost in Translation: Statistical Inference in Court*, 46 ARIZ. ST. L. J. 1057, 1060 (2014) ("[C]ourts tend to rely on rules of thumb and bright line cut-offs.").

¹⁹⁷ The Editorial Board, *Junk Science at the F.B.I.*, N.Y. TIMES (Apr. 27, 2015), www.nytimes.com/2015/04/27/opinion/junk-science-at-the-fbi.html, archived at <https://perma.cc/7JRC-C74A>.

¹⁹⁸ See Ahmed, *supra* note 195, at 646.

¹⁹⁹ Mark Satta, *Spitting at Science: The Unjustified Criminalization of Spitting While HIV-Positive*, BILL OF HEALTH (Feb. 25, 2019), <https://blog.petrieflom.law.harvard.edu/2019/02/25/spitting-at-science-the-unjustified-criminalization-of-spitting-while-hiv-positive/>, archived at <https://perma.cc/HJ5T-CH5B>.

²⁰⁰ *State v. McKnight*, 352 S.C. 635 (2003).

²⁰¹ Among other issues, the state supreme court overturned the conviction because it considered defense counsel's failure to investigate the relationship. *Id.* at 360.

cocaine knowing she was pregnant was sufficient evidence to submit to the jury on whether she acted with extreme indifference to her child's life."²⁰²

The court stated that public knowledge of the fatality of prenatal cocaine use was a "given"; however, when the court issued the decision in 2003, research imputing significant doubt on this conclusion had already been published.²⁰³ When courts promulgate misinformation or accept as fact scientific propositions that are highly contestable, they engage in a self-enforcing cycle of criminalization without evidentiary basis.

C. *Judicial Treatment Of The Causal Relationship Between Cocaine Use And Fetal Harm*

It is not clear how courts are currently adjudicating prenatal substance use cases, mainly because the overwhelming majority of these cases are resolved through guilty pleas or dismissals.²⁰⁴ Of those that go to trial, most decisions are not published. What can be gleaned is that, in several states, the law is not uniformly applied. The director of a Tennessee medical clinic stated that, "[t]here's nothing formulaic about how the law is used . . . It depends what county they come from. We're not sure what the state will do."²⁰⁵ A criminal defense attorney echoed a similar issue in Alabama: "each county is its own little fiefdom . . . [y]ou get vastly different results in terms of how the cases are prosecuted."²⁰⁶ The inconsistency of judicial handling of these cases can, and has, led to inequitable outcomes, such as the disproportionate criminalization of low-income people and people of color. Courts must therefore adopt a uniform approach to determine guilt in prenatal substance use cases.

III. USING THE G2I FRAMEWORK TO ANALYZE THE CAUSAL RELATIONSHIP BETWEEN PRENATAL SUBSTANCE USE AND FETAL HARM

Federal courts and most state courts are obligated to evaluate the methods and principles underlying scientific evidence submitted to them.²⁰⁷ But the approach that they take in evaluating such methods and principles, guided by the *Frye* and *Daubert* cases, is insufficient to address the question

²⁰² *Id.* at 646.

²⁰³ See e.g., Beatrix Lutiger et al., *Relationship Between Gestational Cocaine Use and Pregnancy Outcome: A Meta-Analysis*, 44 *TERATOLOGY* 405, 411 (1991) ("[S]everal adverse effects commonly quoted to be associated with reproductive exposure to cocaine, such as abruptio placenta . . . fail to show by meta-analysis to have significantly increased risk despite a large number of studies.").

²⁰⁴ See Lewis, *supra* note 14.

²⁰⁵ *Criminalizing Pregnancy: Policing Pregnant Women Who Use Drugs in the USA*, AMNESTY INT'L 1, 15 (2017), https://www.amnesty.org/download/Documents/AMR5162032017_ENGLISH.pdf, archived at <https://perma.cc/XT5R-7QT7>.

²⁰⁶ Martin & Yurkanin, *supra* note 69.

²⁰⁷ See Sanders et al., *supra* note 20, at 856.

of whether drug ingestion, among other potential factors, caused fetal harm—the central question in a prosecution for prenatal substance use. The process of differential etiology²⁰⁸, described here as the “G2i framework,” provides an alternate and more accurate means of determining this central question. In contrast to the prevailing approach to assessing scientific validity, the G2i framework accounts for specific causation—that is, whether drug ingestion caused fetal harm in the specific case before the court, rather than the general idea that it could possibly have caused the harm. Adopting the G2i framework to assess guilt for fetal harm would produce more uniform, equitable, and scientifically accurate outcomes in cases concerning prenatal substance use.

A. *Assessing Scientific Validity In The Courtroom: Frye And Daubert*

Much of the evidence tying prenatal substance ingestion to fetal harm comes in the form of expert testimony. Courts and prosecutors often rely on physicians to establish the finding that drug use causes fetal harm, even if those physicians are not qualified as experts on this topic. The admission of expert evidence is presently governed by the Supreme Court case *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, which replaced then-ruling precedent, *Frye v. United States*. However, some states continue to use the *Frye* standard.²⁰⁹ Ultimately, neither of these doctrines address the problem of extrapolating from general data to make decisions about an individual case, an issue that is of fundamental importance in determining the specifics of fetal harm in prenatal substance abuse cases.

1. *The historical standard for scientific expert testimony: Frye v. United States*

The *Frye* standard was established in 1923 by the D.C. Circuit in *Frye v. United States*²¹⁰ and was the first major case addressing the increasing influence of science on the legal system.²¹¹ This standard “gave great deference to the views of forensic practitioners and not to empirical testing,”²¹² and it has been “liberally applied to favor admissibility of expert testi-

²⁰⁸ Differential etiology is “an inferential process combining statistical reasoning with a conceptual model of the causal interrelationships underlying observed data;” it is not simply a logical deduction. *Id.* at 855.

²⁰⁹ See DAVID A. SKLANSKY & ANDREA L. ROTH, EVIDENCE: CASES, COMMENTARY, AND PROBLEMS 518 (5th ed. 2020).

²¹⁰ *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923).

²¹¹ See JoAnne A. Epps & Kevin Todorow, *Refried Forensics: Screening Expert Testimony in Criminal Cases Through Frye Plus Reliability*, 48 SETON HALL L. REV. 1161, 1171 (2018).

²¹² Paul C. Giannelli, *Forensic Science: Daubert’s Failure*, 68 CASE W. RESV. L. REV. 869, 871 (2018).

mony.”²¹³ It is often referred to as the “general acceptance” test.²¹⁴ The test requires an inquiry into whether novel scientific evidence is “generally accepted” in the scientific community.²¹⁵ The *Frye* court did not define “general acceptance,” which left courts across the country to make their own determinations.²¹⁶ Under *Frye*, general acceptance can be established in a variety of ways, including: 1) expert testimony as to the general acceptance of the underlying technique among experts in the profession; 2) authoritative scientific or legal writings showing that the scientific community accepts the underlying technique; and 3) judicial opinions indicating that the technique has gained general acceptance.²¹⁷ The *Frye* standard has been broadly critiqued for its vagueness, and specifically its focus on acceptance rather than reliability.²¹⁸ Critics have argued that the focus on general acceptance over scientific reliability leads to the admission of unreliable evidence in place of reliable evidence. One critic aptly described that a literal reading of the *Frye* decision overlooks the “cultural lag” during which time a new method “diffuse[s] through [the] scientific discipline” to create a body of scientific opinion, depriving courts of scientifically reliable evidence.²¹⁹ A D.C. trial court judge summarized this critique: “under *Frye*, as applied in this jurisdiction, even if a new methodology produces ‘good science,’ it will usually be excluded, but if an accepted methodology produces ‘bad science,’ it is likely to be admitted.”²²⁰ Others argue that “*Frye* forces unqualified jurors to decide which scientific theories should be applied to the particular case.”²²¹

²¹³ See Victor E. Schwartz & Cary Silverman, *The Draining of Daubert and the Recidivism of Junk Science in Federal and State Courts*, 35 HOFSTRA L. REV. 217, 220 (2006).

²¹⁴ *Id.*

²¹⁵ *Id.*

²¹⁶ See Epps & Todorow, *supra* note 211. As one example, an Illinois court has stated that “[g]eneral acceptance” does not mean universal acceptance; and the methodology in question does not need to be accepted by unanimity, consensus, or a majority of experts. Rather, the underlying method used to generate an expert’s opinion must be reasonably relied on by other experts in the relevant field.” *People v. Floyd*, 11 N.E.3d 335, 341 (Ill. App. 2d Dist. 2014) (internal citations omitted).

²¹⁷ § 45:2. Applying the *Frye* “general acceptance” test, 6 JONES ON EVIDENCE § 45:2 (7th ed.).

²¹⁸ Alma Kelley McLeod, *Is Frye Dying Or Is Daubert Doomed? Determining The Standard Of Admissibility Of Scientific Evidence In Alabama Court*, 51 ALA. L. REV. 883, 886 (2000).

²¹⁹ Paul C. Giannelli, *The Admissibility of Novel Scientific Evidence: Frye v. United States, a Half-Century Later*, 80 COLUM. L. REV. 1198, 1223 (1980).

²²⁰ *Motorola Inc. v. Murray*, 147 A.3d 751, 756 (D.C. 2016).

²²¹ *Id.*

2. *The prevailing standard: Daubert v. Merrell Dow Pharmaceuticals*

The *Frye* test has been displaced by federal courts and most state courts²²² in favor of the *Daubert* standard. In *Daubert v. Merrell Dow Pharmaceuticals, Inc.*,²²³ the Supreme Court “radically changed the standard for admissibility of scientific testimony”²²⁴ out of a concern that the *Frye* test was incompatible with Federal Rule of Evidence 702.²²⁵ The *Daubert* standard primarily seeks not whether there is “scientific certainty,” but whether expert testimony “rest[s] upon ‘good grounds.’”²²⁶ The Court instructed trial judges to make a “preliminary assessment” of scientific validity and relevancy,²²⁷ thereby assigning the trial judge the role of gatekeeper.²²⁸ The Court provided key points for trial judges to consider: 1) whether the theory or technique has been tested; 2) whether it has been subjected to peer review and publication; 3) the known or potential rate of error; and 4) whether there is general acceptance of the expert’s scientific methods.²²⁹ Overall, trial courts must determine whether the expert testimony is “more likely than not” true.²³⁰ The *Daubert* standard has been both criticized

²²² See SKLANSKY & ROTH, *supra* note 209. *Frye* remains the principal test in some state jurisdictions, such as New York and California. See § 45:2. Applying the *Frye* “general acceptance” test, 6 JONES ON EVIDENCE § 45:2 (7th ed.).

²²³ *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993). *Daubert* was affirmed and refined in two subsequent Court decisions: *General Electric Co. v. Joiner*, 522 U.S. 136 (1997) and *Kumho Tire Co., Ltd. v. Carmichael*, 526 U.S. 137 (1999).

²²⁴ Giannelli, *supra* note 212, at 871.

²²⁵ *Daubert*, 509 U.S. at 588–89 (1993). Federal Rule of Evidence 702 is the rule governing expert testimony. It was later amended to codify *Daubert*’s holding.

²²⁶ Schwartz & Silverman, *supra* note 212, at 217–23.

²²⁷ Pamela J. Jensen, *Frye Versus Daubert: Practically the Same?*, 87 MINN. L. REV. 1579, 1582–83 (2003).

²²⁸ See *id.*; see also David L. Faigman et al., *Gatekeeping Science: Using the Structure of Scientific Research to Distinguish Between Admissibility and Weight in Expert Testimony*, 110 NW. U. L. REV. 859, 862 (2016).

²²⁹ *Daubert*, 509 U.S. at 593–94 (1993). The fourth prong functions the same as the *Frye* standard.

²³⁰ *Id.* at 596. In *Daubert*, Justice Blackmun wrote for the majority that “[v]igorous cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof are . . . the appropriate safeguards” to attack “shaky but admissible evidence.” *Id.* at 596. But there are, at least, three major barriers to using cross-examination effectively to attack shaky evidence. First, a significant problem arises when medical misinformation, such as in the case of the “crack baby” myth, is so pervasive that defense attorneys believe it. If they internalize medical misinformation, defense attorneys may “fail to challenge the scientific grounds for the case, fail to ask for *Daubert* hearings (or their state equivalent), fail to challenge the expertise of the state’s witnesses, fail to vigorously cross-examine those witnesses who are allowed to testify, or fail to call their own experts.” Paltrow & Jack, *supra* note 66, at 36. As one example, the South Carolina Supreme Court overturned the conviction of Regina McKnight, a young Black woman convicted of murder of her stillborn baby as a result of her cocaine use during pregnancy. Among the successful claims on appeal was ineffective assistance of counsel. The court found the defense counsel’s performance to be deficient because counsel failed to investigate the relationship between cocaine use and stillbirth or present evidence to contradict that of the prosecution. Though one might argue that a collateral attack alleging ineffective assistance of counsel provides a protection for this, these claims are rarely

and lauded as “cast[ing] the trial judge in a ‘gatekeeper’ role.”²³¹ Some argue that the standard “mak[es] unqualified judges evaluate the work of scientists”²³² and that it is unable to address the problem of “junk science” in criminal cases.²³³

B. *The G2i Framework As An Alternative Evidentiary Standard*

In contrast to the current approaches to admitting scientific evidence, the G2i framework implements a more exacting analysis and therefore provides a useful structure to analyze criminal charges by requiring a showing of actual or substantial risk of harm. The framework was created by legal academics to guide lawyers and courts when they face the challenge of reasoning from group data (G) to make decisions about individuals (i).²³⁴ It was formulated as a method for analyzing causation in toxic tort cases. In the context of prenatal substance use cases, the G2i framework can be used to guide courts as they rely on data about substance use and fetal harm (G) to determine whether a specific defendant’s drug use caused the harm that their fetus may have suffered (i).

To accurately analyze scientific evidence, “courts must begin their consideration of scientific evidence by focusing on both whether it is ‘good’—that is, meets certain evidentiary standards—and on what it’s good for.”²³⁵ The G2i framework, in contrast to current evidentiary standards, accomplishes the latter requirement. One issue in prenatal substance use cases is that courts fail to recognize that having expertise in diagnosing illness (differential diagnosis²³⁶), as a doctor would have, is not the same as having expertise in assigning background causes to illnesses (differential etiology).²³⁷ G2i sets out to resolve this error. A key component of G2i is its requirement that courts assess an expert witness’s ability to provide empirical framework for evidence in addition to showing their ability to provide

successful and to bring a collateral attack a person must first be convicted. A collateral attack is cold comfort to, and insufficient protection for, a wrongly convicted person.

²³¹ McLeod, *supra* note 218, at 892.

²³² Motorola Inc., 147 A.3d at 756.

²³³ Jim Hilbert, *The Disappointing History of Science in the Courtroom: Frye, Daubert, and the Ongoing Crisis of “Junk Science” in Criminal Trials*, 71 OKLA. L. REV. 759, 762 (2019).

²³⁴ See David L. Faigman et al., *supra* note 19, at 2.

²³⁵ *Id.* at 4.

²³⁶ Differential diagnosis is “the determination of which of two or more diseases with similar symptoms is the one from which the patient is suffering by a systematic comparison and contrasting of the clinical findings.” Sanders et al., *supra* note 20, at 857. Cf. Differential etiology, which is “an inferential process combining statistical reasoning with a conceptual model of the causal interrelationships underlying observed data.” *Id.* at 855.

²³⁷ See Sanders et al., *supra* note 20, at 859 (“First, the courts failed to distinguish between differential diagnosis as it is understood in the medical field and the search for the legally relevant background cause of an illness. Second, because of this confusion, the courts failed to recognize that expertise in arriving at a correct diagnosis does not necessarily transfer to expertise in assigning causes to illnesses.”).

diagnostic evidence.²³⁸ This distinction between differential diagnosis and differential etiology, often overlooked by courts, is crucial to making a showing of causality in cases that require a causal relationship between a defendant's actions and the harm caused.

Unlike diagnosis, etiology is a legal construction “borne of necessity.”²³⁹ It is not a term used or developed by scientists. But, differential etiology is the only adequate approach in situations where courts rely on experts to prove specific causation or give diagnostic judgment.²⁴⁰ This is because, in the field of applied science, there are no certainties; all diagnostic judgments are probabilistic statements.²⁴¹ As David Faigman, an expert in the intersection of law and science, puts it: “While science attempts to discover the universals hiding among the particulars, trial courts attempt to discover the particulars hiding among the universals.”²⁴² The process of differential etiology, unlike current evidentiary standards, specifically seeks to find those particulars among the universals.

The central issue plaguing the current evidentiary standards for scientific evidence is not simply one of terminology, but one of understanding statistics. Judges do not appear to consider the underlying reasoning of statistics as used in scientific testimony.²⁴³ “The way scientists understand causal inference in their writings and practice . . . differs radically from the testimony jurists require to prove causation in court.”²⁴⁴ This produces a dangerous disconnect between how judges interpret scientific testimony and how it ought to be applied in a case of causal inference. This disconnect has severe consequences for criminal defendants. Courts have failed to develop a coherent “standard technique” to follow when tasked with answering background causal questions.²⁴⁵ Because of this, courts often exclude scientifically sound testimony but admit other testimony which lacks scientific basis.²⁴⁶

C. *The G2i Framework Applied To Prenatal Substance Use*

The G2i framework is well suited for prenatal substance use cases, as criminal toxic causation has similar evidentiary elements to civil toxic causation. Both types of cases require a determination of whether a specific injury, or risk of injury, was in fact caused by a chemical substance. Pres-

²³⁸ See *id.* See also Faigman et al., *supra* note 19, at 2.

²³⁹ See Faigman et al., *supra* note 228.

²⁴⁰ See *id.*

²⁴¹ See *id.* at 1 (“That’s why the applied science that is part of our everyday lives—whether in the form of drugs, diagnostic tests, or weather forecasts—doesn’t come with a promise. It comes with a probability.”).

²⁴² FAIGMAN, *supra* note 1.

²⁴³ See Beecher-Monas, *supra* note 196, at 1057.

²⁴⁴ *Id.*

²⁴⁵ Sanders et al., *supra* note 20, at 859.

²⁴⁶ See Beecher-Monas, *supra* note 196, at 1057.

ently, due to a misunderstanding of statistics, analysis often starts with the individual, failing to first establish that the general phenomenon does, in fact, exist.²⁴⁷ In other words, prosecutions begin by determining that the pregnant person ingested drugs and experienced a miscarriage or stillbirth, rather than first establishing whether their drug ingestion could have possibly caused the adverse pregnancy outcome. If courts were to adopt this framework in criminal cases involving prenatal drug use, it would remedy this issue for criminal causation analysis.

Establishing causal impact under this framework requires proof of general causation and specific causation. First, an expert must properly ascertain the injury, or simply put, make a correct diagnosis.²⁴⁸ Second, an expert must determine whether exposure to the substance at issue can cause the claimed condition (finding general causation, or “ruling in”).²⁴⁹ Finally, an expert must rule out alternative causes (finding specific causation, or “ruling out”).²⁵⁰ It is vital that courts establish both general and specific causation. Where general causation seeks to establish whether a substance can, to a reasonable degree of confidence, cause the asserted condition, specific causation seeks to answer whether the substance actually did cause the condition in that case.²⁵¹ The second and third steps align with the requirements of criminal causation analysis.

These steps also parallel the requirements of Federal Rule of Evidence 702,²⁵² which is the governing standard for admitting expert testimony. Rule 702 requires “sufficient data with which to reach a conclusion that the substance under question is the cause of the plaintiff’s injury and, equally important, a reliable method to address the effects of alternative possible causes.”²⁵³ As presently applied, evidentiary standards do not meet this requirement. The three steps of the G2i framework would more accurately fulfill the mandate of Rule 702. This Note will not explore the first step, correct diagnosis, because prenatal substance use cases do not turn on diagnosis. However, the second and third steps, “ruling in” and “ruling out,” are relevant to these cases, and as such, are explored herein.

²⁴⁷ *Id.*

²⁴⁸ See Sanders et al., *supra* note 20, at 862.

²⁴⁹ See *id.*

²⁵⁰ See *id.*

²⁵¹ Another way to understand this is through an analogy to cigarettes and lung cancer. It is understood that smoking causes lung cancer, but that does not mean it causes *every* instance of lung cancer. This issue captures the G2i problem well because in any given case, the question would not be “can smoking cause cancer?”, but instead, did smoking cause cancer in *this* case.

²⁵² Fed. R. Evid. 702.

²⁵³ Sanders et al., *supra* note 20, at 893. It is referred to as a “weight-of-the-evidence” methodology. See generally Austin Bradford Hill, *The Environment and Disease: Association or Causation*, 108 J. ROYAL SOC’Y. MED. 32 (1965).

1. “Ruling in” or general causation

After diagnosing the condition, the second step is “ruling in,” which involves establishing general causation (“G”). One theory of establishing general causation²⁵⁴ comes from Sir Austin Bradford Hill, a leader in medical statistics.²⁵⁵ Hill’s theory was originally intended to guide scientists, but similarly applies in these cases where courts act as scientific adjudicators. Hill proposes nine factors to determine whether general causation exists:²⁵⁶ strength, consistency, specificity, temporality, biological gradient (also known as dose-response curve),²⁵⁷ plausibility, coherence, experiment, and analogy.²⁵⁸ Some argue that this method can be prone to “strategic misuse,”²⁵⁹ but that fear may be mitigated when applied in conjunction with specific causation.

In prenatal substance use cases, the operative question a judge must decide in “G” (general causation) to get to “i” (specific causation) is whether an illicit substance, such as cocaine, is a teratogen to a reasonable degree of confidence such that the law should be concerned. As an evidentiary matter, the judge must be convinced by a preponderance of evidence²⁶⁰ that cocaine is a teratogen among the general population. Put simply, a judge must be convinced that cocaine acts as a teratogen in at least *some* situations. Depending on how strictly the judge takes this requirement, the prosecution’s case may fail at this step. It is generally understood that cocaine is either a weak teratogen or not a teratogen at all,²⁶¹ and “in any specific case determining the particular cause of preterm birth is often impossible.”²⁶² A judge could determine on this basis that, applying the Hill guidelines, the evidence is not strong, consistent, or specific enough to conclude there is general causation to establish that cocaine produced the fetal harm. If general causation cannot be established, there “can be no specific causation determination.”²⁶³ A court may only move to the next step (determining “i”) if there is an adequate foundation demonstrated at “G.”

²⁵⁴ See generally *id.*

²⁵⁵ See Peter Armitage, *Obituary: Sir Austin Bradford Hill, 1897-1991*, 154 J. ROYAL STATISTICAL SOC’Y 482, 482 (1991) (“But to anyone involved in medical statistics, epidemiology or public health Bradford Hill was quite simply the world’s leading medical statistician. His position was universally recognized and unchallenged.”).

²⁵⁶ Hill, *supra* note 253, at 32.

²⁵⁷ A biological gradient or dose-response curve would show that greater exposure to a cause leads to greater incidence of the effect.

²⁵⁸ Hill, *supra* note 253, at 32.

²⁵⁹ David L. Faigman et al., *Group to Individual (G2i) Inference in Scientific Expert Testimony*, 81 U. CHI. L. REV. 417, 450 (2014).

²⁶⁰ See *id.* at 429.

²⁶¹ As found previously, *infra* Part I, Section B.

²⁶² Nagahawatte & Goldenberg, *supra* note 112, at 84.

²⁶³ Sanders et al., *supra* note 20, at 893.

2. “Ruling out” or specific causation

The third step in the process of differential etiology analysis is “ruling out” and concerns specific causation. Courts have offered “no real guidance” about the details of this step, however, a group of academics has created a systematic approach for courts to evaluate specific causation. Their approach to specific causation asks courts to consider three primary questions: 1) what is the evidence supporting the argument that the injury is an instance of a causal relationship instead of an unrelated, natural development; 2) what is the evidence that the injury is due to some other causal relationship;²⁶⁴ and in the event that there is a competing cause, which is the most likely scenario in most instances of specific causation; and 3) what is the comparative likelihood that the injury is a result of the asserted cause instead of the other possible cause(s).²⁶⁵

a. *G2i applied to criminal causation analysis*

This test must be combined with the criminal law requirement to establish causation, which has two components: 1) factual or “but for” causation and 2) proximate causation.²⁶⁶ Factual causation is very straightforward—it simply means that the harm would not have occurred in the absence of the defendant’s act.²⁶⁷ This is parallel to the first question in a ruling out analysis, whether the evidence indicates a causal relationship. Proximate causation is less clear. The Supreme Court has described it as a “flexible concept”²⁶⁸ explained in terms of “foreseeability or the scope of the risk created by the predicate conduct.”²⁶⁹ Requiring a finding of proximate causation “serves, *inter alia*, to preclude liability in situations where the causal link between conduct and result is so attenuated that the consequence is more aptly described as mere fortuity.”²⁷⁰ Thus, a proximate causation analysis appears to combine the second and third questions within a ruling out analysis, (whether there is another possible cause and if so, the likelihood the injury arose from that cause). Similar to proximate causation, these ques-

²⁶⁴ A good example of this ruling out process is found in the remanded *Daubert* case; then-Judge Kozinski wrote for the majority: “In support of this conclusion, Dr. Palmer asserts only that Bendectin is a teratogen and that he has examined the plaintiffs’ medical records, which apparently reveal the timing of their mothers’ ingestion of the drug. Dr. Palmer offers no tested or testable theory to explain how, from this limited information, he was able to eliminate all other potential causes of birth defects, nor does he explain how he alone can state as a fact that Bendectin caused plaintiffs’ injuries.” *Daubert v. Merrell Dow Pharm., Inc.*, 43 F.3d 1311, 1319 (9th Cir. 1995) (emphasis added).

²⁶⁵ See Sanders et al., *supra* note 20, at 894.

²⁶⁶ See SANFORD F. KADISH ET AL., CRIMINAL LAW AND ITS PROCESSES 607–08 (10th ed., 2017).

²⁶⁷ *Id.*

²⁶⁸ *Paroline v. United States*, 572 U.S. 434, 444 (2014).

²⁶⁹ *Id.* at 445.

²⁷⁰ *Id.*

tions seek to ensure that, in the specific case, the effect is due to the alleged cause. In summary, the analysis for specific causation aligns with that for criminal causation.

b. Specific causation analysis where there are other possible causes of harm

Where there are multiple possible causes for a given effect, the effect is termed a “joint effect.”²⁷¹ There are two statistical models to address this: the additive and multiplicative models. The latter is employed for etiological purposes.²⁷² Under the multiplicative model, the effect of each factor is lessened when another factor is present, as a second factor may confound the relationship.²⁷³ Academics have employed the multiplicative model to compare the statistical probability that either “Drug X” or estrogen caused endometrial cancer in a specific case.²⁷⁴ This model is replicated later in this Note to demonstrate the statistical probability that either cocaine or poverty caused fetal harm in a specific case.

*D. Poverty As A Confounder In The Causal Relationship Between Substance Use And Fetal Harm*²⁷⁵

Under the G2i framework, prosecutions for prenatal substance use must fail where a significant confounder is present. As this Note has discussed, cocaine is not a teratogen, or a weak one at best. But for the purpose of demonstrating the usefulness of the G2i framework, this analysis will assume that cocaine ingestion is independently harmful to a fetus. This is predominantly to demonstrate that even if a court, or the law, assumes cocaine is harmful, the confounding effect of poverty would render a specific causation conclusion impossible in many cases.²⁷⁶ It is important to note that this should not be taken to imply an association between cocaine use and poverty, but this Note presents poverty as the confounder because prosecutions for prenatal substance use are predominantly deployed against people in poverty.

There is extensive evidence that poverty is linked to low birth weight and preterm delivery (the same adverse effects associated with cocaine in-

²⁷¹ Sanders et al., *supra* note 20, at 901.

²⁷² *See id.* at 902.

²⁷³ *Id.* at 903.

²⁷⁴ *See id.*

²⁷⁵ Poverty is used here as the confounding variable because statistics demonstrate that most people arrested for prenatal substance use are indigent. However, as discussed briefly above, there are often many factors present which could contribute to the same negative fetal impacts. This analysis should be similarly applied for any other potentially confounding factors.

²⁷⁶ *See* Addis et al., *supra* note 111 (“It is impossible . . . to apportion the risk of cocaine vs the confounders.”).

gestion).²⁷⁷ Pregnant people who experience poverty are significantly less likely to receive adequate prenatal care,²⁷⁸ which increases the likelihood of having low birth weight infants.²⁷⁹ This relationship holds with regard to poor nutrition as well.²⁸⁰ Both access to care and access to nutritious foods are symptoms of poverty.²⁸¹ The adverse birth effects associated with prenatal cocaine ingestion and poverty, independently, are so closely intertwined that “[r]esearchers cannot determine authoritatively which of this array of hazards actually caused the terrible outcomes they originally attributed to crack.”²⁸² Many of the problems seen in cocaine exposed babies are “just as likely to have been caused by other risk factors.”²⁸³

Living in poverty creates a “cumulative risk”²⁸⁴ because it is possible that “[c]ocaine intensifies already well-recognized environmental hazards for mothers and their infants,” such as poverty.²⁸⁵ As mentioned earlier, those subject to criminal prosecution for prenatal cocaine use are often indigent. This cumulative risk poses a substantial obstacle to determining specific causation of fetal harm. Exposure to multiple risk factors “may overshadow any specific effects of prenatal cocaine exposure”²⁸⁶—and “[c]umulative risk models suggest that it is the number of risk factors rather than the nature of the specific risk factors that determine developmental outcome.”²⁸⁷ It is thus difficult to zero in on cocaine as the singular or primary cause of harm.²⁸⁸

It is unsurprising that poverty exacerbates the propensity toward fetal harm in this context because it also functions this way for prenatal alcohol consumption. Fetal alcohol spectrum disorders (FASDs) are a possible outcome of drinking alcohol during pregnancy.²⁸⁹ One study found that pregnant women, regardless of socioeconomic status, consumed alcohol at the

²⁷⁷ See Jennifer D. Parker et al., *Associations between Measures of Socioeconomic Status and Low Birth Weight, Small for Gestational Age, and Premature Delivery in the United States*, 4 ANNALS OF EPIDEMIOLOGY 271, 275 (1994) (finding a “well-established relationship between low socioeconomic status and adverse birth outcome” as well as a “significantly elevated risk[] of [low birth weight] infants among both black and white mothers of low socioeconomic position” and “elevated risks of preterm delivery . . . among women of low socioeconomic status”).

²⁷⁸ See generally Kalmuss & Fennelly, *supra* note 113.

²⁷⁹ See Snodgrass, *supra* note 97, at 229.

²⁸⁰ See Roberts, *supra* note 15, at 953.

²⁸¹ See generally Siddiqui et al., *supra* note 114, at 1.

²⁸² Roberts, *supra* note 14, at 952.

²⁸³ *Id.*

²⁸⁴ See generally Lester & Tronick, *supra* note 100.

²⁸⁵ Linda C. Mayes et al., *Commentary, The Problem of Prenatal Cocaine Exposure: A Rush to Judgment*, 267 J. AM. MED. ASS'N 406, 407 (1992).

²⁸⁶ Tronick & Beeghly, *supra* note 102, at 165.

²⁸⁷ Lester & Tronick, *supra* note 100 at 117.

²⁸⁸ It is important to note that this does not mean that poverty should be criminalized.

²⁸⁹ CNTRS. FOR DISEASE CONTROL AND PREVENTION, *Basics about FASDs*, [https://www.cdc.gov/ncbdd/fasd/facts.html#:~:text=Fetal%20Alcohol%20Syndrome%20\(FAS\)%203A,communication%2C%20vision%2C%20or%20hearing,archived%20at%20https://perma.cc/86SA-SJ9G](https://www.cdc.gov/ncbdd/fasd/facts.html#:~:text=Fetal%20Alcohol%20Syndrome%20(FAS)%203A,communication%2C%20vision%2C%20or%20hearing,archived%20at%20https://perma.cc/86SA-SJ9G).

same rate;²⁹⁰ however, low-income children had a 70.9% rate of Fetal Alcohol Syndrome, compared with a 4.5% prevalence for children born to upper income women.²⁹¹ Further, comprehensive prenatal care, proper health care, and proper nutrition can improve outcomes or minimize the harm associated with prenatal cocaine exposure.²⁹² Poverty, or the failure of government to provide necessary goods and services, creates or exacerbates fetal harm.²⁹³

Assuming that cocaine ingestion during pregnancy could independently risk fetal harm, a G2i analysis demonstrates that the cumulative effect posed by living in poverty overshadows cocaine use. Under these assumptions, there may be a risk of fetal harm for those who do not live in poverty but do use cocaine. For those who do not use cocaine during pregnancy but live in poverty, there may be a significant risk of harm due to poverty. However, for those who live in poverty, using cocaine does not increase the risk of fetal harm as much as it might for those who do not live in poverty. The relative risk of either factor is affected by the presence of the other. This idea is explained in the chart below, which uses the same hypothetical data²⁹⁴ to illustrate the concept of cumulative risk:

		Prenatal Cocaine Use			
		Never	Used Cocaine During Pregnancy	Risk Difference	Relative Risk (Risk Ratio)
Poverty	Not Living in Poverty	50	200	150	4
	Living in Poverty	150	300	150	2
	Risk Difference	100	100		
	Relative Risk (Risk Ratio)	3	1.5		

As seen in the chart, the ability to identify which condition, poverty or cocaine use, caused harm is confounded when more than one factor is present. Here, the relative contribution of cocaine use to fetal harm for a person liv-

²⁹⁰ See Roberts, *supra* note 15, at 953.

²⁹¹ *Id.* It is important to note that this in no way indicates that alcohol consumption during pregnancy can or should be criminalized. No state criminalizes alcohol use during pregnancy, so it is a good comparison point. It is not criminal, but it is more harmful than cocaine use.

²⁹² See *id.* at 953–54.

²⁹³ This causal dynamic is comparable to that of the criminalization of homelessness in which “a lack of services creates the very conditions of lawlessness.” Roberts, *supra* note 15, at 953. Cities across the country “mak[e] the daily tasks of living for the homeless a crime,” by passing laws that ban sleeping, eating, and sitting in public spaces. Michele E. Gilman, *The Poverty Defense*, 47 U. RICH. L. REV. 495, 497 (2013). In the same way, the law criminalizes pregnant substance users for harm that would be substantially mitigated, if not eliminated, by the provision of government services like access to healthcare and nutritious food.

²⁹⁴ This data was not taken from actual sources. Rather, it was created by the authors to demonstrate how such a calculation would be made.

ing in poverty is represented by the risk ratio of 1.5. The relative contribution of cocaine to fetal harm for a person not living in poverty is represented by the risk ratio of 4. Using the multiplicative model, there can be no finding of specific causation in a case in which the pregnant person using cocaine lives in poverty. This is because the impact of poverty is far greater than the impact of cocaine when both factors are present. The risk of harm from one factor cannot be separated from the risk of harm for another: they work together to produce a stronger effect.

This confounding relationship is not exclusive to cocaine among illicit substances, nor is it to poverty and cocaine use. Poverty is a placeholder for the variety of factors that can produce this cumulative risk, such as poor nutrition, prenatal cigarette use or alcohol consumption, physical abuse, poor healthcare, or structural racism. It can also be substituted for environmental risks, such as lead-infested drinking water or exposure to tear gas or sulfur-dioxide. Just as poverty itself is not a substantive crime, neither are these other possible confounders.

In summary, the fetal harm associated with the ingestion of chemical substances is too closely intertwined with, and thus confounded by, a multitude of other factors such that specific causation cannot be determined. In criminal law terms, proximate causation cannot be established. Hence, under the G2i framework requiring both general and specific causation, prosecutions for prenatal substance use must fail in most, if not all, cases.

CONCLUSION

In a 1998 article, Justice Stephen Breyer stressed the importance of building “legal foundations that are sound in science as well as in law.”²⁹⁵ Yet this goal has not come to fruition. Courts are sentencing pregnant people to prison for causing fetal harm without finding a substantially causal relationship between substance use and fetal harm. Because courts accept scientifically inaccurate information and fail to adequately address criminal causation, they cause pregnant people to unjustly bear the burden of the legal system’s inadequacy. This is not a radical sentiment. The scientific community has overwhelmingly come out against these arrests and prosecutions,²⁹⁶ and the American Bar Association has passed a resolution opposing criminal prosecution of anyone who has experienced a miscarriage or stillbirth.²⁹⁷ Still, the impetus to criminalize prenatal substance use continues. In fact, a

²⁹⁵ Adapted from Sanders et al., *supra* note 20, at 903.

²⁹⁶ Stephen Breyer, *The Interdependence of Science and Law*, 82 JUDICATURE 24, 27 (1998).

²⁹⁷ See e.g., *Substance Use Disorder in Pregnancy*, AMER. COLLEGE OF OBSTETRICIANS AND GYNECOLOGISTS, <https://www.acog.org/advocacy/policy-priorities/substance-use-disorder-in-pregnancy>, archived at <https://perma.cc/5FVT-6WXC>.

prenatal substance use case was heard, and upheld, by the Eighth Circuit in 2019—the first to enter a federal court.²⁹⁸

The war on pregnant bodies has intensified in the wake of the Supreme Court's decision to revoke the constitutional right to abortion on June 24, 2022, in *Dobbs v. Jackson Women's Health Organization*.²⁹⁹ Almost immediately, states declared open season on pregnant people—instantly banning access to abortion,³⁰⁰ prescribing prison sentences for abortion providers,³⁰¹ and raising an interest in banning interstate travel for the purpose of obtaining an abortion.³⁰² Additionally, laws that already existed on the books, but were enjoined pursuant to *Roe v. Wade*, may soon become enforceable. As one example, a Georgia law enacted in 2019 would hold pregnant people using drugs liable for second-degree murder, which carries a ten to thirty year prison sentence.³⁰³

The substantial and increasing threats of incarceration have also induced a panic regarding data privacy—specifically, the police use of texts,³⁰⁴ internet searches,³⁰⁵ and apps used to track the menstrual cycle.³⁰⁶ These fears are not unfounded. In August 2022, a 17-year-old and her mother were criminally charged in connection with the 17-year-old's self-managed abortion.³⁰⁷ The charge relies on Facebook messages between mother and daughter that

²⁹⁸ Amanda Robert, *Women shouldn't face criminal prosecution after abortion or miscarriage*, ABA House says, ABA J. (Feb. 22, 2021), <https://www.abajournal.com/news/article/women-shouldnt-face-criminal-prosecution-after-abortion-or-miscarriage-aba-house-says>, archived at <https://perma.cc/4KCV-ZS52>.

²⁹⁹ See Case Comment, *supra* note 188.

³⁰⁰ *Dobbs v. Jackson Women's Health Org.*, 141 S. Ct. 2619 (2021).

³⁰¹ Total abortion bans took effect on the same day as the *Dobbs* decision in Alabama, Arkansas, Missouri, South Dakota, and Utah. Oklahoma already had a ban in effect before the decision. See Caroline Kitchener, et al., *Abortion is now banned in these states. See where laws have changed.*, WASH. POST (Jun. 24, 2022, 10:23 AM), <https://www.washingtonpost.com/politics/2022/06/24/abortion-state-laws-criminalization-roe/>, archived at <https://perma.cc/BB3J-DUKL>.

³⁰² See Oriana Gonzalez, *Louisiana bill criminalizing abortion providers if Roe falls signed into law*, AXIOS (Jun. 21, 2022), <https://www.axios.com/2022/06/21/louisiana-abortion-trigger-ban-ro-supreme-court>, archived at <https://perma.cc/BYQ2-PCMK>.

³⁰³ See Caroline Kitchener & Devlin Barrett, *Anti-abortion lawmakers want to block patients from crossing state lines*, WASH. POST (Jun. 30, 2022, 8:30 AM), <https://www.washingtonpost.com/politics/2022/06/29/abortion-state-lines/>, archived at <https://perma.cc/ME8G-4GPM>.

³⁰⁴ See Mark Joseph Stern, *Georgia Just Criminalized Abortion. Women Who Terminate Their Pregnancies Would Receive Life in Prison*, SLATE (May 7, 2019, 2:03 PM), <https://slate.com/news-and-politics/2019/05/hb-481-georgia-law-criminalizes-abortion-subjects-women-to-life-in-prison.html>, archived at <https://perma.cc/US8Q-LB7K>.

³⁰⁵ See Jennifer Korn & Clare Duffy, *Search histories, location data, text messages: How personal data could be used to enforce anti-abortion laws*, CNN (Jun. 24, 2022, 4:27 PM), <https://www.cnn.com/2022/06/24/tech/abortion-laws-data-privacy/index.html>, archived at <https://perma.cc/7XCE-R7BG>.

³⁰⁶ See Cat Zakrzewski, Pranshu Verma, & Claire Parker, *Texts, web searches about abortion have been used to prosecute women*, WASH. POST (Jul. 3, 2022, 9:20 AM), <https://www.washingtonpost.com/technology/2022/07/03/abortion-data-privacy-prosecution/>, archived at <https://perma.cc/6QLC-5R49>.

³⁰⁷ See *id.*

Facebook itself produced for the court.³⁰⁸ While this story has received substantial attention, it once again overlooks the threat that healthcare provider reporting has always played, and continues to play, in the criminalization of pregnancy.³⁰⁹ These newfound fears of data privacy similarly ignore the long and unrelenting history of criminalizing pregnant bodies, particularly for women of color, that has always existed in the United States—even while abortion was recognized as a constitutional right. Without that right, however, the landscape only becomes bleaker.

It is clear that neither state legislatures nor prosecutors are going to concede their war on pregnant bodies, nor will the federal government step in to prevent it.³¹⁰ The onus thus lies on courts to invalidate laws criminalizing prenatal substance use, or at minimum, to adopt the procedures outlined herein to ensure that pregnant people using substances are not unjustly imprisoned. Courts similarly must consider the role of poverty, racism, and systemic injustice in criminalizing the bodies of those who lose their pregnancies. By assuming that the only possible cause of harm is drug use, prosecutors and the courts ignore evidence pointing toward the influence of any number of other factors that would result in statistically possible or actual harm to a fetus. It is impossible to distinctly discern which factor, among an intersection of influences, caused any fetal harm.³¹¹ This creates nearly insurmountable reasonable doubt in determining whether drug use caused the harm. Prosecutions for prenatal substance use “not only lack legal foundation, they also lack medical and scientific foundation. In other words, [prenatal substance use prosecutions] are based on junk law and junk science.”³¹² If the courts, and the law more broadly, aim to retain any legiti-

³⁰⁸ See Andrea González-Ramírez, *Mom and Teen Daughter Accused of Illegal Abortion Based on Facebook Messages*, THE CUT (Aug. 10, 2022), <https://www.thecut.com/2022/08/nebraska-mom-daughter-charges-illegal-abortion-facebook-chat.html>, archived at <https://perma.cc/GPD5-54RG>.

³⁰⁹ See Jason Koebler & Anna Merlan, *This Is the Data Facebook Gave Police to Prosecute a Teenager for Abortion*, VICE (Aug. 9, 2022, 2:44 PM), <https://www.vice.com/en/article/n7zevd/this-is-the-data-facebook-gave-police-to-prosecute-a-teenager-for-abortion>, archived at <https://perma.cc/4JSB-PY3M>.

³¹⁰ See Cecilia Nowell, *The Long, Scary History of Doctors Reporting Pregnant People to the Cops*, MOTHER JONES (Apr. 15, 2022), <https://www.motherjones.com/crime-justice/2022/04/self-induced-abortion-herrera-texas-murder-hospital/>, archived at <https://perma.cc/MB7F-ZL8B>; Dr. Biftu Mengesha, *In Absence of Roe, Healthcare Providers Have a Professional and Ethical Duty to Step Up*, MS. MAGAZINE (Jun. 29, 2022), <https://msmagazine.com/2022/06/29/doctors-healthcare-workers-pro-abortion-report-miscarriage/>, archived at <https://perma.cc/YJ3F-B3BC> (“Most people who have faced criminal charges for ending pregnancies were reported to law enforcement by someone who worked in a healthcare facility.”).

³¹¹ See Ashley Parker, Yasmeen Abutaleb, & Tyler Pager, *Two long weeks: Inside Biden’s struggle to respond to abortion ruling*, WASH. POST (Jul. 9, 2022, 4:00 PM), <https://www.washingtonpost.com/politics/2022/07/09/biden-democrats-abortion-dobbs/>, archived at <https://perma.cc/72HN-TTLN>.

³¹² See Nagahawatte & Goldenberg, *supra* note 112, at 84 (“Although in any specific case determining the particular cause of preterm birth is often impossible.”); Cf., J. Man et al., *Stillbirth and intrauterine fetal death: factors affecting determination of cause of death at autopsy*, 48 *ULTRASOUND IN OBSTETRICS AND GYNECOLOGY* 566, 570 (2016) (“[U]sing objective criteria to classify cause of death, many intrauterine deaths remain unexplained

macy, they cannot continue enforce criminal penalties for prenatal substance use.

regardless of gestational age, despite full autopsy examination by specialist pathologists.”)

