

Prenatal marijuana exposure: Implications for Florida

Marijuana remains the most frequently used illicit substance in the United States (1). According to data from the National Study on Drug Use and Health (NSDUH), marijuana use among adults has doubled over the past 15 years amidst an increasingly permissive regulatory environment (2). Since 1996, a total of 31 states have legalized the use of marijuana for medical purposes with 9 of those states going on to legalize recreational use of marijuana. At the population level, the presence of medical marijuana laws (MML) is thought to reduce the perceived risk of marijuana use, contributing to increased use among adolescents (3), adults (3), and pregnant women.

Marijuana is also the most commonly used illicit substance among pregnant women in the US. Prevalence of self-reported marijuana use among pregnant women in the US increased 1.6 fold from 2.4% in 2002 to 3.9% in 2014, with the greatest increase occurring in women 18 -25 years of age (2). These findings likely underestimate prevalence as a result of underreporting among study participants due to social desirability bias (4). A similar study in California, the first state to legalize medical marijuana in 1996, found that use among pregnant women increased 1.8 fold from 2009-2016, with the greatest increase occurring in women < 25 years of age (5). Not surprisingly, rates of use among pregnant women in Colorado, one of two states to first legalize recreational marijuana in 2012, are also on the rise. One birthing hospital in Pueblo, CO reported that nearly half of all newborns delivered over a single month in 2016 tested positive for THC (6).

Although marijuana is broadly perceived as innocuous, no amount of the drug has been proven safe for use during pregnancy. Previous research has shown that prenatal exposure to marijuana

results in a wide array of neurocognitive and neurobehavioral deficits across developmental stages (7) (**Table 1**). Furthermore, the American College of Obstetricians and Gynecologists recommends that women who are pregnant or considering pregnancy discontinue marijuana use completely (8).

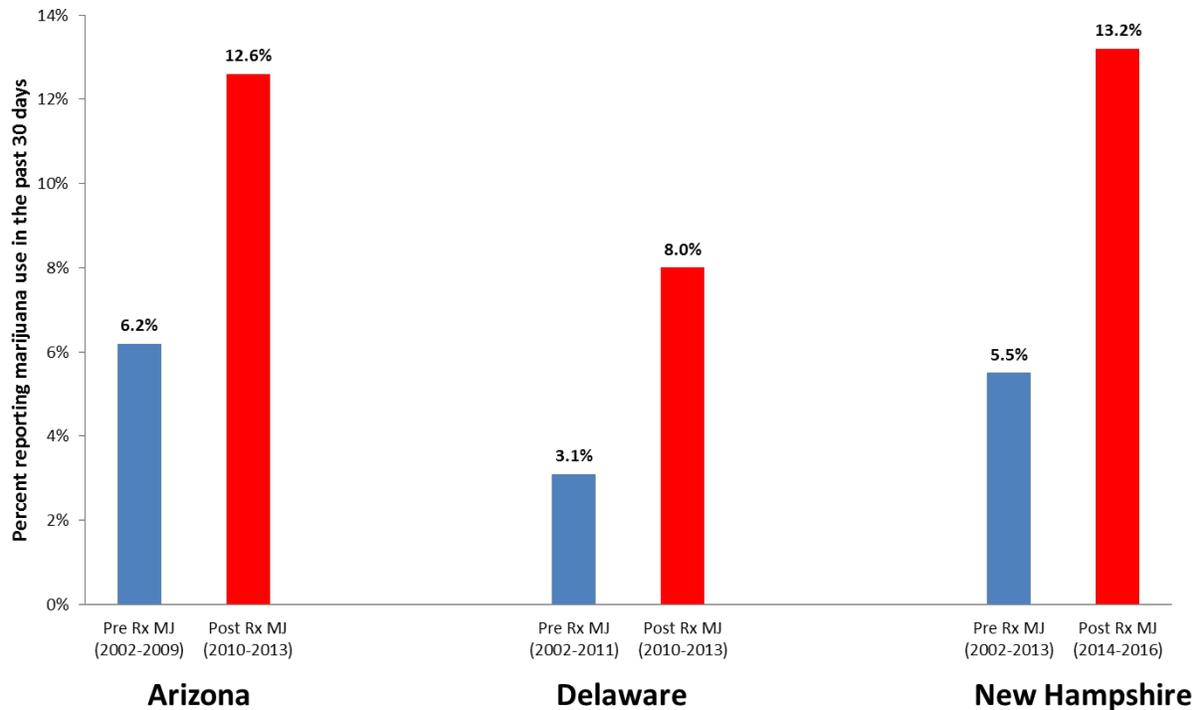
Table 1. Negative effects of prenatal marijuana exposure by developmental stage

Fetus	Neonate (< 2 months)	Infancy through early childhood (2 mos - 9 years)	Adolescence (10 - 18 yrs)
Lowered gestational age	Decreased response to light	Impaired memory and concentration	Decreased visual perception
Decreased birth length	Increased startle response	Impaired verbal ability	Decreased visual reasoning and memory
Decreased birth weight	Increased tremors	Increased hyperactivity and impulsivity	Increased impulsivity
Immune system suppression	Decreased body length	Decreased verbal reasoning ability	Diminished capacity for abstract reasoning
		Decreased quantitative reasoning	Decreased verbal reasoning ability
		Difficulties with sleep	Impaired learning
		Increased aggression in females	Impaired concentration and memory
		Decreased IQ	Decreased IQ
		Increase in delinquency	Increased hyperactivity and impulsivity
			Increased risk of depression
			Increase in delinquency
			Decreased fine motor coordination

Since the legalization of medical marijuana in 1996, attitudes toward use have become increasingly permissive and tolerant, with more and more states legalizing marijuana for medical and eventually recreational use. Compared to non-MML states, passage of medical marijuana laws was associated with higher adolescent use of marijuana and increased numbers of arrests among adult males for marijuana possession (9,10). However, it is not clear what effect passage of MMLs may have on use of marijuana among pregnant women. No study has systematically examined the effect of MML specifically on prevalence of marijuana use among pregnant women. To that end, data from the NSDUH were used to compare rates of marijuana use among pregnant women for the time period before and after legalization of medical marijuana in states for which data were available. Due to disclosure limitations designed to protect respondent

information, only data from Arizona, Delaware, and New Hampshire could be analyzed (**Figure 1**).

Figure 1. Prevalence of marijuana use among pregnant women before and after legalization of medical marijuana in Arizona, Delaware, and New Hampshire.

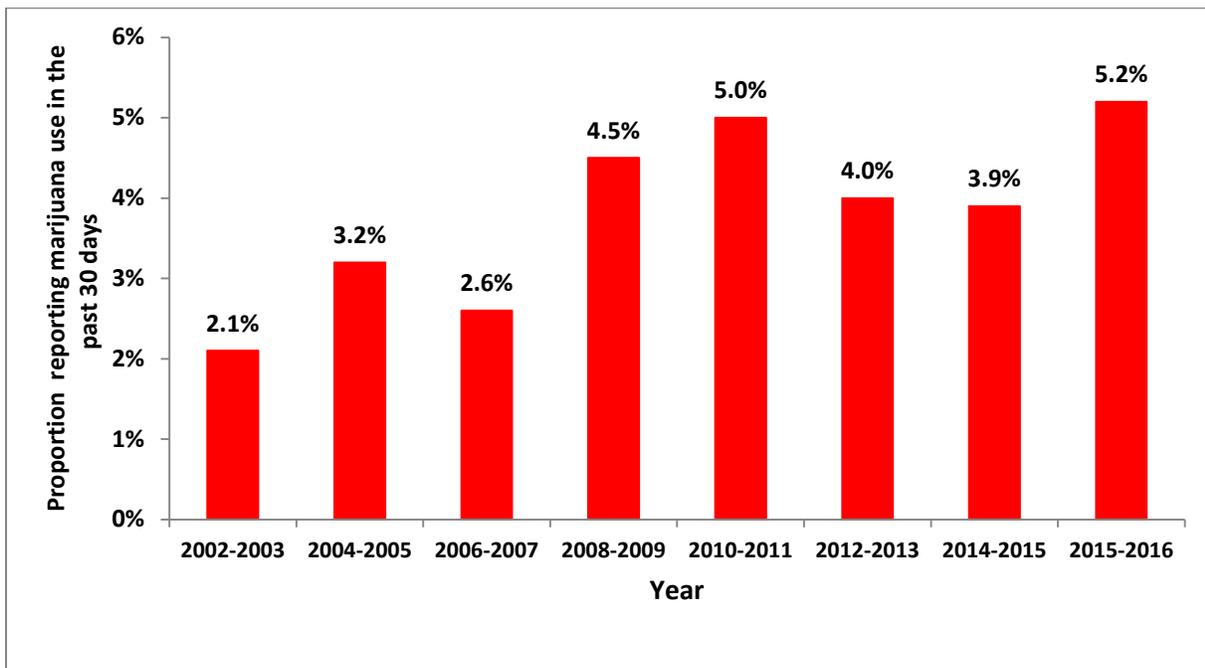


In the three states for which data were available, prevalence of marijuana use among pregnant women more than doubled after the legalization of medical marijuana. Therefore, it is reasonable to infer that similar increases will occur in other states with newly passed MML such as Florida, where voters passed an amendment legalizing use of medical marijuana in November of 2016.

According to data from the NSDUH, marijuana use among pregnant women in Florida grew from 2.1% in 2002, to 5.2% in 2016, an overall 2.5 fold increase (**Figure 2**). This was in contrast

to the 1.6 fold increase observed in the US population and the 1.8 fold increase in CA over a similar time period (2, 4). State level NSDUH data were only available through 2016. Therefore, it was not possible to empirically demonstrate the effect of passage of medical marijuana legislation on illicit use of marijuana among pregnant women in Florida.

Figure 2. Self-reported marijuana use among pregnant women in Florida, 2002-2016.

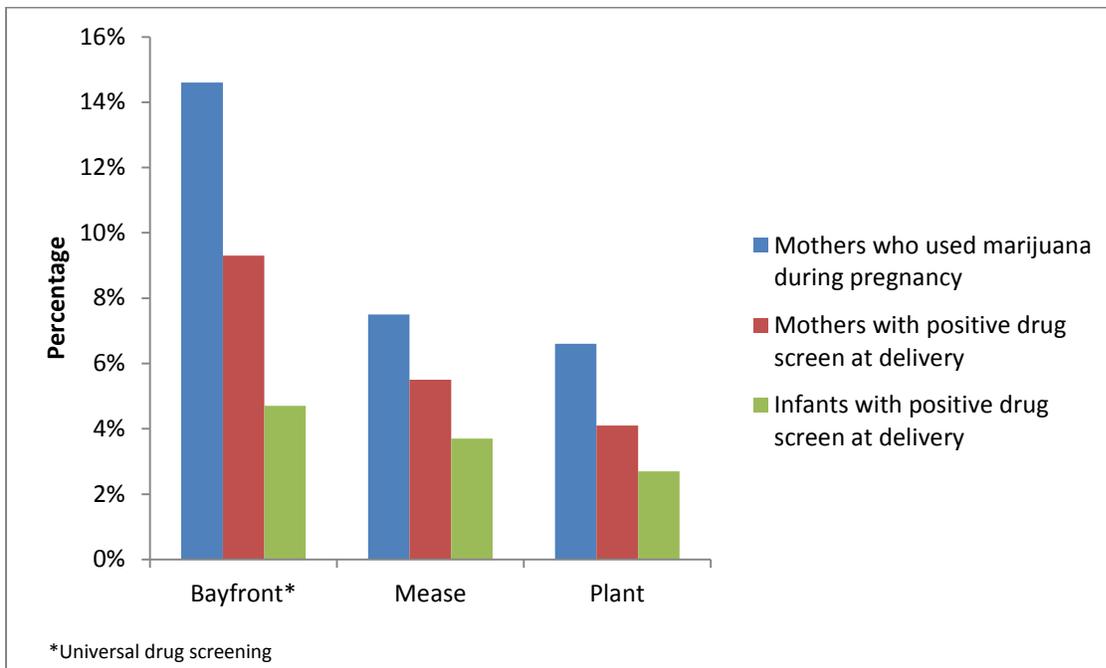


The American College of Obstetricians and Gynecologists recommends universal screening for all maternal drug use, illicit or otherwise (4). Yet in the state of Florida, healthcare providers are not required to universally screen pregnant women or newborns for drug exposure. Only pregnant women suspected of drug use or who self-report drug use are screened. This is problematic from an epidemiological perspective because under current guidelines, these data are only collected on what is essentially a high-risk population. Furthermore, women identified through such screening tend to be poly-substance abusers, making it extremely difficult to directly assess any health effects solely attributable to prenatal THC exposure. Nevertheless, data

collected at the local level by county agencies may be able to provide a rough estimation of the popularity of marijuana among young pregnant women in Florida.

In three birthing hospitals in Pinellas County (Bayfront Baby Place, Mease, and Morton Plant), approximately 13.3% (858/6431) of all newborns tested positive for one or more drugs at time of delivery over a nine month period from 2016-2017 (11). After stratifying the data by hospital, Bayfront Baby Place, the only hospital with a universal screening policy in place, had the highest proportion of mothers that used marijuana during their pregnancy and the highest proportion of women who tested positive for any drug at time of delivery (**Figure 3**). Bayfront also had the highest proportion of infants testing positive for any drug at time of delivery (**Figure 3**).

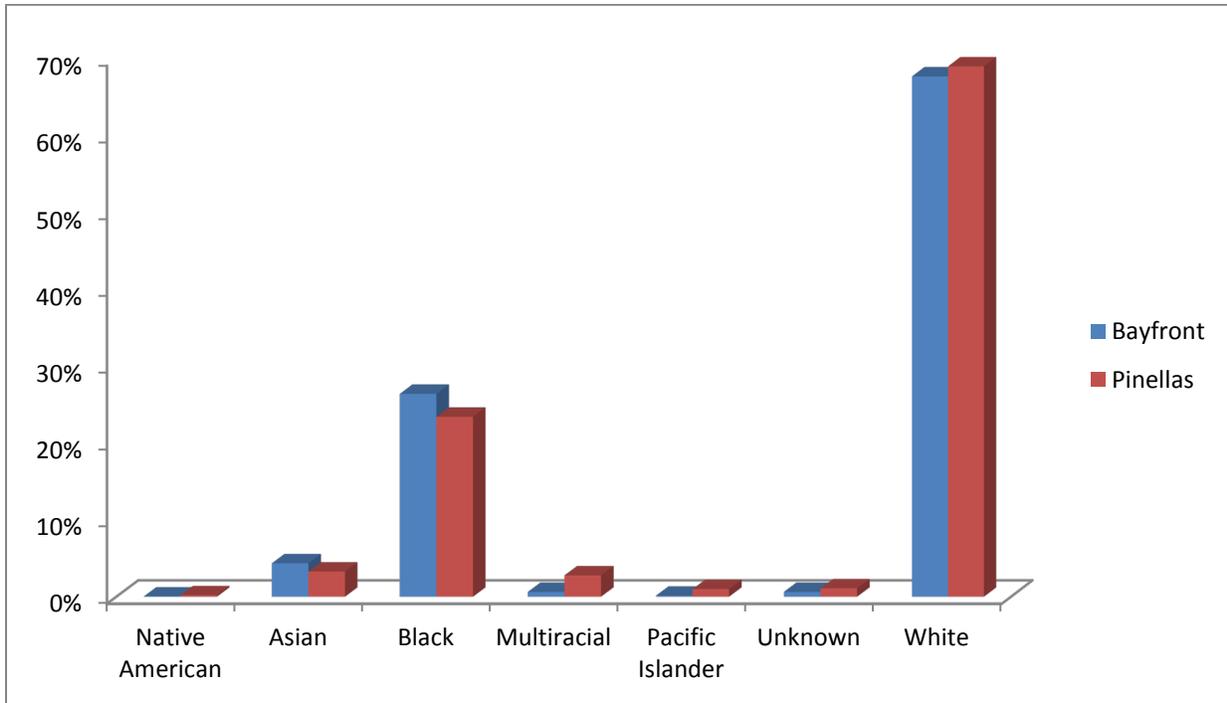
Figure 3. Substance exposure among pregnant women and newborns at Bayfront Baby Place, Mease, and Plant Hospitals; October 2017 thru June 2018.



It is important to note that Mease and Morton Plant Hospitals only screen for drugs if the mother is suspected of drug use or self-reports drug use during pregnancy. For research purposes this introduces a selection bias that would artificially increase the number of positive drug screens since only the most high-risk individuals would be tested. On the other hand, it would also tend to underestimate the true prevalence of marijuana use among pregnant women in Pinellas County because marijuana use tends to be widely underreported among pregnant women due to social desirability bias (4). Moreover, marijuana use may lack the biopsychosocial markers that typify hard drug use, making it more difficult for healthcare providers to detect. Therefore, in the absence of universal screening, data on prenatal drug use, especially marijuana, should be interpreted with caution.

Bayfront Baby Place has a universal drug screening policy for mothers and newborns at time of delivery which may allow for a more reliable estimate of the true prevalence of marijuana use among pregnant women in Pinellas County. Examination of the racial distribution of Bayfront Baby Place's patient population from October 2017 thru June 2018 reveals that it closely approximates that of Pinellas County (**Figure 4**) (11,12). Therefore, the inferences gleaned from these data may be generalizable to the wider population of pregnant women in Pinellas County.

Figure 4. Racial distribution of Bayfront Baby Place patient population from October 2017 thru June 2018 and Pinellas County in 2016.



As previously noted, 439 (14.6%) of the 3,008 women delivering at Bayfront Baby Place from October 2017 thru June 2018, were found to have used marijuana during their pregnancy, with 280 (9.3%) of those cases being confirmed by a positive drug screen at time of delivery (11). Of the 3,067 live births at Baby Place during the same period, 145 (4.7%) newborns tested positive for one or more drugs, including THC (11). Among women delivering at Bayfront Baby Place, women who gave birth to a substance exposed newborn were more likely to be unemployed, unmarried, and less educated compared to women who did not give birth to a substance exposed baby (11) (**Table 2**).

Table 2. Demographic characteristics of mothers who gave birth to substance exposed newborns (SEN).

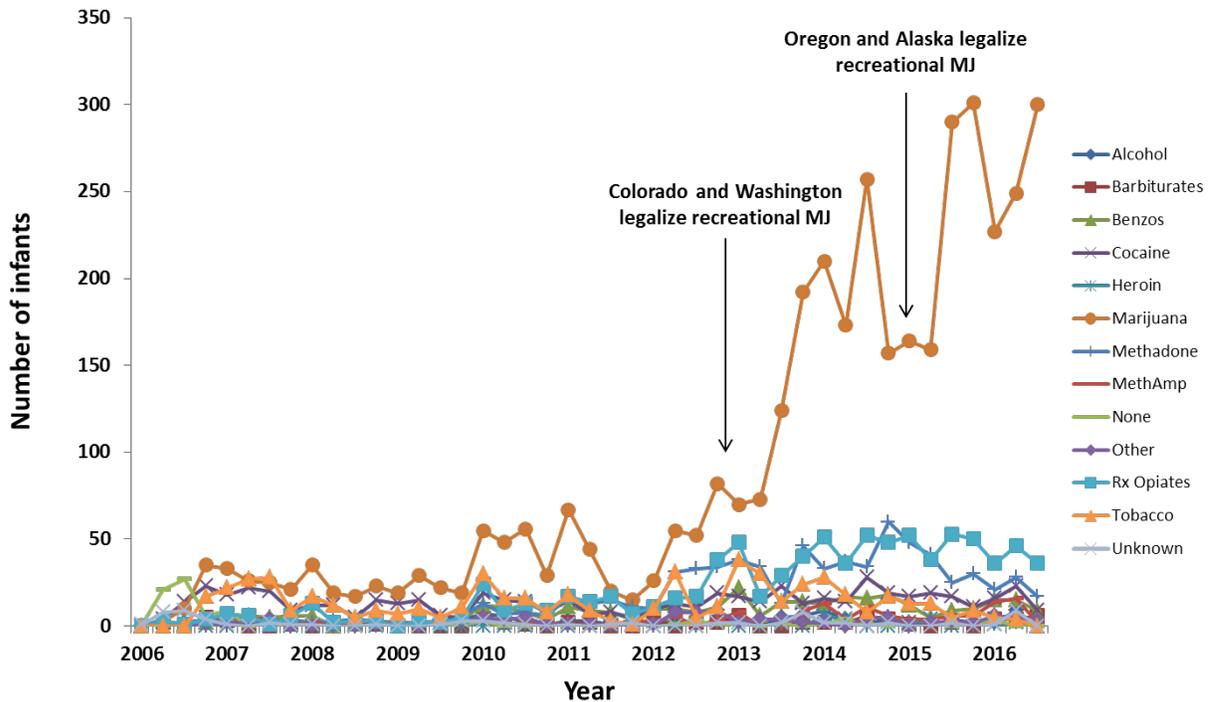
Variable	SEN	Non-SEN
Employed	32%	56%
Married	13%	47%
Associate degree or higher	10%	25%
Mean age (yrs)	27.2	29.1

In another survey of five birthing hospitals in Hillsborough county, marijuana was the most commonly detected drug in substance-exposed newborns from 2006-2016 (13) (**Figure 5**).

Interestingly, large increases in the proportion of substance exposed newborns testing positive for THC were observed at the end of 2012 and 2014, which coincided with the legalization of recreational marijuana in Colorado and Washington, and Oregon and Alaska, respectively.

According to a report published by the Drug Enforcement Agency, Florida continues to be one of the principal destinations for black market diversion of marijuana grown in Colorado (6). Florida was the 5th most popular destination for diverted Colorado marijuana seized by the DEA and US Postal Service in 2016 (6). This may help explain the large increase in THC exposed newborns born in Hillsborough County during this time period. As more states legalize recreational marijuana, it is likely that use among pregnant women will increase as criminal organizations seek to capitalize on the substantial profits to be made through black market diversion from states with more permissive laws to states with more restrictive laws such as Florida. Future research should aim to quantify the relationship between availability of diverted marijuana from recreational use states such as Colorado and increased use among pregnant women in Florida.

Figure 5. Number of substance exposed infants born in Hillsborough County according to substance, 2006 – 2016.



Source: Healthy Start Coalition of Hillsborough County; Substance Exposed Newborn Taskforce. Data obtained from Brandon, Florida, South Florida, St. Joseph’s Women’s, and Tampa General Hospitals

Conclusions

Marijuana is the most commonly used illicit substance among pregnant women. As more states loosen restrictions on the use of marijuana, it is likely that use among pregnant women will only increase, initiating a cascade of deficits for the remainder of the lives of the exposed, with potentially far-reaching social, health, and economic consequences for both the exposed and society at large. Future intervention efforts should include educating pregnant women on the

wide array of neurocognitive deficits produced by prenatal THC exposure. In addition, birthing hospitals should implement universal drug screening at time of delivery so that interventions can be appropriately targeted to those most at-risk for adverse developmental outcomes. Further research is needed on the factors driving the increase in marijuana use among pregnant women in Florida and to quantify the long-term social, health, and economic consequences of prenatal marijuana exposure.

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