Untangling the Roots of the West Virginia Opioid Crisis: Relationships in Adolescent Pregnancy, Drug Abuse, and Future Outcomes

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Abstract

Background: The purpose of this study was to determine if there is a relationship between teenage pregnancy and negative health outcomes, including drug abuse, among West Virginia female youth. **Methods:** Data was acquired for females between 10 and 19 years of age, by county, from the West Virginia Department of Health and Human Resources. Pearson correlation analysis was utilized to examine the relationship between the teenage pregnancy rate and drug related statistics, pregnancy related statistics, heart health related statistics, and environmental variables. This study was conducted from July 2018 to March 2019 at West Virginia University. **Results:** Teenage pregnancy is correlated to harmful behavioral adaptations that may increase a women's health risks. We find that teenage pregnancy, regardless of pregnancy outcome, is correlated with increased drug overdose death rates for women, as well as health concerns that increase one's risk for heart disease. **Conclusions:** Teenage pregnancy is correlated to a number of outcomes including drug overdose rates and impaired heart health outcomes. Reduction of unintended teenage pregnancy may be useful as a non-traditional method of ameliorating the opioid abuse crisis in the state of West Virginia.

Background

Teenagers in the United States have the highest teenage pregnancy rates among developed nations, and are more likely to give birth than any other industrialized country in the world (1). West Virginia (WV) ranks as the 7th worst state in the nation for females to reside (2), 8th in teenage birth rates, and 7th in teenage pregnancy rates (3). When evaluating teenage pregnancy rates in individual WV counties, many are above the national average. However, in the southern region of the state, particularly Mingo and McDowell counties, teenage pregnancy rates are significantly higher than the national average (i.e. 3 times higher) (3, 4). Consequently, the persistent plight of unintended teenage pregnancy in WV is frequently underrecognized. The average WV teenage pregnancy rates, including more prosperous counties, such as Monongalia and Gilmer, create a false impression of success in battling unintended teenage pregnancy. In a country with already high teenage pregnancy and birth rates, when compared to other industrialized nations (1, 5), WV shows rates of teenage pregnancy, opioid drug abuse among pregnant women (6), and babies born with neonatal abstinence syndrome (NAS) (7) higher than the United States average, making WV in fact worse than the worst.

The opioid epidemic has become a hallmark of the Appalachian region, but among the states hardest hit by opioid misuse, WV has also been long affected by high rates of poverty (8). The topography of the state creates challenges for continuing medical education of its healthcare providers, and the areas of greatest need in WV are tucked away in mountainous terrain, falling short in access to medical care that is exacerbated by insufficient transportation (8, 9).

In WV, the teenage population lacks access to preventative health care including reliable contraception (8–10). This barrier drastically reduces the availability of long acting reversible contraception (LARC) (11). Ultimately, WV teenagers endure the long-term consequences of unprotected sexual encounters and

unintended pregnancies (11, 12). Therefore, it is not by accident that WV teens are plagued with interruption of high school, drug abuse, high rates of poverty and overdose related deaths (6, 13). It appears that teenagers and particularly female teenagers in WV, have become a vulnerable, at risk population that has been either overlooked or ignored (9, 11, 12).

Due to the life threatening nature of opioid addiction, the focus of WV has been treating those afflicted with opioid addiction and overdose, and the prevention of unnecessary opioid prescriptions (14, 15). While treatment remains an invaluable aspect of mitigating the opioid epidemic, the long-term solution lies in prevention. The key to putting out a fire is not to douse the flames, but to aim at the base.

The aim of this study was to identify relationships between teenage pregnancy, opioid abuse, other indicators of poor health, and reduced opportunity in WV. Analogous to the joint Obstetric Care Consensus by the American College of Obstetricians and Gynecologists and the Society for Maternal Fetal Medicine's approach to reducing the cesarean section rate focus on preventing the first Cesarean birth (16), we suggest that preventing the first unintended teenage pregnancy may mitigate overdose deaths and other negative health outcomes.

Due to high rates of teenage pregnancy and births, drug usage during pregnancy, and NAS births, we hypothesized that we would observe significant correlations between teenage pregnancy and clusters of detrimental behaviors observed heavily throughout nearly all economically challenged counties in the state; including drug usage that increases risk of overdose and multiple co-medical morbidities. We believe that this study is a necessary contribution to the field due to its non-traditional approach to reduction of the opioid crisis, and it's potential to improve the lives of West Virginia female youth.

Methods

The aim of this study was to identify relationships between teenage pregnancy, opioid abuse, other indicators of poor health, and reduced opportunity in WV. The West Virginia Department of Health and Human Resources (WVDHHR) provided aggregate data at the county level for each of the 55 WV counties; thus, did not require IRB approval due to no contact with actual patients. Data encompassed WV teenage pregnancy rates for sexually identified females between 10 and 19 years of age, and all other statistical variables for females 15 to 19 years of age for calendar years 2014–2017. According to the WVDHHR, the data provided for the 10 to 19 age group does not fully include data for ages 10 to 14 due to lack of reporting on the occurrence of pregnancy, abortion, etc. Further, teenage pregnancy rates are derived from the difference in birth and fetal death rates, and include births that occur outside of the state to WV residents. This is not the case for abortion rates, as estimates for abortion are provided only for those that occur in the state (i.e. Charleston), and abortions performed outside of the state are not reported. Each county level statistic was adjusted to correct for differences in population size using the estimated female population ages 15–19 for the respective county from 2014–2017. Statistical variables were corrected systematically to avoid inflating correlations.

The authors were primarily interested in the relationships between pregnancy and birth rates among young women and several categories of important health variables: (1) drug relevant outcomes, (2) pregnancy relevant outcomes, (3) heart health variables, and (4) environmental characteristics.

The following drug relevant outcomes were included to explore the relationship between pregnancy and opioid abuse: (1) overdose death rates among WV female residents of all ages from 2014–2017, (2) Neonatal Abstinence Syndrome (NAS) births from 2014–2017, calculated as a total percent of resident births for all ages, and (3) rate of mothers using drugs during pregnancy relative to the total number of births for all ages, 2014–2017. Pregnancy relevant outcomes include: (1) WV resident fetal death rate for mothers ages 15–19 from 2014–2017, (2) and WV resident abortion rate for females ages 15–19 from 2014–2017.

Heart health outcomes were included to explore the relationship between young women's pregnancies/births and more general downstream health indicators. Thus, we include: (1) percent of obesity among WV female adults as reported by the WVDHHR from 2013–2017, (2) percent of physical inactivity among WV female adults as reported by the WVDHHR from 2013–2017, (3) percent of high cholesterol among WV female adults as reported by the WVDHHR as an average from 2009, 2011, 2013, 2015, and 2017, and (4) percentage of high blood pressure among WV female adults as reported by the WVDHHR as an average from 2009, 2011, 2013, 2015, and 2017.

Finally, two environmental factors were examined to determine if they correlate to teenage pregnancy rates: (1) high school dropout percentage for WV females aged 18 and over (students are required to attend school through age 17) from 2016–2017, and (2) number of DHHR listed clinics per number of females age 15–19.

Given the small sample size (55 observations; one for each county), Pearson correlation analysis was used to examine these key relationships using the IBM SPSS software analysis program. The complete correlation matrix and raw data may be acquired from authors upon request. This analysis is a conservative test of relationships for at least two reasons. First there is a small sample size, thus statistical power is low. Second, the data are aggregated, thus noisy, also reducing the ability to detect a true relationship. Further, due to the conservative nature of the test, a p value of up to 0.10 was considered significant.

Results

Pregnancy rates and birth rates are highly correlated ($r = 0.989$, $p < 0.01$). We first look at the relationship between pregnancy and birth rates with drug relevant outcomes (*Table 1*).. Teenage pregnancies/births are associated with overdose death rates (both r 's > 0.40 , p 's < 0.01). However, there does not appear to be an association between teenage pregnancy rates and percent of mothers using drugs during pregnancy (both $p > 0.10$). Nor does it follow that there is a relationship between birth/pregnancy rates and the number of babies born with neonatal abstinence syndrome; in this dataset, they are not related (both $p > 0.10$) (*Table 1*)..

Teenage pregnancy rates and birth rates are associated with fetal death rates among young mothers ($r = 0.308$, $p < 0.05$ and 0.261 , $p < 0.10$, respectively). Birth rates are also associated with the abortion rate among teenagers ($r = 0.304$, $p < 0.05$).

We find statistically significant correlations in all eight heart health relationships tested (*Table 1*).. Obesity, physical inactivity, high cholesterol, and high blood pressure are all significantly correlated with pregnancy and birth rates (*Table 1*)..

Neither the high school dropout rate nor the number of DHHR listed clinics are associated with teenage pregnancy and birth rate data. This may be due to the variability in the data. For example, there is a large variation in the female dropout rate; the annual mean female dropout rate for 2016–2017 was 0.764 percent, with a standard deviation of 0.660 percent. However, there is very little variation in the number of clinics per county (mean number of clinics per number of 15 –19-year-old females is 0.0013 with a standard deviation of 0.0013).

Discussion

Pregnancies and births among teenagers are particularly important because of the high level of obstetric risks (e.g., increased risk of preterm delivery, anemia, hypertensive disorders of pregnancy such as pre-eclampsia, higher rate of infant mortality) and increased risk for cephalopelvic disproportion, leading to possible need for cesarean section (17). Additionally, there is a significant negative impact of teenage births on education, income, and wealth over the mother's lifetime (10, 18).

In 1991, opioid related deaths began to rise following an increase in the prescribing of prescription pain medication (19). Since 1991, opioid abuse unfolded gradually, hitting communities where opioid prescriptions were readily available and liberally prescribed for pain management (19). The sharpest rise in drug related deaths hit in 2016, when the opioid crisis developed into an epidemic with fentanyl laced drugs and nearly 20,000 deaths (19). WV had 887 fatal overdoses during this time, reaching an all-time high that was only beaten in 2017 when WV experienced another 909 fatal overdoses (20, 21).

Often, opioid abuse and discussions of Appalachia are intertwined. Appalachia is a term used to describe both a cultural region in the eastern United States, as well as its residents. The term Appalachia evokes thoughts of high poverty rates, high rates of teenage pregnancy, and high rates of opioid misuse. These associations overshadow images of the beautiful region that follows the backbone of the Appalachian Mountains. As the only state that is fully encompassed within the Appalachian region, WV is home to rolling hills and green landscapes, but is also a case study of poverty, teenage pregnancy, and opioid related deaths.

We find no relationship between commonly targeted interventions for teenage pregnancies and births. Teenage pregnancy rates and birth rates are part of a cluster of poor health outcomes and behaviors. This data suggests that teenage pregnancy is correlated with harmful behavioral adaptations that may increase a teenager's health risks. The limitations of this study include correlation analysis, and therefore

no direct measure of causation. We find that teenage pregnancy, regardless of pregnancy outcome, is correlated to both drug abuse and overdose, as well as health concerns that increase one's risk for heart disease. This evidence supports an immediate need to focus on prevention of the first unintended teenage pregnancy.

The link between teenage pregnancy and opioid abuse is supported by this data. We were able to show that the teenage pregnancy rate is correlated to clusters of behavior that resemble a continuation of poverty and drug abuse, indicating the potential of teenage pregnancy to be a driving force behind the high rate of drug abuse and overdose in WV (12). This data highlights the need to direct our attention to the high teenage pregnancy rate, and to programs that focus on pregnancy prevention in order to potentially mitigate both drug use and overdose. Since opioid abuse may be rooted in unintended teenage pregnancy, pregnancy prevention may not be only a means to reduce the opioid crisis, but also a way to improve health outcomes in adulthood for females living in WV throughout their lifespan.

Based on the results of this study, the West Virginia University National Center of Excellence in Women's Health highly encourages the implementation of programs aimed to decrease unintended teenage pregnancy, as a potential means to decrease a number of negative health outcomes, including drug use that leads to a life of dependence and addiction. While this data is strictly based on correlations at the county level between multiple data sets, it appears that teenage pregnancies are associated with a state of dependence in which young women are reliant on either the state or their families to care of them and their children (22). This state of dependence opens an avenue for low self-esteem, hopelessness, and helplessness. Additionally, it takes a psychological toll creating insecurity, depression, and anxiety (23). In families afflicted with a history of poverty, a teenage pregnancy can be devastating by reducing independence when access to adequate resources and child care assistance is already severely limited (24, 25).

We argue that WV needs greater focus on preventative programs to mitigate the opioid crisis, with a primary focus on early intervention measures focused on reducing unintended pregnancy. With special focus on female teenagers and prevention of the first unintended pregnancy, we are devoted to teenagers, their education, and future well-being. Our goals are to prevent the poverty, hopelessness, and helplessness which may lead to unhealthy coping strategies of drug abuse and addiction.

Ultimately, abstinence only sex education has shown to be not only ineffective but also active in the shaming of adolescents (26). Further, other methods of pregnancy prevention including fertility awareness have also proven ineffective (27) leaving the only remaining option to be the use of birth control, preferably the use of long acting reversible contraceptives to prevent teenage pregnancy (10). It is important to not only educate young men and women with proper sex education, but to provide the means to implement that education (28). Although it was not the purpose of this study, the lives of young men are also deleteriously affected by teenage pregnancy with similar outcomes and solutions (29).

Reducing the first unintended teenage pregnancy shows the potential to not only decrease the ever-growing opioid crisis, but to improve the long-term quality of life of women in the state.

In a state bombarded by obesity and heart disease, a decrease in teenage pregnancy may lead to improved levels of physical activity (23), decreased levels of obesity (30), reduced hypertension (31), and reduced cholesterol (32). This two-prong effect; (1) reduction of drug use and dependency, and (2) the potential of a healthier future for these women, is extremely powerful.

Conclusions

Teenage pregnancy is correlated to a number of negative outcomes including drug overdose rates, and emphasize the need for intervention and preventative measures that begin early in adolescence. While teenage pregnancy is a central focus, this recommendation should be part of a multi-pronged approach to mitigating the opioid epidemic. Future directions for this project include the development of a state wide program that would aim to provide education of adolescents and health care providers and contraceptive measures to teenagers in order to prevent unintended pregnancy, similar to the methodology conducted in the Colorado project, which showed great success (33–35). The mission of the West Virginia University National Center of Excellence in Women's Health includes providing a voice and direction to the vulnerable, at risk, overlooked, and ignored teenagers of WV.

Declarations

Ethics approval and consent to participate

This research involved the use of human subject data collected and distributed to the authors by the West Virginia Department of Health and Human Resources, thus this research did not require IRB approval or consent. This research project did not involve human participants.

Consent for publication

Not applicable

Availability of data and material

All data used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The corresponding author is currently involved in an author writers' agreement with AbbVie Pharmaceuticals. The corresponding author is also a speaker for Hologic-Cynosure. These associations did not influence the methodology, analysis, or conclusions.

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Authors' contributions

AD conceived of the study, participated in its design, performed data analysis, and was the primary writer for the manuscript; EC conceived of the study, participated in its design, assisted in drafting and finalization of manuscript; MPF assisted in data collection and analysis, and participated in drafting and finalization of manuscript; KD assisted in data organization and drafting of the manuscript; KF assisted in data gathering for analysis; RRC conceived of the study, participated in its design, provided clinical oversight, and assisted in drafting and finalization of manuscript. All authors read and approved the final manuscript.

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Table 1

Table 1: Correlation analysis of drug-related, pregnancy-related, heart health, and environmental factors with teenage pregnancy rate and birth rate.

Variables	Pregnancy Rate Ages 15-19	Birth Rate Ages 10-19
Birth Rate Ages 10-19	0.989***	—
Drug Related Statistics		
Overdose Death Rate all WV Female Residents	0.444***	0.418***
Neonatal Abstinence Syndrome Births	-0.219	-0.215
Percent of Mothers Using Drugs During Pregnancy	0.134	0.099
Pregnancy Related		
Fetal Death Rate Ages 15-19	0.308**	0.261*
Abortion Rate Ages 15–19	0.434***	0.304**
Heart Health		
Obesity Rate Adult Females	0.408***	0.431***
Physical Inactivity Adult Females	0.429***	0.408***
High Cholesterol Adult Females	0.391**	0.394**
High Blood Pressure Adult Females	0.467***	0.457***
Environment		
High School Dropout Rate for Females	0.110	0.092
Number of DHHR listed Clinics Per Number of Females Ages 15-19	0.169	0.163

* significant at $p < 0.10$

** significant at $p < 0.05$

*** significant at $p < 0.01$