TEEN PREGNANCY IN ARIZONA AND THE ARIZONA YOUTH PARTNERSHIP, STARTING OUT RIGHT PROGRAM, 2010-2019

by

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As members of the Dissertation Committee, we certify that we have read the dissertation prepared by Allison Root, titled Teen Pregnancy in Arizona and the Arizona Youth Partnership, Starting Out Right Program, 2010-2019, and recommend that it be accepted as fulfilling the dissertation requirement for the Degree of Doctor of Public Health.

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ABSTRACT

Background

Teenage pregnancy is recognized as a significant public health concern associated with a range of risks for both the mother and baby. Supporting teens who are pregnant through community-based programs may help to avoid compounding adverse health effects that have been associated with teenage pregnancy. Understanding health needs of pregnant teens and characteristics of participants of teen pregnancy programs is important in developing and improving programs. In Arizona, the Starting Out Right (SOR) program of Arizona Youth Partnership (AzYP) provides prenatal education services and support for pregnant teens.

This study has three specific aims: 1) describes participation patterns in the SOR program in 2018 and 2019, 2) describe the prevalence of smoking, hypertension, preeclampsia, eclampsia, overweight and obesity, gestational diabetes, and sexually transmitted infections (STIs) in teens who gave birth in Arizona from 2010-2019, and 3) compare the health characteristics, prenatal services, and birth outcomes of SOR participants and nonparticipants from 2010-2019 using state vital statistics records.

Methods

For aim one, the SOR program provided a de-identified report of teens who enrolled or inquired to enroll into the program in 2018 and 2019 with their demographic information and class participation. These data were utilized to examine factors related to non-attendance and factors related to low, moderate, and high attendance. Logistic regression tested the association of non-attendance and county of residence, race, ethnicity, referral type, age, and weeks of gestation at enrollment. Multinomial logistic regression tested the association between levels of

attendance (low, moderate, and high) and county of residence, race, ethnicity, referral type, age, and weeks of gestation at enrollment.

For aims two and three, in collaboration with the Arizona Department of Health Services, the University of Arizona obtained vital statistics birth data for teen births (mothers $\leq$ 19 years of age) from 2010-2019 from three counties in Arizona: Pima, Maricopa, and Gila. The SOR program provided a list of program participants from 2010-2019 to the University of Arizona Data Information Services who provided a de-identified data set with a variable that identified those who were in the SOR program and those who were not in the SOR program. For aim two, this data was used to compute parametric tests for trend over time for health characteristics that are associated with pregnancy risk factors, mean differences in these factors by county, and percent differences by county. For aim three, chi-square analysis and multiple logistic regression tested differences for health characteristics and birth outcomes between SOR participants and nonparticipants.

Results

The results for aim one showed that participants in Maricopa had a greater odds of higher attendance versus lower attendance than Pima County (OR 2.8, 95% CI 1.1, 7.5), and participants in Gila County had a greater odds of higher attendance versus lower attendance than Pima County (OR 6.5, 95% CI 1.5, 27.6). A significantly greater percentage ($p < 0.001$) of teens who were referred to SOR by a physician or community agency initiated participation (36%) compared with teens who never attended (17%). The number of classes attended for participants who enrolled late in pregnancy (> 28 weeks) was nearly equivalent to participants who enrolled early in pregnancy (<20 weeks).

Results for aim two found that the mean age of teen moms was 17.7 ± 1.1 years, consistent over the 10-year time span. Cigarette smoking was much higher in rural Gila County (11.2%), compared to suburban and urban Pima (4.2%) and Maricopa (4%) counties. Preeclampsia had an upward trend, starting from 4.4% in 2010 increasing to 9.6% in 2019 ($p<0.001$). The prevalence of overweight and obese was 35.4% for the total sample and ranged from a low of 32.1% in 2014 to a high of 37.5% in 2017 ($p<0.001$). Positive STIs ranged from 6.8% of the sample in 2014 to 11.7% in 2017, a significant increase over time ($p<0.001$).

Results for aim three found that the adjusted odds ratios for the noted health characteristics (smoking, hypertension, preeclampsia, eclampsia, overweight and obesity, gestational diabetes, and sexually transmitted infections) were not significantly different for SOR participants and nonparticipants. SOR participants had reduced odds of having a preterm birth, aOR 0.8 (95% CI 0.7,0.9), and reduced odds of having a low birthweight baby, aOR 0.8(95% CI 0.6,0.9), compared to nonparticipants. SOR participants had increased odds of breastfeeding at discharge, aOR 1.3(95% CI 1.0,1.7), compared to nonparticipants.

Conclusions

Aim 1. Strengthening referral systems may be one way to increase overall enrollment. Teens who enrolled later in pregnancy were just as likely as those who enrolled earlier in pregnancy to participate with high attendance and complete the program curriculum. Pregnant teens should continue to be referred to teen pregnancy programs from a variety of sources at any stage during their pregnancy.

Aim 2. Births from teen pregnancies decreased in Pima, Maricopa, and Gila counties from 2010-2019 but there are still many births to teen mothers every year. The prevalence of preeclampsia and STIs in teen pregnancies in Arizona has increased over time and are both significantly higher in rural areas than urban or suburban areas. Smoking during pregnancy and STI infections were higher in rural areas and are health behaviors that can be addressed during teen pregnancy. Teens need access to appropriate health information and support during pregnancy to effectively prevent STIs, reduce or quit smoking during pregnancy, and make other positive behavior changes, including improving diet quality.

Aim 3. Engagement with the SOR program was associated with significant positive effects on birth outcomes including reduced preterm birth and low birthweight, and increased initiation of breastfeeding. The SOR program should continue to provide these valuable services during teen pregnancy and look for ways to draw in more teens that may be less likely to participate in programs, or who may be delaying prenatal care.

PREFACE

This study aims to report patterns of participation in Starting Out Right (SOR), health trends for pregnant teens, how health trends compare between participants and nonparticipants of a community-based teen pregnancy program in Arizona (SOR), insights into demographic characteristics of participants and nonparticipants, and the association of SOR program participation and birth outcomes. The specific aims are to 1) describe participation patterns in the SOR program in 2018 and 2019, 2) describe trends over time for the health of pregnant teens in Arizona by describing the prevalence of smoking, hypertension, preeclampsia, eclampsia, overweight and obesity, gestational diabetes, and sexually transmitted infections (STIs) in teens who gave birth in Arizona from 2010-2019, 3) after linking SOR participants to state birth records, compare the health characteristics (smoking, hypertension, preeclampsia, eclampsia, overweight and obesity, gestational diabetes, STIs), prenatal services (month first prenatal visit occurred, number of prenatal visits, participation in the Special Supplemental Program for Women, Infants, and Children (WIC) program), and birth outcomes (delivery method, gestational age at delivery, NICU admission, birthweight, breastfeeding) of SOR participants and nonparticipants from 2010-2019.

Dissertation Format

Chapter 1 includes a brief overview of teen pregnancy programs and includes background information for the selected health indicators and birth outcomes. Chapters 2, 3, and 4 reflect aims 1, 2, and 3 respectively. Chapter 2 reports key findings of participation patterns in the SOR program in 2018 and 2019. Chapter 3 reviews the prevalence of the selected health indicators for teens for gave birth in Arizona, and chapter 4 compares the selected health characteristics between SOR participants and nonparticipants and assesses the association of SOR participation and birth outcomes. Chapter 5 includes overall conclusions, recommendations, and reflections. Note: The University of Arizona IRB determined that human subjects review was not required for this study.

CHAPTER 1

INTRODUCTION

Background

Teen pregnancy in the United States

Teenage pregnancy is recognized as a significant public health concern associated with a range of risks for both the mother and baby.[1] Pregnant teens and their infants are at high risk for multiple adverse health and social outcomes including limitations in educational and employment opportunities, increased risk for substance use and poorer mental health in mothers, and negative birth outcomes including low birth weight babies and preterm delivery.[1-8]

While there have been significant reductions in teen pregnancy in the US, teen birth rates are still higher in the US than in other high-income countries (17.4 births per 1,000 for 15 to 19 year olds in 2018).[9] Prevention efforts remain important, but supporting optimal overall health for teens who become pregnant will help to avoid compounding adverse health effects that have been associated with teenage pregnancy. In this study the term "teen pregnancy" is used to describe births to women ages 19 years and younger.

Programs for pregnant and parenting teens

A variety of programs for pregnant and parenting teens have been developed with different goals in mind, some including improving birth outcomes, supporting maternal educational attainment, parenting education, and preventing rapid repeat pregnancies (RRP).[10, 11] Many programs for pregnant teens provide comprehensive case management, although program services vary throughout the nation based on the level of intervention and setting, with services provided to individuals or groups, provided through schools, home visitation, healthcare, or community-based sites, and delivered by professionals, paraprofessionals, or volunteers.[10, 12] Programs that are well-designed for pregnant teens have the potential to positively influence health for the mother and baby over the life course.[13-25] This section will highlight various teen pregnancy program designs, also summarized in Table 1. We will also review theory-based approaches to teen pregnancy programs and approaches to increasing teen pregnancy program enrollment and participation.

Teen pregnancy program design. Teen pregnancy programs use a variety of strategies to deliver program services, ranging from home visits to phone-based programs, but programs shown to have positive results generally provide some type of intensive one-on-one support.[11] Several programs that improved educational outcomes either included education as one of a range of outcomes or had education attainment as a primary goal. Programs have generally been more effective for improving educational progress (attendance) than educational attainment (completion of GED or high school diploma).[11]

The length of program curricula varies depending on the program design and goals. One public health nursing home visitation program shown to reduce preterm birth and improve birthweight for teens provided weekly home visits for the first four weeks after program enrollment, then every other week until delivery.[22] Another program designed to improve perinatal outcomes for teens utilized a public health nursing home visit design with a goal of 17 visits during pregnancy, combined with group classes during the third trimester of pregnancy to discuss transition to motherhood, parent-child communications, and staying healthy.[19]

"Be Proud, Be Responsible, Be Protective," an evidence-based curriculum to prevent RRP in adolescents, is based on an eight hour curriculum implemented in four, two hour sessions, and has been shown to increase intention to use condoms (Cohen's *d* 0.33).[20] "AIM 4

Teen Moms" was designed as a nine session program, with seven of the nine sessions delivered one-on-one via trained facilitators, and two ninety-minute group sessions with trained facilitators (4-15 participants), over a twelve week period.[15, 26] "Teen Options to Prevent Pregnancy" delivers education through monthly telephone contact with a nurse educator, over an 18-month period, and additionally provides access to contraception and social workers as needed.[24-26]

A systematic review and meta-analysis of teen birth outcomes found that programs with psychosocial interventions including knowledge of maternal and fetal health, enhanced social support, and facilitating access to health care services and resources were effective for reducing the risk of low birth weight in pregnant teens, with a pooled risk ratio of 0.60 (95% CI 0.38, 0.92).[12] These programs provided public health nursing home visitation aimed to improve social competence to manage stress and develop self-esteem,[19] and to expand social networks to reduce stress and anxiety.[27] Many programs incorporate elements of positive youth development (PYD) aimed to improve self-sufficiency. The PYD framework views teens as active partners versus recipients of information that need to be fixed.[28] This youth focused approach encourages self-care and self-advocacy thought to improve self-sufficiency and resiliency.

<u>Theory-based approaches.</u> Community-based approaches to teen pregnancy programs draw on a variety of theoretical frameworks. A Nurse-Family Partnership intervention in California based on self-efficacy theory and goal setting was associated with less preterm births than the general population of teen births in California.[22] The "Teen Options to Prevent Pregnancy" program in Ohio focuses on preventing RRP and includes nurse educators trained in motivational interviewing. The program is based on the Behavioral Model of Health Services Use theory, suggesting that use of contraceptives will be motivated by a women's perception of her need for birth control and by providing easy access.[26] "Aim 4 Teen Moms," in the greater

Los Angeles area, also designed to prevent RRP, is based on the Theory of Possible Selves, suggesting that motivation is drawn from images of your possible future self.[26] A Cochrane review of theory based interventions for contraception use (including home-based, school-based, and community-based programs) found five of eight interventions based in social cognitive theory resulted in increased effective contraception use.[29] Four of six interventions utilizing motivational interviewing had a positive significant difference for contraceptive use.[29] Interventions included in the review based on other theories including the transtheoretical model, protection motivation theory, health belief model, theory of planned behavior, and social and behavioral change model either had low quality evidence or did not show an effect for contraceptive use.[29] Programs most successful in promoting healthy birth spacing identified prevention of RRP as their primary goal.[11] Effect sizes from a review of 14 studies ranged from -0.57 to -0.14 with intervention groups having a reduced rate of RRP, but not always statistically significant.[11]

Teen pregnancy program participation

The most effective ways to recruit and engage teens for teen pregnancy programs is an under-researched area and it may be the teens who are most disengaged or difficult to reach (i.e., not attending school or working), who could benefit the most from engagement in a teen pregnancy program. On the other hand, demands for work or school may limit a teen from participating in programs, and some parents of pregnant teens or partners may discourage participation.[30-33] One study found that establishing formal referral partnerships was important for recruiting teens.[26] Programs that utilized health fairs, WIC offices, and worked closely with schools for pregnant and parenting teens also had success with program recruitment.[26]

Approaches to addressing concerns for transportation have included offering bus tokens, providing dinner or child care onsite, offering transportation, and paying for taxis.[26] Ultimately, different approaches to transportation depend on the local area, including ease of use of public transportation and insurance or liability laws of the state.[26]

Focus groups to understand components of effective recruitment ads for an internet-based program for pregnant and parenting adolescents found that participants focused most importantly on the visual images including pregnant or parenting teens that were smiling and happy, and who they could identify with (looked like themselves).[34] Teens preferred positive messages with words they would use and generally preferred the phrase "get the support you need to make it through your pregnancy and beyond," more than others such as "free help, support and information just for pregnant and teen moms" which some thought might exclude other family members from participating.[34]

The Massachusetts Pregnant and Parenting Teen Initiative program identified three key strategies important for higher levels of participation and engagement including social-emotional support, adequate staffing, and concrete supports.[16] Social-emotional support included support groups and social activities, adequate staffing included communication between program staff and limited staff turnover, and concrete supports included child care, diapers, food, or transportation.[16] Program sites with the highest levels of program retention utilized all three of the identified strategies, where sites with the lowest levels of program retention had the highest levels of teens who reported being homeless, not being in school, and not being employed.[16]

Feedback from pregnant teens about their needs and what they most appreciate in programs they have participated in is valuable to understanding participation. A qualitative study of community-based doulas matched to pregnant and parenting teens reported that teens may view support from family and friends as less valued or not sufficient to support them through pregnancy, childbirth, and parenting compared to the support they received from the doula.[14] Teens reported appreciation for discussing sensitive health topics, respecting teen autonomy and decision making, and support for attaining goals.[14] Another qualitative study to explore unmet needs of parenting teens found that teens wanted better access to mental health screening, a consistent medical home, increased knowledge and access to contraception, and parenting education and support groups.[35] A qualitative study by Moseson and others (2019) reported the impact of stigma on social support during pregnancy, citing that because of stigma, young women selectively disclose their pregnancy thereby limiting social support. The young women expressed wanting to have connections with others who had experienced a similar situation and who would not judge them.[36] Teens valued both in person and online support groups.[36]

"Starting Out Right" for teen pregnancy

In Arizona, the Starting Out Right (SOR) program of Arizona Youth Partnership (AzYP), provides prenatal education services for teens, utilizing a curriculum based in social cognitive theory and theory of reasoned action.[23] The curriculum is designed to improve well-being, reduce rapid repeat pregnancy and STIs, build confidence in a teens ability to give birth and care for newborn, promote breastfeeding, and promote self-sufficiency. The program provides education and support to promote healthy teen pregnancies and build life and stress management skills (Appendix A Logic Model).

Teens may be referred to the program through doctors' offices, schools, other community agencies, or may self-refer (see Logic Model "Community Partners and Service Linkages"). Any pregnant or parenting woman under the age of 22 is eligible to participate in the program.[37]

The SOR prenatal curriculum is designed for pregnant teens, using criteria found to be valid in the development of curricula for teens in STI and HIV education programming, with intended emphasis on non-judgmental, age-appropriate care (see Logic Model "Program Design").[23] The curriculum includes a total of eight classes, divided into a series on healthy pregnancy and a series on childbirth education(see Logic Model "Activities"). The Healthy Pregnancy Series is designed as four two-hour sessions, ideally offered in the first or second trimester of pregnancy. The Childbirth Education Series is designed as four two and a half hour sessions, ideally offered later in pregnancy (third trimester). Classes are facilitated by trained staff members and topics include pregnancy health and wellness, healthy relationships, birth control, newborn care, labor and delivery, and breastfeeding. The program additionally provides case management, support groups and special events with a focus on improving safety, health, and well-being.[23]

Once teens give birth, they are eligible to continue receiving services through AzYP programming for continued support in preventing RRP, educational attainment, goal setting, and parenting skills. The SOR curriculum was originally developed in the year 2000, has had multiple revisions, and the most recent curriculum was published in 2017.[23] An evaluation in 2017 measured breastfeeding outcomes among 314 SOR program participants (previously named Teen Outreach Pregnancy Services) who responded to a survey about barriers to breastfeeding and breastfeeding duration, and 91.1% reported ever breastfeeding.[38] Additionally, the SOR program includes psychosocial components previously shown to be effective for reducing low birthweight in teen births.[38]

Teen pregnancy programs and birth outcomes

While some programs have been shown to effectively reduce repeat pregnancies, and increase educational attainment, how community based programs may influence health behaviors associated with poor birth outcomes is under-researched.[11] Social inequalities, stigma faced from medical providers, and childhood adversities have been shown to be related to adverse birth outcomes, however these factors may be difficult for teen pregnancy programs to address. This study reviews health indicators and birth outcomes for pregnant teens who participated in the Starting Out Right (SOR) for Teen Pregnancy program in the state of Arizona.

Significance of Selected Health Indicators and Birth Outcomes

Selected health indicators of interest for this study include cigarette smoking, hypertensive disorders in pregnancy, overweight and obesity, gestational diabetes, and STIs. Birth outcomes studied include method of delivery (C-section v. vaginal birth), gestational age at delivery, neonatal intensive care unit (NICU) admission, birthweight, and breastfeeding.

Health indicators

Cigarette smoking. Twenty percent of all high school students in 2016 reported using tobacco products with over half using e-cigarettes.[39] Substance use in teens is a risk factor for teen pregnancy, therefore teens who become pregnant may have a history of substance use.[40] In 2016, the prevalence of maternal smoking for all ages in the state of Arizona was estimated to be 4.6%.[41] Tobacco use and exposure during pregnancy is an established risk factor for low birth weight.[42]

Hypertensive disorders in pregnancy. Chronic hypertension is estimated to be present in 0.9-1.5% of pregnancies, with major risk factors obesity and older age.[43] Chronic hypertension in pregnancy can lead to poor birth outcomes including superimposed preeclampsia, fetal growth restriction, preterm birth, and increased risk for C-section deliveries.[43] Prevalence of preeclampsia varies from 2-8% depending upon the population sampled and the year of study.[44-46] Maternal age less than 18 years or greater than 35 years is a risk factor for preeclampsia.[47]

Preeclampsia is associated with increased risk for hypertension, maternal mortality, cardiovascular disease, gestational diabetes, type 2 diabetes, and increased risk of preterm birth.[48] Hypertensive disorders of pregnancy have also been recently linked to poorer working memory fifteen years after pregnancy.[49] Eclampsia is estimated to be 0.3% globally, with women under 20 years of age and women in their first pregnancy at higher risk.[50]

Body mass index (BMI) and gestational diabetes. Overweight (BMI ≥ 25) and obesity (BMI ≥ 30) during pregnancy increases the risk for gestational diabetes, gestational hypertension, C-section, maternal death, babies that are small or large for gestational age, preterm birth, and stillbirth.[51-54] Overweight and obesity have increased over time for all teens, increasing the likelihood that pregnant teens will also have increasing rates of overweight and obesity. The prevalence of obesity among US women of childbearing age (18-49) has increased from 7.4% in 1976 to 27.5% in 2014.[55] The negative effects of overweight and obesity may extend into the postpartum period and beyond with higher rates of postpartum depression, lower rates of breastfeeding, and other longer term consequences including increased risk of childhood and adolescent obesity.[56-60] The prevalence of gestational diabetes is estimated to be between 7-12% of all pregnancies in North America.[61] Gestational diabetes is associated with increased risk for type 2 diabetes after delivery, high birth weight, preterm birth, and neonatal hypoglycemia.[62, 63] Adequate nutrition and weight gain during pregnancy contribute to improved pregnancy outcomes.[42] Teens are less likely to consume a healthful diet and may be concerned about weight gain during pregnancy more than adult women.[64]

Sexually transmitted infections (STIs). The state of Arizona ranks in the top 20 of all states in the US for the greatest rates of STIs, with an upwards trend in infection rates.[65, 66] Chlamydia, the most common STI in Arizona, had a 13% increase from 2016 to 2017, gonorrhea increased by 21% from 2016 to 2017, and syphilis increased by 24% from 2016 to 2017.[67] The Centers for Disease Control and Prevention (CDC) estimates that youth ages 15-24 account for half of the 20 million new STIs in the United States each year.[68] Untreated STIs during pregnancy raise the risk of preterm premature rupture of the membranes, preterm birth, uterine infection, and stillbirth.[68] Infections can also be transmitted to the baby.

<u>Prenatal services.</u> Inadequate prenatal care is strongly associated with preterm birth in teens, with one study reporting teens without prenatal care having a 7-fold higher risk of preterm birth compared to teens who attended 75% to 100% of recommended visits.[69] One measure of adequate prenatal care is the Adequacy of Prenatal Care Utilization Index (APNCU), the ratio of actual prenatal visits to the expected prenatal visits dependent upon the month prenatal care started and the gestational age at delivery.[70] Based on the APNCU, adequacy of prenatal care is defined as receiving 80% of expected visits or more, with less than 80% of expected visits considered less than adequate prenatal care.[70]

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) provides vouchers to purchase food, nutrition and breastfeeding education for pregnant women. Numerous studies conclude that participation in the WIC program is associated with improved birth outcomes including lower risk of preterm birth.[71-73] However, studies also commonly report less breastfeeding among women enrolled in WIC compared to WIC eligible nonparticipants.[74, 75]

Birth outcomes

<u>C-section.</u> Women are generally more likely to have a medically indicated C-section with pregnancy complications, chronic conditions, multiple births, obesity prior to pregnancy, and age 25 or older.[76]

Preterm birth. Teen mothers have higher risk for preterm delivery than women ages 20-35.[77, 78] A meta-analysis in 2013 found that first time moms aged 18 or younger had the highest risk for preterm birth across all age categories.[79] Other risks for preterm birth in a first pregnancy include African American race, smoking, STIs, intimate partner violence during pregnancy, and disruptive life events.[77]

Neonatal intensive care unit (NICU) admission. Common reasons for NICU admissions include preterm birth, respiratory distress, and infections. Women with gestational diabetes during pregnancy are at increased risk for their infants to be admitted to the NICU.[80]
There is wide variation in NICU admission rates for near term infants without significant medical conditions, and admissions may vary by the discretion of the doctor or policies of the medical facility.[81]

Birthweight. Low birthweight can potentially result from a combination of maternal risk factors including health behaviors, biological factors, stress, and psychosocial factors. Teen mothers have higher risk for low birthweight than mothers aged 20-24.[78] Adequate nutrition and weight gain during pregnancy contribute to a reduced risk of low birthweight.[42] Teens may be less likely to consume a healthful diet and may be concerned about weight gain during pregnancy more so than adult women.[64] Psychosocial stress, and exposure to chronic stress related socioeconomic disadvantage and racial discrimination are also associated with negative pregnancy outcomes including low birthweight.[82-84] Pregnant teens face social isolation and increased stress compared to their nonpregnant counterparts, have higher rates of poverty, tend to be single, may have been victims of abuse, have lower levels of education, may lack social support, and may have low self-esteem.[40] Additionally, pregnant teens are more often stigmatized and face discrimination from clinicians, and people may focus on their faults rather than their resilience.[85, 86]

Breastfeeding. The benefits of breastfeeding are well known for their positive effects on maternal and child health.[87] Teen mothers generally have lower breastfeeding initiation than older mothers.[88] Mothers whose babies are born by C-section versus vaginal birth may have a more difficult time breastfeeding.[89] Babies born preterm or who are admitted to the NICU generally have lower breastfeeding initiation than babies who are not preterm or who do not require NICU admission.[90]

There is evidence of improved maternal outcomes as a result of teen pregnancy programs including reduced low birthweight and reduction in repeat births.[10] There are limited data on the health status of pregnant teens or for evidence based programs to improve birth outcomes for teens. Evaluation of teen pregnancy programs may provide information to drive improvements and share results with others working with pregnant teens.

Table 1. Approaches to teen pregnancy programs.

Author & Year	Location	Population	Intervention	Theory	Outcome (compared to control)	Additional Information
Black et al. 2006, Home-Based Mentoring Program	Urban US	Urban black first time moms, less than 18 years old	Bi-weekly home based mentoring.	Social cognitive theory	More than 2 visits increased odds of not having a second infant more than threefold, no second births reported among mothers who attended 8 or more sessions.	Interpersonal negotiation skills, adolescent development, parenting
Breedlove 2005, Community Based Doula Intervention	Urban Midwest	Medicaid eligible, 14-18 years old, normal pregnancy	Doulas facilitated pregnancy and parenting education classes, 24-hr call availability at labor/birth, pre and post birth home visits.	not specified	Enhanced feelings of emotional support, increased self-confidence, increased ability to cope with stress.	Lay-community members trained as doulas. Doulas were adult women of the same culture, resided within same neighborhood and near community center where services were provided.
Covington et al. 2015, AIM 4 Teen Moms	Los Angeles, CA	Ages 15-19 with child less than 7 months of age.	Seven one hour sessions with trained facilitator and two 90 minute group sessions; 12 week program	Theory of Possible Selves, Positive Youth Development	Participants less likely to have sex without contraception; no difference in school engagement	
Egan et al. 2020, Massachusetts Pregnant and Parenting Teen Initiative	Massachusetts	Expectant and parenting adolescents aged 14-24	Case management, health education, linkages to community and clinical services to young families, monthly check-ins for a minimum of six months.	not specified	98% enrolled in health insurance, 93% reported using contraception, 58% made progress toward school/career goals	Service model varies from services offered by agency to completely referral based (no direct services provided)

Author & Year	Location	Population	Intervention	Theory	Outcome	Additional Information
Ford et al. 2002, Prenatal Care Intervention	Detroit, Michigan	Urban pregnant adolescents ≤ 20 years old	Peer centered prenatal care program; increase knowledge about pregnancy, prepare for childbirth, work with the healthcare system, assess own health and baby's health, prevent repeat pregnancy	Social cognitive theory	Less low birth weight; less unplanned pregnancy, more likely to continue education at one year postpartum.	Intervention delivered during routine prenatal care
Jacobs et al. 2016, Healthy Families Massachusetts	Massachusetts	First time parents under age 21, pregnancy until reaches age 3.	Bi-weekly visits intended for prenatal, weekly for 6 months after birth. Mothers received 24 home visits on average over approximately 15 months.	not specified	Nearly two times as likely to have completed at least 1 year of college, less parenting distress, 25% more likely to report using condoms after 1 year.	Intervention goals: prevent child abuse and neglect by supporting parenting, optimal health for children, educational attainment and job/life skills, prevent rapid repeat pregnancy, parental health and well-being. Goal setting, routine development and health screenings, linkages to medical and other services.
Koniak-Griffin et al. 2000, County Health Department	Southern California	Low income pregnant adolescents	Home visitation by public health nurses and preparation for motherhood classes: health, sexuality and family planning, maternal role, life skills, social support.	not specified	Reduced preterm birth and low birth weight, more positive educational outcomes.	Counseling included: maternal role issues, education, handling emotions

Author & Year	Location	Population	Intervention	Theory	Outcome	Additional Information
Koniak-Griffin et al. 2003, Project CHARM, Be proud! Be responsible! Be protective!	Los Angeles, CA	Primarily low-income Latina	Four, two hour sessions	Social cognitive theory & theory of reasoned action	Increased intention to use condoms	Skill building, roll playing, trained nurse facilitators
McDonell et al. 2007, Pathways Teen Mother Support Project	Rural South Carolina	low income pregnant and parenting teens ≤ 18	Case management and group education. Sessions were given over a two year time-period with individualized case planning for social and educational goals.	not specified	fewer pregnancies, graduated at higher rates, improved problem solving beliefs, less impulsive, reduced marijuana use	Topics include family group decision making, peer groups, life skills education, leadership development.
Nguyen et al. 2003, Nurse-Family Partnership	Orange County, CA Urban	Hispanic adolescent mothers and babies	Nurse-Family Partnership home visitation	Self-efficacy theory	Less preterm births than in the general population of births to adolescents in California	Weekly home visits first 4 weeks, visits every other week until delivery, weekly for next 6 weeks, visits every other week until child 20 months, monthly until 24 months.
Pedersen et al. 2017, Starting Out Right	Arizona	Pregnant and age 21 or under	Group classes: 4 healthy pregnancy and 4 childbirth education; case management; special events and support groups	Social cognitive theory, theory of reasoned action	Increased breastfeeding. (Other outcomes evaluated in this study).	Community-based program.

Author & Year	Location	Population	Intervention	Theory	Outcome	Additional Information
Smith et al. 2015; Rotz et al 2016, Teen Options to Prevent Pregnancy	Columbus, OH	Medicaid eligible 10-19 at least 28 weeks pregnant or recently given birth	18 monthly individual sessions by a nurse educator. Access to contraception and referrals.	Behavioral Model of Health Services Use	Participants less likely to have repeat pregnancy within 18 months	Nurse educators trained in motivational interviewing.

CHAPTER 2

PARTICIPATION PATTERNS IN THE STARTING OUT RIGHT FOR TEEN PREGNANCY PROGRAM IN 2018 AND 2019

Introduction

Programs designed for pregnant teens have the potential to influence prenatal and long-term health. In Arizona, the Starting Out Right (SOR) program of Arizona Youth Partnership (AzYP) provides prenatal education services for teens, utilizing a curriculum designed to improve birth outcomes, promote breastfeeding, teach about birth control, and help adolescents achieve educational goals. The program addresses these topics in the context of a healthy teen pregnancy and aims to build life and stress management skills and healthy relationships (Appendix A Logic Model).

Participation in teen programs

Pregnant teens may choose to participate in teen pregnancy programs for a variety of reasons. A 2018 study found that teen parents participating in programs are looking for opportunities for social support within peer groups to reduce feelings of isolation and stigma.[35] Many teen parents may feel they do not have adequate mental health screening, a consistent medical home, adequate information about contraceptives, and generally want more parenting education and support groups.[35]

One program for pregnant teens in Massachusetts identified three key strategies important for higher levels of participation and engagement including social-emotional support, adequate staffing, and concrete supports.[16] Social-emotional support included support groups and social activities, adequate staffing included communication between program staff and limited staff turnover, and concrete supports included child care, diapers, food, or transportation.[16] Program sites with the highest levels of program retention utilized all three of the identified strategies, where sites with the lowest levels of program retention had the highest levels of teens who reported being homeless, not being in school, and not being employed.[16] Other studies have found that sometimes demands for work or school may limit a teen from participating in programs, and some parents of pregnant teens or partners may discourage participation.[30-33] Transportation is also a known barrier to many health education programs.[26] Programs that utilized health fairs, WIC offices, and worked closely with schools for pregnant and parenting teens have had success with program recruitment.[26]

Starting Out Right (SOR)

The SOR program provides case management, healthy pregnancy and childbirth education classes, support groups, and special events for pregnant women in Arizona up to age 21. The program teaches communication skills and emphasizes healthy relationships.[23] The program utilizes curriculum designed to be age appropriate, in a total of eight classes, including a series of four, two-hour healthy pregnancy classes, and four two and a half hour childbirth education classes. When participants enroll in the first or second trimester of pregnancy, the plan it that the Healthy Pregnancy classes are completed, then in the 3rd trimester, the Childbirth Education classes would be completed. If a class is missed, a make-up class is encouraged, therefore some classes may be taken out of order or not at all. When teens enroll in their late 2nd trimester or early 3rd trimester, and depending on the rotating class schedule, participants may take the Childbirth Education series first, then take the Healthy Pregnancy series. Weeks of gestation at enrollment, delivery date, and whether a teen delivers full term may affect whether a teen is able to attend all eight classes and the order that they attend. Ideally participants receive all eight classes prior to 36 weeks of gestation.

General knowledge of who is participating and who is not participating in the SOR program may provide ideas for new ways to promote enrollment and increase engagement in the program. This study is an exploration of variables available within the AzYP database for analyzing participation in the group education classes including county of residence, age, race, referral source, and gestational age at enrollment. The purpose of this paper is to describe participation patterns in the SOR program in 2018 and 2019 to better understand the characteristics of teens who participate and have higher attendance in the group educational classes versus those who do not participate or who have lower attendance.

Methods

Sample

The SOR program provided a de-identified report of people who enrolled or inquired to enroll in the program in 2018 and 2019. The report included information collected by the program including age, race, ethnicity, insurance type, weeks of gestation at enrollment, number of classes attended, zip code of residence, and information about the referral source for how the person came to know about the program.

Variables

Educational classes. Participants were grouped into whether they ever attended one of the eight educational classes or never attended. A second dataset was generated that included only teens who had attended at least one class. In this dataset, the number of classes attended were grouped into low attendance (1-2 classes), moderate attendance (3-5 classes), and high attendance (6-8 classes) based on the concept of whether teens were participating in less than 1/3 of the classes, approaching 2/3 of the classes, or more than 2/3 of the classes.

Additional variables. Weeks of gestation was categorized into less than 20 weeks, 20-28 weeks, and greater than 28 weeks. Age was categorized into less than 17 years, 17-18 years, and 19-21 years old. Categories for referral type included: self-referred, friend, doctor, government agency, school, community social service or other community group, and unknown. Referral type was additionally categorized into "self-referred or friend" or "referred through a community agency or doctor office." Insurance type was categorized into private insurance, AHCCCS (Arizona Medicaid), or missing. The SOR program provides services in primarily three counties in Arizona: Maricopa, Pima, and Gila. There were two participants with residence reported in Pinal County, and one out of state. These participants were grouped together with Gila County to make comparisons between the three primary locations.

Statistical analyses

Mean values for age at enrollment, number of classes attended, and weeks of gestation at enrollment were calculated overall and by county. General characteristics of participants who enrolled but never attended and participants who enrolled and attended at least one class were totaled overall and by county. For participants who attended, race, ethnicity, insurance type, number of classes attended, and referral source were totaled overall and by county. Multinomial logistic regression tested the association between levels of attendance (low, moderate, and high) and county, race, ethnicity, referral type, age, and weeks of gestation at enrollment. Logistic regression tested the association between non-attendance and county, race, ethnicity, referral type, age, and weeks of gestation at enrollment. Stata version 16.0 was used for all statistical analyses.

Results

There were 454 referrals for enrollment in 2018 and 2019. Of the 454 referrals, 255 women enrolled and attended at least one of the eight classes. Characteristics of enrollees who attended versus who never attended are shown in Table 2. Characteristics of enrollees who attended at least one of the eight classes are shown in Table 3. A high percentage of information was missing for people who were referred to the SOR program (or self-referred) but who never attended. Of note is that a high percentage of people who never attended were self-referred or referred by a friend (83% v. 64%) ($p<0.001$), and a much larger percentage of people who attended were referred by a doctor or community agency (36% v. 17%) ($p<0.001$). The most common referral source was self-referred or unknown, and other referral sources included: friend, doctor, government agency, school, and community social service or other community provider.

Most participants who attended resided in Maricopa County (59%), followed by Pima County (21%), and Gila County and others (20%). County of residence was missing for 63 of the 255 participants. The age at enrollment for SOR participants was reported in 196 out of the 255 records. The average age at enrollment was 17.8 years. The mean age for Pima County was 17.9 ± 1.6, Maricopa County 17.5 ± 1.7, and Gila County and others 18.5 ± 1.8 years. The average weeks of gestation at enrollment was 23.2 ± 8.4 weeks, and similar by county (22.1 ± 8.4 for Pima County, 23.5 ± 8.7 for Maricopa County, 23.9 ± 7.9 for Gila County and others). The weeks of gestation at enrollment was missing for 58 out of the 255 enrolled. The average number of classes attended was 4.9 ± 2.4 overall, 4.1 ± 2.3 for Pima County, 5.1 ± 2.3 for Maricopa County, and 5.8 ± 2.0 for Gila County and others. Forty-three percent of participants completed 6-8 classes, 39% completed 3-5 classes, and 19% completed 1-2 classes. Additional characteristics of participants, including race, ethnicity, and insurance type are summarized in Table 3.

Participants in Maricopa had a greater odds of higher attendance versus lower attendance than Pima County (OR 2.8, 95% CI 1.1, 7.5), and participants in Gila County had a greater odds of higher attendance versus lower attendance than Pima County (OR 6.5, 95% CI 1.5, 27.6) (Table 4). The odds of high attendance were 70% lower (95% CI 0.1, 0.6) if the race information was missing than if the participant was White. No association was found between the referral type and high attendance. No association was found between age and high participation, unless if the age was not reported in the program database, the odds of high attendance were 80% lower (95% CI 0.1,0.8) than those with a recorded age of less than 17. The odds of high attendance were 70% lower (95% CI 0.1, 0.7) if the weeks of gestation at enrollment information was missing in the participant record than if the participant enrolled at less than 20 weeks. Otherwise, weeks of gestation at enrollment was not significantly related to low or high attendance.

The odds of non-attendance were significantly lower for those who enrolled in Gila County, OR 0.2 (95% CI 0.1,0.7), and for those who were referred by a doctor or community agency, OR 0.3 (95% CI 0.2,0.5) (Table 5). The odds of non-attendance were significantly higher if the county information was missing, OR 4.4 (95% CI 2.4,8.4), the race ethnicity information was missing, OR 7.8(95% CI 4.2, 14.6), the age information was missing, OR 4.1(95% CI 2.3,7.6), or the weeks of gestation information was missing, OR 5.9(95% CI 3.4,10.1). Age and weeks of gestation at enrollment were otherwise insignificant in their association with attendance or non-attendance.

Discussion

In 2018 and 2019 43% of SOR attendees completed 6-8 classes, 39% completed 3-5 classes, and 19% completed 1-2 classes. Average attendance in prenatal teen program classes is not typically published, and comparisons to other programs would be difficult as programs vary in the number and type of services provided. For example, the "Teen Options to Prevent Pregnancy" program reported that 36.7% of participants attended at least one community visit for individualized education about birth control and 96% received at least one phone call about birth control utilizing motivational interviewing techniques.[91]

Approximately 56% of referrals to SOR in 2018 and 2019 (including self-referred) enrolled in the program. Referrals from doctors or community agencies resulted in increased likelihood of program enrollment. The referral source that was reported least often was schools. The SOR program may want to consider whether more outreach to schools, including junior colleges and colleges may potentially be worthwhile. Strengthening referral systems may increase overall enrollment.

Many participants are self-referred, and sometimes noted as referred from "online" or "Facebook." The program may consider a more specific drop-down menu for self-referred participants to understand their outreach efforts and consider which social media outlets teens are using (Instagram, Twitter, or others). Media ads for program recruitment may be worthwhile on sites that teens who may be underserved by the health care system may be likely to view.

Higher levels of participation in the program may provide more support and skills to improve health behaviors and manage stress, leading to improved health status. The factor with the strongest association to high attendance was the county of residence. Participants who reported residence in Gila County were most likely to have the greatest class attendance. This may be related to the convenience of location for participants in Gila County, that it is a small, rural, community, where participants may feel more accountable to attending, or have developed a stronger connection to staff or other participants. There may also be fewer competing prenatal health programs available in Gila County compared to Pima or Maricopa counties. It is also of note that during 2018 and 2019, program offerings in Pima County experienced large disruptions based on staff turnover and budget restrictions requiring relocation of program services.

Age, weeks of gestation at enrollment, and insurance type were not associated with attendance, unless information was missing for these factors the odds of attendance was lower. Most teens enrolled during the second trimester of pregnancy. Participants who enrolled later in pregnancy (> 28 weeks) participated with levels of high attendance almost equal to participants who enrolled early in pregnancy (<20 weeks), suggesting that teens should continue to be referred to prenatal teen programs, such as SOR, at all stages of pregnancy. Other factors including transportation, support system, housing stability, work and school schedules, and staff rapport, that have been previously associated with attendance in teen programs, may have a stronger influence over how often a teen will be able to attend and engage in a program.[16, 92]

There is some evidence that when some of the data are missing in the program database, participants are less likely to have high attendance. The SOR program may need to consider why some of the data are missing, and whether it is due to staff error, or related to participant uncertainty about enrollment, housing instability, or refusal to share personal information. Participants with missing data early on may benefit from more frequent follow up to support increased engagement with the program.

Strengths and Limitations

This study detailed participation in the SOR program for recent program participants utilizing the program database. There are many factors related to why a teen may choose to enroll and engage in a teen pregnancy program that we were unable to assess for this study including level of family or adult support, housing stability, the teens own perceived value of the program, and convenience. We also did not assess engagement with case management services or attendance for support groups or special events. There was a fair amount of missing demographic information that could have affected the results. This study also did not link attendance information to program outcomes.

Conclusion

Program participants learn about the SOR program from a variety of sources. Strengthening referral systems may be one way to increase overall enrollment. Teens who enrolled later in pregnancy were just as likely as those who enrolled earlier in pregnancy to participate with high attendance and complete the program curriculum. While the SOR program may look for ways to promote more enrollments during the first trimester of pregnancy, pregnant teens should continue to be referred to teen pregnancy programs from a variety of sources at any stage during their pregnancy.

Table 2. Characteristics of teens referred to Starting Out Right who attended versus who never attended, 2018-2019.

	All Counties		Pima County		Maricopa County		Gila County and Others		Missing County Info.	
	Attended	Never Attended	Attended	Never Attended	Attended	Never Attended	Attended	Never Attended	Attended	Never Attended
Total N (%)	255(100)	199(100)	41(100)	18(100)	113(100)	55(100)	38(100)	3(100)	63(100)	123(100)
Total n, Age	197	76	41	18	113	55	38	3	5	--
Age, mean (SD)	17.8(1.8)	17.6(1.7)	17.9(1.6)	17.7(1.8)	17.5(1.6)	17.6(1.7)	18.7(1.9)	17.7(1.5)	18(2.0)	--
Age range	13-23	14-21	13-21	14-21	13-21	14-21	15-23	16-19	16-21	--
Total n, Weeks of Gestation at Enrollment	197	74	41	18	113	55	38	1	5	--
Weeks of Gestation at Enrollment, mean (SD)	23(8.4)	23(9.9)	22(8.5)	23(8.3)	23(8.7)	23(10.4)	24(7.9)	34(0)	21(5.8)	--
Weeks of Gestation at Enrollment, range	6.7-40.0	6.9-40.0	7.1-36.0	7.9-34.1	6.7-40.4	6.9-40.0	8.0-39.1	--	14.3-29.4	--
					n(%)					
Race*										
African American	26(10)	8(4)	4(10)	1(6)	20(18)	7(13)	2(5)	--	--	--
Non-Hispanic White	63(25)	17(9)	14(34)	4(22)	26(23)	13(24)	20(53)	--	3(4)	--
Hispanic	97(38)	34(17)	20(49)	7(39)	61(54)	26(47)	15(39)	1(33)	1(2)	--
Mixed Race and Other	10(4)	15(7)	2(5)	4(22)	6(5)	9(16)	1(3)	2(67)	1(2)	--
missing	59(23)	125(63)	1(2)	2(11)	--	--	--	--	58(92)	123(100)
Insurance type										
private insurance	27(11)	1(1)	3(7)	--	14(13)	--	8(21)	--	2(3)	7(6)
AHCCCS	73(29)	9(5)	--	--	50(44)	2(4)	5(13)	--	18(29)	1(1)
missing	155(60)	187(94)	38(93)	18(100)	49(43)	53(96)	25(66)	3(100)	43(68)	115(93)
Referral source										
self-referred, friend, or unknown	162(64)	166(83)	21(51)	10(56)	57(50)	32(58)	22(58)	1(33)	62(98)	123(100)
doctor or community agency	93(36)	33(17)	20(49)	8(44)	56(50)	23(42)	16(42)	2(67)	1(2)	--

*4 of the Hispanic were African American, 7 were mixed race and other

Table 3. Patterns of participation in Starting Out Right participants, 2018-2019.

	Total	Pima County	Maricopa County	Gila County & Other	County Missing
Total N(%)	254(100)	41(16)	113(44)	37(15)	63(25)
Total participants for mean age and weeks of gestation at enrollment, n(%)	197(100)	41(21)	114(58)	37(19)	5(2)
Age, mean (SD)	17.8(1.7)	17.9(1.6)	17.5(1.7)	18.5(1.8)	18(2.0)
Age range	13-21	13-21	13-21	15-21	16-21
Weeks of gestation at enrollment, mean (SD)	23.2(8.4)	22.1(8.4)	23.5(8.7)	23.9(7.9)	21.5(5.8)
Weeks of gestation at enrollment, range	6.7-40.0	7.1-36.0	6.7-40.0	8.0-39.1	14.3-29.4
Number of Classes Attended, mean value(SD)	4.9(2.4)	4.1(2.3)	5.1(2.3)	5.8(2.0)	4.2(2.5)
Race*					
White	62(25)	14(34)	26(23)	19(51)	3(4)
Hispanic	98(38)	20(49)	62(54)	15(41)	1(2)
African American	26(10)	4(10)	20(18)	2(5)	--
Mixed Race and Other	10(4)	2(5)	6(5)	1(3)	1(2)
missing	59(23)	1(2)	--	--	58(92)
Ethnicity					
Hispanic	98(38)	20(49)	62(54)	15(41)	1(2)
Non-Hispanic	98(38)	20(49)	52(46)	22(59)	4(6)
missing	59(23)	1(2)	--	--	58(92)
Insurance type					
private insurance	27(10)	3(7)	14(13)	8(22)	2(3)
AHCCCS	73(29)	--	50(44)	5(13)	18(29)
missing	154(61)	38(93)	49(43)	24(65)	43(68)
Number of Classes Attended (254)					
1	25(10)	6(15)	7(6)	1(3)	11(17)
2	22(9)	5(12)	9(8)	2(5)	6(10)
3	34(13)	8(20)	16(14)	2(5)	8(13)
4	55(22)	9(22)	24(21)	5(14)	17(27)
5	10(4)	--	4(4)	4(11)	2(3)
6	17(7)	3(7)	6(5)	5(14)	3(5)
7	37(14)	5(12)	20(18)	10(27)	2(3)
8	54(21)	5(12)	27(24)	8(21)	14(22)
Number of Classes Attended					
Low (1-2)	47(19)	11(27)	16(14)	3(8)	17(27)
Moderate (3-5)	99(39)	17(41)	44(39)	11(30)	27(43)
High (6-8)	109(43)	13(32)	54(47)	23(62)	19(30)
Referral source (254)					
self-referred or unknown	139(55)	16(39)	53(47)	11(30)	59(94)
friend	22(9)	5(12)	4(4)	10(27)	3(4)
doctor	47(19)	17(42)	23(20)	7(19)	--
government agency	19(7)	--	11(10)	8(21)	--
school	8(3)	1(2)	6(5)	1(3)	--

community social service or other community group	19(7)	2(5)	17(14)	--	1(2)
Referral source (254)					
self-referred, friend, or unknown	161(63)	21(51)	57(50)	21(57)	62(98)
doctor or community agency	94(37)	20(49)	57(50)	16(43)	1(2)

*two of the Hispanic were African American, and 5 mixed race and other

Table 4. Factors associated with low, moderate, and high attendance in the Starting Out Right program, 2018-2019.

	Total n(%)	Low Attendance (1-2 classes)	Moderate Attendance (3-5 classes)	High Attendance (6-8 classes)	Unadjusted; OR (95% CI)[1]	Adjusted; OR (95% CI)[2]
Total n(%)	254(100)	47(19)	99(39)	108(42)		
County						
Pima	41(100)	11(27)	17(41)	13(32)	ref	ref
Maricopa	113(100)	16(14)	44(39)	53(47)	**2.8(1.1-7.5)**	2.8(1.0,8.1)
Gila and other	37(100)	3(8)	11(30)	23(62)	**6.5(1.5-27.6)**	**6.2(1.4,28.4)**
missing	63(100)	17(27)	27(43)	19(30)		1.4(0.1,17.7)
Race[3]						
White	62(100)	5(8)	23(37)	34(55)	ref	ref
Hispanic	97(100)	19(20)	36(37)	42(43)	0.3(0.1,1.0)	0.3(0.1,1.1)
African American	26(100)	5(19)	12(46)	9(35)	0.3(0.1,1.1)	0.2(0.1, 1.1)
Mixed Race and Other	10(100)	1(10)	2(20)	7(70)	1.0(0.1,10.2)	1.1(0.1,11.5)
missing	59(100)	17(29)	26(44)	16(27)	**0.1(0.1,0.4)**	--
Referral Type						
self-referred or unknown	139(100)	34(24)	54(39)	51(37)		
friend	22(100)	1(5)	9(41)	12(54)		
doctor	47(100)	7(15)	18(38)	22(47)		
government agency	19(100)	3(16)	5(26)	11(58)		
school	8(100)	2(25)	2(25)	4(50)		
community social service or other community group	19(100)	--	11(58)	8(42)		
Referral Type (Combined categories)						
self-referred or friend	161(100)	35(22)	63(39)	63(39)	ref	ref
doctor or other community agency	93(100)	12(13)	36(39)	45(48)	2.1(1.0,4.5)	1.4(0.6,3.4)
Age						
<17 years	43(100)	4(9)	20(47)	19(44)	ref	ref
17-18 years	88(100)	14(16)	31(35)	43(49)	0.6(0.2,2.2)	0.5(0.1, 2.0)
19-21 years	65(100)	13(20)	22(34)	30(46)	0.5(0.1,1.7)	0.3(0.1, 1.4)
missing	58(100)	16(28)	26(44)	16(28)	**0.2(0.1,0.8)**	--
Weeks of Gestation at Enrollment						
<20 weeks	74(100)	10(13)	25(34)	39(53)	ref	ref
20 - 28 weeks	60(100)	11(18)	16(27)	33(55)	0.8(0.3,2.0)	0.8(0.3, 2.2)
>28 weeks	62(100)	10(16)	32(52)	20(32)	0.5(0.2,1.4)	0.6(0.2, 1.9)
missing	58(100)	16(28)	26(44)	16(28)	**0.3(0.1,0.7)**	--

[1]Odds ratio is odds of high attendance to low attendance
[2]Adjusted model includes county, race, age, weeks of gestation at enrollment
[3]two of the Hispanic were African American, and 5 mixed race and other

Table 5. Factors associated with non-attendance versus attendance in Starting Out Right, 2018-2019.

	Total	No Attendance	Any Attendance	Unadjusted; OR (95% CI)	Adjusted; OR (95% CI)
Total n(%)	454(100)	199(44)	255(56)		
County					
Pima	59(100)	18(31)	41(69)	ref	ref
Maricopa	168(100)	55(33)	113(67)	1.1(0.6,2.1)	1.3(0.6,2.5)
Gila and other	41(100)	3(7)	38(93)	**0.2(0.1,0.7)**	**0.1(0.0, 0.6)**
missing	186(100)	123(66)	63(34)	**4.4(2.4,8.4)**	--
Race					
White	80(100)	17(21)	63(79)	ref	ref
Hispanic	131(100)	34(26)	97(74)	1.3(0.7,2.5)	0.9(0.5,2.0)
African American	34(100)	8(24)	26(76)	1.1(0.4,3.0)	0.8(0.3,2.1)
Mixed Race and Other	25(100)	15(60)	10(40)	**5.6(2.1,14.6)**	**3.6(1.2,10.6)**
missing	184(100)	125(68)	59(32)	**7.8(4.2,14.6)**	5.9(0.5,78.0)
Referral Type					
self-referred, friend, or unknown	328(100)	166(51)	162(49)	ref	ref
doctor or community agency	126(100)	33(26)	93(74)	**0.3(0.2,0.5)**	0.7(0.4,1.2)
Age					
<17	65(100)	22(34)	43(66)	ref	ref
17-18	118(100)	30(25)	88(75)	0.7(0.3,1.3)	0.7(0.3,1.4)
19-21	90(100)	24(27)	66(73)	0.7(0.4,1.4)	0.8(0.4,1.8)
missing	181(100)	123(68)	58(32)	**4.1(2.3,7.6)**	--
Weeks of Gestation at Enrollment					
<20 weeks	101(100)	27(27)	74(73)	ref	ref
20-28 weeks	84(100)	24(29)	60(71)	1.1(0.6,2.1)	1.1(0.5,2.1)
28 weeks+	86(100)	23(27)	63(73)	1.0(0.5,1.9)	0.9(0.5,1.9)
missing	183(100)	125(68)	58(32)	**5.9(3.4,10.1)**	--

Adjusted model includes county, race, referral type, age, and weeks of gestation at enrollment

CHAPTER 3

PREVALENCE OF SMOKING, HYPERTENSION, PREECLAMPSIA, ECLAMPSIA, OVERWEIGHT AND OBESITY, GESTATIONAL DIABETES, AND SEXUALLY TRANSMITTED INFECTIONS IN TEENS WHO GAVE BIRTH IN THREE COUNTIES IN ARIZONA FROM 2010-2019

Introduction

Pregnant teens and their infants are at high risk for multiple adverse health and social outcomes.[1-8] This underlies the importance of having optimal overall health for pregnant teens, to avoid compounding the adverse health outcomes already associated with teenage pregnancy. Understanding prominent health needs of pregnant teens is important in targeted health messaging and developing and improving programs.

While there have been reductions in teen pregnancy in the U.S, teen birth rates are still higher in the U.S. than in other high-income countries (20.3 births per 1,000 for 15 to 19 years old in 2016).[9] There are limited data on the health status of pregnant teens, with most large-scale studies of pregnant teens focused on contraceptive use, reduction in repeat births, educational attainment, and employment.[10] Birth certificate records are a way to study health trends and include the following information: self-reported tobacco use, hypertensive disorders of pregnancy, pre-pregnancy weight and height, diagnosis of gestational diabetes, and positive tests for sexually transmitted infections. As previously presented in Chapter 1 the health characteristics of interest in this study are repeated in this chapter to more easily refer to them.

Health characteristics

This section provides background information for the health characteristics of interest in this study and the risks that they are associated with in pregnancy.

"Cigarette smoking. Twenty percent of all high school students in 2016 reported using tobacco products with over half using e-cigarettes.[39] Substance use in teens is a risk factor for teen pregnancy, therefore teens who become pregnant may have a history of substance use.[40] In 2016, the prevalence of maternal smoking for all ages in the state of Arizona was estimated to be 4.6%.[41] Tobacco use and exposure during pregnancy is an established risk factor for low birth weight.[42]

Hypertensive disorders in pregnancy. Chronic hypertension is estimated to be present in 0.9-1.5% of pregnancies, with major risk factors obesity and older age.[43] Chronic hypertension in pregnancy can lead to poor birth outcomes including superimposed preeclampsia, fetal growth restriction, preterm birth, and increased risk for C-section deliveries.[43] Prevalence of preeclampsia varies from 2-8% depending upon the population sampled and the year of study.[44-46] Maternal age less than 18 years or greater than 35 years is a risk factor for preeclampsia.[47] Preeclampsia is associated with increased risk for hypertension, maternal mortality, cardiovascular disease, gestational diabetes, type 2 diabetes, and increased risk of preterm birth.[48] Hypertensive disorders of pregnancy have also been recently linked to poorer working memory fifteen years after pregnancy.[49] Eclampsia is estimated to be 0.3% globally, with women under 20 years of age and women in their first pregnancy at higher risk.[50]

Body mass index (BMI) and gestational diabetes. Overweight (BMI ≥ 25) and obesity (BMI ≥ 30) during pregnancy increases the risk for gestational diabetes, gestational hypertension, C-section, maternal death, babies that are small or large for gestational age, preterm birth, and stillbirth.[51-54] Overweight and obesity have increased over time for all teens, increasing the likelihood that pregnant teens will also have increasing rates of overweight and obesity. The prevalence of obesity among US women of childbearing age (18-49) has increased from 7.4% in 1976 to 27.5% in 2014.[55] The negative effects of overweight and obesity may extend into the postpartum period and beyond with higher rates of postpartum depression, lower rates of breastfeeding, and other longer term consequences including increased risk of childhood and adolescent obesity.[56-60] The prevalence of gestational diabetes is estimated to be between 7-12% of all pregnancies in North America.[61] Gestational diabetes is associated with increased risk for type 2 diabetes after delivery, high birth weight, preterm birth, and neonatal hypoglycemia.[62, 63] Adequate nutrition and weight gain during pregnancy contribute to improved pregnancy outcomes.[42] Teens are less likely to consume a healthful diet and may be concerned about weight gain during pregnancy more so than adult women.[64]

<u>Sexually transmitted infections (STIs).</u> The state of Arizona ranks in the top 20 of all states in the US for the greatest rates of STIs, with an upwards trend in infection rates.[65, 66] Chlamydia, the most common STI in Arizona, had a 13% increase from 2016 to 2017, gonorrhea increased by 21% from 2016 to 2017, and syphilis increased by 24% from 2016 to 2017.[67] The Centers for Disease Control and Prevention (CDC) estimates that youth ages 15-24 account for half of the 20 million new STIs in the United States each year.[68] STIs during pregnancy raise the risk of preterm premature rupture of the membranes, preterm birth, uterine infection, and stillbirth.[68] Infections can also be transmitted to the baby."

Significance

This study reports health trends for pregnant teens including the prevalence of smoking, hypertension, preeclampsia, eclampsia, overweight and obesity, gestational diabetes, and STIs in teens who gave birth in Pima, Maricopa, and Gila counties in Arizona from 2010-2019 as part of an evaluation of a pregnancy support program. Pima, Maricopa, and Gila counties were of primary interest because these are the counties where the pregnancy support program provides services and because Pima and Maricopa counties comprise most of the population for the state of Arizona. This study provides practitioners and programs serving pregnant teens a description of the selected health characteristics for pregnant teens in Arizona and may be used to guide practice and programmatic improvements. The information may also be useful for targeted health education within specific populations or for establishing priorities for budgeting or funding.

Methods

Sample

In collaboration with the Arizona Department of Health Services, the University of Arizona obtained vital statistics birth certificate data for teen births (mothers ≤ 19 years of age) from 2010-2019 from three counties in Arizona: Pima, Maricopa, and Gila. The sample includes only information for infants born to nulliparous teen mothers. There were a few teens who gave birth outside of Pima, Maricopa, or Gila county (<0.5%) who were participants of a teen pregnancy program and were included in the sample (other counties: Coconino, Graham, Mohave, Navajo, Pinal, Santa Cruz, Yavapai, or Yuma). The following section describes the variables that were obtained from the vital statistics records.

Demographics

Age in years on the date of delivery was included as a continuous variable. Ethnicity was reported as yes or no for Hispanic ethnicity. Race was categorized into: White, African American, Native American, Asian, and other.

Health measures

Health variables of interest were selected based on whether they were potentially modifiable before or during a pregnancy and availability of information in the birth certificate records. These included cigarette smoking, hypertensive disorders in pregnancy, pre-pregnancy Body Mass Index (BMI), gestational diabetes, and STIs. Beginning in 2014, the definition of some of the variables ADHS collected through the birth records changed slightly (i.e. smoking), and additional new variables were collected (i.e. gestational diabetes and pre-pregnancy weight and height). The following are the primary variables and their definitions (see also Appendix B):

1. Cigarette smoking. From 2010 to 2013 this included women who reported any tobacco use during pregnancy. From 2014 to 2019 this definition broadened to include all women who reported smoking cigarettes during the three months prior to pregnancy or at any time during the pregnancy. For all years, this may have included women who stopped smoking or started smoking at some point during the pregnancy. Estimates from 2014 to 2019 will be greater than 2010 to 2013 because of the slightly broadened definition.
2. Hypertension. Chronic or pre-existing hypertension before pregnancy.
3. Pre-eclampsia or pregnancy induced hypertension (PIH). Elevation of blood pressure above normal during the pregnancy. This may include some women with protein in the urine and edema, but without seizures or coma. This variable is referred to as preeclampsia in this paper.
4. Eclampsia. Pregnancy induced hypertension with protein in the urine and generalized seizures or coma, also including pathologic edema.
5. Body mass index (BMI). Staring in 2014, pre-pregnancy weight and height of the mother was collected in the birth record. Weight and height information was used to calculate BMI. BMI was then categorized into four categories: underweight (<18.5), normal (18.5-24.9), overweight (25-29.9), and obese (≥30).

6. Gestational diabetes. Glucose intolerance requiring treatment diagnosed during the current pregnancy. Gestational diabetes information was not utilized in the birth record before 2014.
7. Sexually transmitted infections (STIs). STIs include anyone with an infection present at the time of confirmed pregnancy or a diagnosis during the pregnancy or at delivery with or without documentation of treatment. This includes infections for gonorrhea, syphilis, chlamydia, hepatitis B, or hepatitis C. This information was collected in the birth record starting in 2014. Information about specific STIs was not released for the research, but rather combined into a single variable indicating a positive diagnosis for an STI infection.

Statistical analyses

The total number of births from teen mothers ages 19 and younger from 2010-2019 are reported for the total sample and by year. The mean and standard deviation for age and BMI were calculated for the total sample and by year. Other variables including race, ethnicity, cigarette smoking, chronic hypertension, pre-eclampsia, eclampsia, BMI categories, gestational diabetes, and STIs were totaled for the sample and by year. The same information was analyzed by county, for Pima, Maricopa, and Gila counties, and collectively for the additional sample of births that occurred in other counties in Arizona. Nonparametric tests for trends over time, mean differences by county (t-test), and percent differences by county (chi-square) were calculated with STATA version 16.0 (StataCorp 2019).

Results

The sample included 25,953 teen births from 2010 to 2019 (Table 6) with approximately 20% in Pima county, 78% in Maricopa County, 1.5% in Gila County, and less than 0.5% from other counties.

The mean age was 17.7 ± 1.1 years. The mean age was consistent each year during the ten-year time span, ranging from a mean of 17.7 ± 1.1 years in 2010-2012 to a mean of 17.8 ± 1.1 years in 2013-2019. Ages ranged from 11.8 to 19.9 years. Total births decreased over the ten-year span, ranging from 3,799 births in 2010 to 1,731 births in 2019. The racial distribution for mothers was 81.6% White, 8.3% African American, 6.8% Native American, 1.8% Asian, and 1.5% other or unknown race. The sample was consistent over time in the distribution of race by year. The largest ethnic group consisted of Hispanic teens (65%) and ranged from 61% in 2011 to 71% in 2018, a significant increase over time ($p<0.001$).

Cigarette use was reported for 4.2% of the sample, this ranged from a low of 2.4% reported in 2012 to a high of 6.3% in 2014. Chronic hypertension was rare and reported in less than or equal to 0.5% in each year (0.3% for the total sample). Preeclampsia had an upward trend, starting from 4.4% in 2010 increasing to 9.6% in 2019 ($p<0.001$). Eclampsia was also rare and reported in less than 1% of the total sample. Mean BMI for the sample (2014-2016) was 24.3 ± 5.2. Mean values for BMI were consistent by year. The total of overweight and obese was 35.4% for the total sample and ranged from a low of 32.1% in 2014 to a high of 37.5% in 2017 ($p<0.001$). Gestational diabetes was reported for 2.4% of the sample (2014-2019), ranging from 1.8% in 2014 to 2.9% in 2019. STIs were reported in 9.5% of the sample (2014-2019). Positive STIs ranged from 6.8% of the sample in 2014 to a high of 11.7% in 2017, a significant increase over time ($p<0.001$).

Pima County

The total births in Pima County declined over time by year from 790 births in 2010 to 337 births in 2019, with a total of 5,074 births from 2010-2019 (Table 7). Mean age was consistent over time at 17.8 ± 1.1 year for the total sample, starting at 17.7 ± 1.1 year in 2010 and 17.8 ± 1.1 for all other years (2011-2019). Teens for this sample from Pima County were 82.8% White, 7.5% Native American, 5.5% African American, and less than 1% were other or unreported race. The Pima County sample was 68.1% Hispanic.

Cigarette smoking was reported for 4.2% of the total sample in Pima County, ranging from a low of 1.9% in 2013 to a high of 7.1% in 2019 ($p<0.001$). Chronic hypertension was rare, with less than 1% reported for all years. Preeclampsia was reported for 6.9% of all births in Pima County. There was an upward trend for preeclampsia with 5.2% reported in 2010 and 10.7% reported in 2019 ($p<0.001$). Eclampsia reported in 2010 and 2011 in Pima County was higher than expected at about 5%, this may have been reporting error, because from 2012-2019 there were approximately 1% or less with reported eclampsia. Mean BMI was consistent by year with a mean of 24.2 ± 5.3 from 2014-2019. The total for overweight and obesity combined for Pima County was 35%. Gestational diabetes was rare with the highest reported year 3.6% in 2019, and 2.3% reported from 2014-2019 combined. STIs increased from 2014 to 2019, from a low of 5.9% in 2014 to a high of 15.1% in 2019 ($p<0.001$).

Maricopa County

Births to teens in Maricopa County declined over time by year from 2,950 births in 2010 to 1,367 births in 2019, with a total of 20,410 births from 2010-2019 (Table 8). Mean age was consistent over time at 17.7 ± 1.1 years, ranging from 17.7 ± 1.1 years in 2010-2012 and 2015 to 17.8 ± 1.1 years in 2013-2014, and 2016-2019. The teens in the Maricopa County sample were

81.8% White, 9.1% African American, 5.9% Native American, 1.4% Asian, and 1.7% other or unreported race. The sample was 65.2% Hispanic.

Cigarette smoking was reported in 4% of the total sample in Maricopa County, ranging from a low of 2.5% in 2012 to a high of 6.2% in 2017 ($p<0.001$). Chronic hypertension was rare, with less than 1% reported for all years. Preeclampsia was reported for 6.3% of all births in Maricopa County. There was an upwards trend for preeclampsia with 4.2% reported in 2010 and 9.2% reported in 2019 ($p<0.001$). Eclampsia was rare with approximately 1% or less reported for each year. Mean BMI was consistent by year with a mean of 24.3 ± 5.2 from 2014-2019. The percent of overweight and obesity increased from 31.3% in 2014 to 37.3% in 2019 ($p<0.001$) with 35.6% of the total sample overweight or obese. Gestational diabetes was rare with the highest reported year 2.9% in 2019, and 2.4% reported from 2014-2019 combined. STIs increased from 2014 to 2018, from a low of 6.9% in 2014 to 11.1% in 2018, and then 9.6% in 2019 ($p<0.001$).

Gila County

Total births in Gila County decreased from 58 in 2010 to 24 in 2019, with 367 births in the sample from 2010-2019 (Table 9). Mean age was consistent over time at 17.7 ± 1.3 years for the total sample, ranging from 17.5 ± 1.3 years in 2011 and 2015 to 18.0 ± 1.4 years in 2017. Gila County had almost equal White (48.5%) and Native Americans (49.3%), and approximately 1% African American and 1% other or unreported race. Unlike the other counties, Gila County was predominately non-Hispanic (76.3%).

Cigarette smoking was reported for 11.2% of the total sample in Gila County, ranging from a low of 4.1% in 2011 to a high of 20.8% in 2017 ($p<0.01$). Chronic hypertension was rare, only reported for one person from 2010-2019. Preeclampsia was reported for 8.5% of all births in Gila County, there was no significant trend over time (p=0.15). Preeclampsia ranged from 2.9% in 2012 to 16.7% in 2013. Eclampsia was rare, 0.8% from 2010-2019. Mean BMI was consistent by year with a mean of 24.6 ± 4.9 from 2014-2019. Total overweight and obesity combined was 34.4% of the sample. Gestational diabetes was rare with 2.2% from 2014-2019. STIs fluctuated by year with 13.6% for the total sample from 2014 to 2019, and a low of 6.1% in 2016 to a high of 22.2% in 2017.

Other counties

There were 102 teen births that occurred in Arizona but outside of Pima, Maricopa, or Gila County and were included in the sample from 2010-2019 (Table 10). The average age for these teens was 17.9 ± 1.2 years. The sample was 88.2% White, 6.9% Native American, 2.9% African American, and 2% other or unreported race. The majority were non-Hispanic (76.5%).

Cigarette smoking was reported for 14.7%. None reported chronic hypertension. The sample had 6.9% with preeclampsia, and 1.9% with eclampsia. The mean BMI was 23.8 ± 5.4, with 27.3% of the sample overweight or obese. None reported gestational diabetes. STIs were reported for 3% of the sample.

Similarities and differences by county

The distribution of race and ethnicity were similar for Pima and Maricopa counties (majority White Hispanic), but different for Gila County where the majority were non-Hispanic (76.3%), with a much larger percentage of Native Americans (49.3%). Although the proportion of Hispanic mothers was similar for Pima (68%) and Maricopa (65%) counties, the difference in the proportion of Hispanic mothers was statistically significant between all counties except for between Gila and the group of other counties (both 23% Hispanic).

Cigarette smoking was much higher in Gila (11.2%) and the other group of counties (14.7%), compared to Pima (4.2%) and Maricopa (4%) counties, a statistically significant difference between Gila and Pima ($p<0.001$), and Gila and Maricopa ($p<0.001$), not a statistically significant difference between Pima and Maricopa ($p=0.4$), or Gila and other ($p=0.3$). Preeclampsia was higher in Gila (8.5%) than in the other counties: Pima (6.9%), Maricopa (6.3%), and the other group of counties (6.9%), although differences between counties were not statistically significant. There were no significant differences between counties for the proportion of mothers with overweight or obesity. STIs were highest in Gila (13.6%), then Pima (10.6%), Maricopa (9.2%), and lowest among the group of other counties (3%), a statistically significant difference between all counties ($p <0.05$).

Similarities and differences in health characteristics by race and ethnicity

Hispanic mothers were less likely to smoke cigarettes than non-Hispanic mothers ($p<0.001$) and less likely to have an STI ($p<0.05$); there were no differences in the likelihood of a Hispanic mother being overweight or obese, or having preeclampsia compared to a non-Hispanic mother.

White mothers were more likely to report smoking cigarettes than Native Americans ($p<0.05$) but were not significantly different than African Americans in reported cigarette smoking. Asians reported lower cigarette smoking than any other race ($p<0.01$). Native Americans had the highest proportion of preeclampsia (9.9%) which was significantly higher than White or African American ($p<0.01$). Native American women were more likely to be overweight or obese than all other races ($p<0.001$). African American women were more likely to have an STI than all other races ($p<0.001$).

Discussion

Births to teens in the state of Arizona have been on the decline since 2010, matching national trends for teen pregnancies.[9] The 2019 teen birth rate in Arizona was 24.7 births per 1,000 females age 15-19, slightly higher than the US birth rate of 21.0 births per 1,000.[93] Although all counties in this sample had declines in teen births, the declines were less in Gila County. The 2019 teen birth rate was 47.8 for Gila County, nearly double than for Pima and Maricopa, where the teen birth rate was 22 and 23 respectively per 1,000.[93] Age of teens at delivery was consistent over time and consistent in rural and urban areas of the state. Mothers giving birth were predominately White and Hispanic, except for in Gila County where there was a higher percentage of births to non-Hispanic, Native Americans.

The prevalence of cigarette smoking in this study (4.7%) was similar to cigarette smoking among all age pregnancies in Arizona (4.7%), except for in Gila County where cigarette smoking was much higher (11.2%).[41] The prevalence of smoking during pregnancy in this study (4.7%) was lower than the prevalence of smoking during pregnancy that was reported for the United States (8.3%) for ages 15-19 years in 2017.[94]

The prevalence of chronic hypertension in the sample for all counties (0.3%) was slightly lower than national estimates for all pregnancies in the US (0.9-1.5%).[43] This study presents information indicating that prevalence of preeclampsia may be increasing over time among teen pregnancies and may be related to increasing BMI, as a previous study cited as a potential cause of increasing incidence of preeclampsia.[95] Previous studies have shown some evidence of an inverse relationship between omega-3 fatty acid consumption and risk for preeclampsia.[96] It is possible that declines in diet quality may be related to an increase in hypertensive disorders of pregnancy. Excess weight gain during pregnancy has also been shown to be related to preeclampsia.[97] It may also be possible that increased awareness around the risks of preeclampsia have prompted increased screening during pregnancy and documentation of pregnancy induced hypertension may be recorded more often compared to 5-10 years ago. Preeclampsia increases the risk of maternal mortality, cardiovascular disease, type 2 diabetes, and preterm birth.[48, 98, 99]

Mean BMI was consistent over time, but there was an increasing trend in the percent of overweight and obesity. There were increasing trends in STIs in pregnancy for teens, mirroring national trends.[100] The higher rates of smoking, preeclampsia, and STIs seen in Gila County is consistent with health disparities often reported for rural populations.[101-103] This research suggests that Native American teens living in Gila County are at increased risk for unfavorable health in pregnancy compared to teens living in Maricopa or Pima County.

Strengths and Limitations

This data analysis included a large sample spanning ten years in the state of Arizona. Pima and Maricopa counties represent the most populous counties in Arizona and include most of the births that occur in Arizona. Gila County is rural and provides a comparison to differences that may exist between rural and urban areas.

The data related to cigarette smoking does not account for secondhand smoke exposure or how frequently people smoked cigarettes. It is also not possible to determine from the data if someone has quit smoking or when they may have quit smoking during the pregnancy. The birth records do not currently collect information related to vaping. It is possible that although there may be some declines in cigarette smoking, there may be increased use of vaping products. The STI information is grouped together, so we cannot know if one type of STI is increasing more than another, although the health education for prevention of STIs would be the same regardless of the type of STI, except for vaccine-preventable hepatitis B. Also, we have no way of assessing whether treated STI infections re-occurred during pregnancy, or alternatively were not diagnosed until the birth.

Conclusion

Births from teen pregnancies decreased in Pima, Maricopa, and Gila counties from 2010-2019 but there are still many births to teen mothers every year. The prevalence of preeclampsia and STIs in teen pregnancies in Arizona has increased over time and are both significantly higher in rural areas than urban or suburban areas. Smoking during pregnancy and STI infections were higher in rural areas and are health behaviors that can be addressed during teen pregnancy. It is important to consider the most appropriate ways to give teens access to appropriate health information and support during a pregnancy, so that they that they will be able to effectively prevent STIs, reduce or quit smoking during pregnancy, and make other positive health behavior changes, including improving diet quality that will lead to the best possible birth outcomes and longer-term health for both the mother and baby. Continued monitoring of health indicators for teens will benefit health education programs to prioritize topics and populations that may need additional support. Future research may consider monitoring the use of vaping products and exploring reasons for increases in preeclampsia seen in this sample over time.

Table 6. Trends in teen pregnancies in Pima, Maricopa, and Gila counties in Arizona, 2010-2019[1]

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	TOTAL
	n=3,799	n=3,314	n=3,323	n=2,931	n=2,671	n=2,325	n=2,182	n=1,937	n=1,740	n=1,731	n=25,953
Age, mean(SD)	17.7(1.1)	17.7(1.1)	17.7(1.1)	17.8(1.1)	17.8(1.1)	17.8(1.1)	17.8(1.1)	17.8(1.1)	17.8(1.0)	17.8(1.1)	17.7(1.1)
Age, range	11.9-19.9	12.8-19.9	12.0-19.9	12.3-19.9	13.5-19.9	13.7-19.9	13.2-19.9	13.2-19.9	13.5-19.9	11.8-19.9	11.8-19.9
						n(%)					
Race											
White	3,120(82.1)	2,698(81.4)	2,772(83.4)	2,427(82.8)	2,171(81.3)	1,910(82.2)	1,738(79.7)	1,568(80.9)	1,401(80.5)	1,364(78.8)	21,169(81.6)
African American	259(6.8)	289(8.7)	248(7.5)	236(8.1)	221(8.3)	187(8.0)	198(9.1)	180(9.3)	155(8.9)	176(10.2)	2,149(8.3)
Native American	259(6.8)	232(7.0)	224(6.7)	213(7.3)	164(6.1)	144(6.2)	172(7.9)	130(6.7)	119(6.8)	119(6.9)	1,776(6.8)
Asian	160(4.2)	94(2.8)	77(2.3)	54(1.8)	20(0.8)	18(0.8)	12(0.6)	11(0.6)	9(0.5)	7(0.4)	462 (1.8)
Other or Unknown	1(0.1)	1(0.1)	2(0.1)	1(0.1)	95(3.6)	66(2.8)	62(2.8)	48(2.5)	56(3.2)	656(3.8)	397(1.5)
Ethnicity											
Hispanic	2,426(63.9)	2,035(61.4)	2,109(63.5)	1,792(61.1)	1,759(65.9)	1,522(65.5)	1,451(66.5)	1,352(69.8)	1,236(71.0)	1,192(68.9)	16,874(65.0)
Non-Hispanic	1,373(36.1)	1,279(38.6)	1,214(36.5)	1,139(38.9)	912(34.1)	803(34.5)	731(33.5)	585(30.2)	504(29.0)	539(31.1)	9,079(35.0)
Cigarette Smoking	125(3.3)	101(3.1)	81(2.4)	85(2.9)	168(6.3)	126(5.4)	114(5.2)	117(6.0)	82(4.7)	82(4.7)	1,081(4.2)
Chronic Hypertension	9(0.2)	7(0.2)	9(0.3)	9(0.3)	8(0.3)	7(0.3)	6(0.3)	3(0.2)	6(0.4)	9(0.5)	73(0.3)
Preeclampsia	168(4.4)	192(5.8)	165(4.9)	170(5.8)	161(6.0)	170(7.3)	153(7.0)	159(8.2)	167(9.6)	166(9.6)	1,671(6.4)
Eclampsia	68(1.8)	64(1.9)	35(1.1)	25(0.9)	13(0.5)	10(0.4)	9(0.4)	4(0.2)	8(0.5)	10(0.6)	246(0.9)
											n=12,586
Gestational Diabetes					49(1.8)	57(2.5)	51(2.3)	47(2.4)	42(2.4)	51(2.9)	297(2.4)
STIs					182(6.8)	203(8.7)	200(9.2)	227(11.7)	199(11.4)	187(10.8)	1,198(9.5)
BMI sample size					n=2,661	n=2,318	n=2,172	n=1,898	n=1,700	n=1,705	n=12,454
BMI, mean(SD)					23.8(4.9)	24.1(5.1)	24.4(5.3)	24.5(5.2)	24.5(5.2)	24.5(5.4)	24.3(5.2)
BMI, range					12.5-50.8	12.7-48.7	12.4-60.9	11.7-53.5	11.3-48.9	13.9-60.9	11.3-60.9
BMI categories											
<18.5					250(9.4)	218(9.4)	139(7.3)	124(7.3)	149(8.7)	149(8.7)	1,059(8.5)
18.5 to 24.9					1,556(58.5)	1,310(56.5)	1,206(55.5)	938(55.2)	931(54.6)	931(54.6)	6,985(56.1)
25 to 29.9					554(20.8)	493(21.3)	476(21.9)	398(23.4)	394(23.1)	394(23.1)	2,754(22.1)
≥30					301(11.3)	297(12.8)	311(14.3)	240(14.1)	231(13.6)	231(13.6)	1,656(13.3)

1. Data for gestational diabetes, STIs, and BMI were not available before 2014. 102 out of 25,953 births were from other counties including Coconino, Graham, Mohave, Navajo, Pinal, Santa Cruz, Yavapai, and Yuma

Table 7. Trends in teen pregnancies in Pima County, Arizona, 2010-2019[1]

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	TOTAL
	n=790	n=703	n=632	n=566	n=528	n=433	n=392	n=386	n=307	n=337	n=5,074
Age, mean(SD)	17.7(1.1)	17.8(1.1)	17.8(1.1)	17.8(1.1)	17.8(1.0)	17.8(1.1)	17.8(1.0)	17.8(1.1)	17.8(1.1)	17.8(1.0)	17.8(1.1)
Age, range	11.9-19.9	14.3-19.9	13.7-19.9	13.5-19.9	13.5-19.8	13.7-19.9	14.2-19.8	14.2-19.9	13.8-19.4	13.9-19.9	11.9-19.9
						n(%)					
Race											
White	642(81.3)	570(81.1)	520(82.3)	465(82.2)	451(85.4)	358(82.7)	319(81.4)	328(85.0)	265(86.3)	281(83.4)	4,199(82.8)
African American	36(4.5)	42(6.0)	32(5.1)	21(3.7)	32(6.1)	24(5.5)	27(6.9)	28(7.3)	15(4.9)	24(7.1)	281(5.5)
Native American	61(7.7)	49(7.0)	43(6.8)	52(9.2)	32(6.1)	34(7.9)	39(10.0)	24(6.2)	24(7.8)	24(7.1)	382(7.5)
Asian	51(6.5)	41(5.8)	37(5.8)	28(4.9)	4(0.8)	3(0.7)	1(0.3)	2(0.5)	1(0.3)	2(0.6)	170(3.4)
Other or Unknown	--	1(0.1)	--	--	9(1.7)	14(3.2)	6(1.5)	4(1.0)	2(0.7)	6(1.8)	42(0.8)
Ethnicity											
Hispanic	536(67.9)	463(65.9)	408(64.6)	362(64.0)	367(69.5)	289(66.7)	269(68.6)	286(74.1)	233(75.9)	240(71.2)	3,453(68.1)
Non-Hispanic	254(32.1)	240(34.1)	224(35.4)	204(36.0)	161(30.5)	144(33.3)	123(31.4)	100(25.9)	74(24.1)	97(28.8)	1,621(31.9)
Cigarette Smoking	30(3.8)	26(3.7)	14(2.2)	11(1.9)	32(6.1)	26(6.0)	21(5.4)	18(4.7)	12(3.9)	24(7.1)	214(4.2)
Chronic Hypertension	3(0.4)	4(0.6)	2(0.3)	1(0.2)	2(0.4)	--	1(0.3)	2(0.5)	2(0.7)	1(0.3)	18(0.4)
Preeclampsia	41(5.2)	50(7.1)	32(5.1)	33(5.8)	37(7.0)	36(8.3)	31(7.9)	26(6.7)	28(9.1)	36(10.7)	350(6.9)
Eclampsia	40(5.1)	32(4.6)	8(1.3)	3(0.5)	2(0.4)	2(0.5)	1(0.3)	--	2(0.6)	1(0.3)	91(1.8)
											n=2,383
Gestational Diabetes					14(2.7)	7(1.6)	6(1.5)	12(3.1)	4(1.3)	12(3.6)	55(2.3)
STIs					31(5.9)	44(10.2)	34(8.7)	51(13.2)	41(13.4)	51(15.1)	252(10.6)
BMI sample size					n=527	n=433	n=391	n=383	n=304	n=332	n=2,370
BMI, mean(SD)					24.0(4.9)	24.1(5.3)	23.9(5.3)	24.5(5.6)	24.5(5.8)	24.0(5.2)	24.2(5.3)
BMI, range					12.5-40.8	15.1-48.7	12.4-60.9	11.7-47.4	15.1-48.9	15.3-42.9	11.7-60.9
BMI categories											
<18.5					48(9.1)	35(8.1)	38(9.7)	31(8.1)	28(9.2)	33(9.9)	213(9.0)
18.5 to 24.9					291(55.2)	248(57.3)	228(58.3)	209(54.6)	170(55.9)	186(56.0)	1,332(56.2)
25 to 29.9					121(23.0)	89(20.6)	80(20.5)	75(19.6)	56(18.4)	72(21.7)	493(20.8)
≥30					67(12.7)	61(14.1)	45(11.5)	68(17.8)	50(16.5)	41(12.4)	332(14.0)

1. data for gestational diabetes, STIs, and BMI were not available before 2014

Table 8. Trends in teen pregnancies in Maricopa County, Arizona, 2010-2019[1]

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	TOTAL
	n=2,950	n=2,558	n=2,630	n=2,286	n=2,087	n=1,866	n=1,734	n=1,523	n=1,409	n=1,367	n=20,410
Age, mean(SD)	17.7(1.1)	17.7(1.1)	17.7(1.1)	17.8(1.1)	17.8(1.1)	17.7(1.1)	17.8(1.1)	17.8(1.0)	17.8(1.0)	17.8(1.1)	17.7(1.1)
Age, range	12.5-19.9	12.8-19.9	12.0-19.9	12.3-19.9	14.4-19.8	13.7-19.9	13.2-19.9	13.2-19.9	13.5-19.9	11.8-19.8	11.8-19.9
						n(%)					
Race											
White	2,447(82.9)	2,102(82.2)	2,210(84.0)	1,912(83.6)	1,683(80.6)	1533(82.2)	1,388(80.1)	1,228(80.6)	1,127(80.0)	1,072(78.4)	16,702(81.8)
African American	222(7.5)	247(9.6)	216(8.2)	215(9.4)	186(8.9)	163(8.7)	169(9.8)	152(10.0)	140(9.9)	152(11.1)	1,862(9.1)
Native American	171(5.8)	156(6.1)	162(6.2)	132(5.8)	116(5.6)	103(5.5)	110(6.3)	92(6.0)	83(5.9)	81(5.9)	1,206(5.9)
Asian	109(3.7)	53(2.1)	40(1.5)	26(1.1)	16(0.8)	15(0.8)	11(0.6)	9(0.6)	8(0.6)	5(0.4)	292(1.4)
Other or Unknown	1(0.1)	--	2(0.1)	1(0.1)	86(4.1)	52(2.8)	56(3.2)	42(2.8)	51(3.6)	57(4.2)	348(1.7)
Ethnicity											
Hispanic	1,879(63.7)	1,561(61.0)	1,681(63.9)	1,418(62.0)	1,377(66.0)	1,223(65.5)	1,169(67.4)	1,060(69.6)	998(70.8)	944(69.1)	13,310(65.2)
Non-Hispanic	1,071(36.3)	997(39.0)	949(36.1)	868(38.0)	710(34.0)	43(34.5)	565(32.6)	463(30.4)	411(29.2)	423(30.9)	7,100(34.8)
Cigarette Smoking	91(3.1)	73(2.9)	66(2.5)	60(2.6)	126(6.0)	96(5.1)	86(4.9)	94(6.2)	65(4.6)	54(4.0)	811(4.0)
Chronic Hypertension	6(0.2)	3(0.1)	7(0.3)	8(0.4)	6(0.3)	7(0.4)	5(0.3)	1(0.1)	4(0.3)	7(0.5)	54(0.3)
Preeclampsia	124(4.2)	140(5.5)	130(4.9)	127(5.6)	120(5.8)	131(7.0)	118(6.8)	130(8.6)	137(9.7)	126(9.2)	1,283(6.3)
Eclampsia	28(0.9)	32(1.3)	27(1.0)	20(0.9)	10(0.5)	8(0.4)	7(0.4)	4(0.3)	6(0.4)	8(0.6)	150(0.7)
											n=9,714
Gestational Diabetes					34(1.6)	49(2.6)	44(2.5)	35(2.3)	37(2.6)	39(2.9)	238(2.4)
STIs					143(6.9)	157(8.4)	163(9.4)	170(11.2)	156(11.1)	131(9.6)	920(9.2)
BMI, sample size					n=2,078	n=1,859	n=1,725	n=1,488	n=1,372	n=1,346	n=9,868
BMI, mean(SD)					23.8(5.0)	24.5(5.3)	24.6(5.3)	24.5(5.2)	24.5(5.1)	24.6(5.5)	24.3(5.2)
BMI, range					13.9-50.8	12.7-48.4	14.4-54.0	14.8-53.5	11.3-46.3	13.9-60.9	11.3-60.9
BMI categories											
<18.5					197(9.5)	181(9.7)	140(8.1)	106(7.1)	96(7.0)	112(8.3)	832(8.4)
18.5 to 24.9					1,230(59.2)	1,047(56.3)	944(54.7)	818(55.0)	752(54.8)	732(54.4)	5,523(56.0)
25 to 29.9					424(20.4)	397(21.4)	385(22.3)	359(24.1)	339(24.7)	315(23.4)	2,219(22.5)
≥30					227(10.9)	234(12.6)	256(14.8)	205(13.8)	185(13.5)	187(13.9)	1,294(13.1)

1. data for gestational diabetes, STIs, and BMI were not available before 2014

Table 9. Trends in teen pregnancies in Gila County, Arizona, 2010-2019[1]

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	TOTAL
	n=58	n=49	n=34	n=42	n=38	n=22	n=49	n=27	n=24	n=24	n=367
Age, mean(SD)	17.7(1.1)	17.5(1.3)	17.8(1.1)	17.8(1.3)	17.8(1.4)	17.5(1.2)	17.7(1.4)	18.0(1.4)	17.6(1.2)	17.5(1.4)	17.7(1.3)
Age, range	14.3-19.0	14.1-19.3	14.7-19.4	13.8-19.0	14.4-19.8	15.4-19.8	14.5-19.8	14.6-19.8	14.3-19.5	14.8-19.4	13.8-19.8
						n(%)					
Race											
White	31(53.4)	22(44.9)	17(50.0)	15(35.7)	22(57.9)	15(68.2)	26(53.1)	12(44.4)	9(37.5)	9(37.5)	178(48.5)
African American	--	--	--	--	2(5.3)	--	1(2.0)	--	--	--	3(0.8)
Native American	27(46.6)	27(55.1)	17(50.0)	27(64.3)	14(36.8)	7(31.8)	22(44.9)	14(51.9)	12(50.0)	14(58.3)	181(49.3)
Asian	--	--	--	--	--	--	--	--	--	--	--
Other or Unknown	--	--	--	--	--	--	--	1(3.7)	3(12.5)	1(4.2)	5(1.4)
Ethnicity											
Hispanic	11(19.0)	10(20.4)	11(32.3)	7(16.7)	11(28.9)	8(36.4)	12(24.5)	5(18.5)	5(20.8)	7(29.2)	87(23.7)
Non-Hispanic	47(81.0)	39(79.6)	23(67.7)	35(83.3)	27(71.1)	14(63.6)	37(75.5)	22(81.5)	19(79.2)	17(70.8)	280(76.3)
Chronic Hypertension	--	--	--	--	--	--	--	--	--	1(4.0)	1(0.3)
Preeclampsia	3(5.2)	2(4.1)	1(2.9)	7(16.7)	3(7.9)	3(13.6)	4(8.2)	3(11.1)	2(8.3)	3(12.5)	31(8.5)
Eclampsia	--	--	--	1(2.4)	--	--	1(2.0)	--	--	1(4.2)	3(0.8)
Cigarette Smoking	4(6.9)	2(4.1)	--	5(11.9)	6(15.8)	3(13.6)	7(14.3)	5(18.5)	5(20.8)	4(16.7)	41(11.2)
											n=195
Gestational Diabetes					1(2.6)	1(4.6)	1(1.9)	--	1(4.2)	--	4(2.2)
STIs					7(18.4)	2(9.1)	3(6.1)	6(22.2)	2(8.3)	5(20.8)	25(13.6)
					n=38	n=22	n=49	n=26	n=24	n=24	n=183
BMI, mean(SD)					24.3(5.1)	23.8(3.5)	24.9(4.9)	24.4(4.7)	26.1(6.6)	24.1(5.0)	24.6(4.9)
BMI, range					17.0-39.0	17.2-30.2	18.5-33.1	17.0-35.5	19.0-42.9	20.7-36.9	16.2-42.9
BMI categories											
<18.5					2(5.3)	2(9.1)	1(1.9)	2(7.7)	--	4(16.7)	11(6.0)
18.5 to 24.9					24(63.2)	13(59.1)	29(59.2)	16(61.5)	16(66.7)	11(45.8)	109(59.6)
25 to 29.9					7(18.4)	6(27.3)	11(22.5)	5(19.2)	3(12.5)	7(29.2)	39(21.3)
≥30					5(13.2)	1(4.5)	8(16.3)	3(11.5)	5(20.8)	2(8.3)	24(13.1)

1. data for gestational diabetes, STIs, and BMI were not available before 2014

Table 10. Trends in rural teen pregnancies from a sample including Coconino, Graham, Mohave, Navajo, Pinal, Santa Cruz, Yavapai, and Yuma counties, Arizona, 2010-2019[1]

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	TOTAL
	n=1	n=4	n=27	n=37	n=18	n=4	n=7	n=1	n=0	n=3	n=102
Age, mean(SD)	17.8	17.2(0.4)	17.5(1.4)	18.3(1.1)	18.1(1.3)	18.1(0.8)	17.8(1.3)	17.6	--	18.0(1.0)	17.9(1.2)
Age, range	--	16.6-17.5	14.4-19.8	15.2-19.9	14.9-19.6	16.8-18.8	15.4-19.6	--	--	17.0-19.0	14.4-19.9
					n(%)						
Race											
White	--	4(100)	25(92.6)	35(94.6)	15(83.3)	4(100)	5(71.4)	--		2(66.7)	90(88.2)
African American	1(100)	--	--	--	1(5.6)	--	1(14.3)	--		--	3(2.9)
Native American	--	--	2(7.4)	2(5.4)	2(11.1)	--	1(14.3)	--		--	7(6.9)
Asian	--	--	--	--	--	--	--	--		--	--
Other or Unknown	--	--	--	--	--	--	--	1(100)		1(33.3)	2(2.0)
Ethnicity											
Hispanic	--	1(25.0)	9(33.3)	5(13.5)	4(22.2)	2(50.0)	1(14.3)	1(100)		1(33.3)	24(23.5)
Non-Hispanic	1(100)	3(75.0)	18(66.7)	32(86.5)	14(77.8)	2(50.0)	6(85.7)	--		2(66.7)	78(76.5)
Cigarette Smoking	--	--	1(3.7)	9(24.3)	3(16.7)	1(25)	--	--		--	15(14.7)
Chronic Hypertension	--	--	--	--	--	--	--	--		--	--
Preeclampsia	--	--	2(7.4)	3(8.1)	1(5.6)	--	--	--		1(33.3)	7(6.9)
Eclampsia	--	--	--	1(2.7)	1(5.6)	--	--	--		--	2(1.9)
											n=33
Gestational Diabetes					--	--	--	--		--	--
STIs					1(5.6)	--	--	--		--	1(3.0)
BMI, mean(SD)					23.1(4.9)	25.4(5.5)	23.4(6.0)	21		27.5(8.5)	23.8(5.4)
BMI, range					17.2-35.4	21.5-33.1	18.5-33.1	--		20.7-36.9	17.2-36.9
BMI categories											
<18.5					3(16.7)	--	--	--		--	3(9.1)
18.5 to 24.9					11(61.1)	2(50.0)	5(71.4)	1(100)		2(66.7)	21(63.6)
25 to 29.9					2(11.1)	1(25.0)	--	--		--	3(9.1)
≥30					2(11.1)	1(25.0)	2(28.6)	--		1(33.3)	6(18.2)

1. data for gestational diabetes, STIs, and BMI were not available before 2014

CHAPTER 4

HEALTH CHARACTERISTICS AND BIRTH OUTCOMES OF "STARTING OUT RIGHT FOR TEEN PREGNANCY" PROGRAM PARTICIPANTS AND NONPARTICIPANTS, 2010-2019

Introduction

Programs for pregnant teens have been identified as beneficial to teens and their infants, who are at high risk for multiple adverse health and social outcomes.[1-8, 11] Teen pregnancy programs are designed to provide support and skills needed for teens to continue school, have access and knowledge of birth control options, prepare teens for childbirth and breastfeeding, and provide parenting education. Understanding prenatal health of pregnant teens and characteristics of participants of teen pregnancy programs is important in developing and improving programs.

There are limited data on the health status of pregnant teens participating in prenatal programs, with many studies focused on education attainment or reduction in repeat births.[10] This study reports prenatal health characteristics for participants of the Starting Out Right for Teen Pregnancy (SOR), a program of the Arizona Youth Partnership and a nonparticipant comparison group. Health characteristics reviewed include smoking, hypertension, preeclampsia, eclampsia, overweight and obesity, gestational diabetes, sexually transmitted infections (STIs), and adequacy of prenatal care. The study also assesses the association of SOR program participation and birth outcomes for pregnant teens, including delivery method, gestational age at delivery, NICU admission, birthweight, and breastfeeding from 2010-2019.

Starting Out Right program

The SOR Program uses a curriculum based in social cognitive theory and theory of reasoned action.[23] The SOR prenatal curriculum is designed for pregnant teens, using criteria found to be valid in the development of curricula for teens in STI and HIV education programming with an emphasis on non-judgmental, age-appropriate care.[23] Classes include pregnancy health and wellness, labor and delivery, breastfeeding, newborn care, healthy relationships, and birth control, with case management and support groups focused on improving safety, health, and well-being.[23] Case management is available for all participants. The SOR curriculum was originally developed in the year 2000 and has had multiple revisions with the most recent revision published in 2017.[23] A current logic model of the program is included in Appendix A. The program aims to improve health and well-being (physical and mental), reduce rapid-repeat pregnancy and STIs, build confidence in ability to give birth and care for a baby, promote breastfeeding, develop self-sufficiency (education attainment, use of health and social resources). Long term outcomes include reduced health care costs, improved community health, improved relationships within families and communities, and improved parenting skills.

The purpose of this study is to describe differences in health characteristics (smoking, hypertension, preeclampsia, overweight and obesity, gestational diabetes, and STIs) and birth outcomes (C-sections, preterm births, NICU admissions, birthweight, and breastfeeding) between SOR participants and nonparticipants from 2010-2019. Comparisons by county will also highlight similarities or differences in health characteristics and birth outcomes by geographic location.

Methods

Sample

In collaboration with the Arizona Department of Health Services, the University of Arizona obtained vital statistics birth certificate data for teen births from 2010-2019 from three counties in Arizona: Pima, Maricopa, and Gila. The SOR program provided a list of participants from 2010-2019 to the University of Arizona Data Information Services who identified program participants and provided a de-identified data set for births that occurred for teen moms in these three counties with a variable that identified those who were in the SOR program and those who were not in the SOR program. Teens aged 19 years and younger who were pregnant and gave birth for the first time were included.

Measures and variables

Demographic data. Age, ethnicity, race, and insurance type (as a proxy for income).

Health conditions. Cigarette smoking, hypertension, preeclampsia, eclampsia, preconception weight and height (used to calculate BMI), gestational diabetes, and STIs.

Prenatal services. Month first prenatal visit occurred, number of prenatal visits, participation in the Special Supplemental Program for Women, Infants, and Children (WIC) program).

Prenatal care adequacy. Based on the Adequacy of Prenatal Care Utilization Index (APNCU), the ratio of actual prenatal visits to the expected prenatal visits dependent upon the month prenatal care started and the gestational age at delivery.[70] Adequate prenatal care was defined as receiving 80% of expected visits or more. Receiving less than 80% of expected visits was considered less than adequate prenatal care, as defined by the APNCU.[70]

Birth outcomes. Delivery method (C-section or vaginal), plurality, gestational age at delivery, NICU admission, birthweight, and breastfeeding at hospital discharge.

Statistical analyses

The number and percent of births from teen mothers ages 19 years and younger from 2010-2019 are reported for participants and nonparticipants overall and by county. The mean and standard deviation for age, month entered prenatal care, and BMI were calculated for SOR participants and nonparticipants overall and by county. Other variables including race, ethnicity, cigarette smoking, chronic hypertension, preeclampsia, eclampsia, BMI categories, gestational diabetes, STIs, WIC participation, C-section births, preterm births (<37 weeks of gestation), NICU admission, birthweight, and breastfeeding at discharge were totaled for SOR participants and nonparticipants and additionally by county for SOR participants and nonparticipants.

Percent differences in the selected health characteristics, prenatal care, and the selected birth outcomes for SOR participants and nonparticipants were calculated with chi-square analysis. A t-test for month prenatal care began was also calculated for SOR participants and nonparticipants.

Logistic regression was used to test differences in health characteristics for SOR participants and nonparticipants. For the noted health indicators, potential confounding variables based on the literature that were included a priori in the adjusted models for BMI, gestational diabetes, and STIs. These variables included: age, BMI, smoking, race, ethnicity, county, WIC participation, insurance type, multiple births, and month prenatal care began. The adjusted OR (aOR) for chronic hypertension (diagnosed before pregnancy) included only smoking and race due to the limited number of cases. For preeclampsia, eclampsia, and smoking the aOR based on the literature included age, smoking, race, ethnicity, county, insurance type, multiple births, and month prenatal care began. In the full sample from 2010 to 2019 we were unable to adjust for BMI category, gestational diabetes, or WIC participation, as these data were only available after 2014. Because these are potentially confounding variables, in a subsample from 2014 to 2019 we adjusted for these additional variables.

Logistic regression tested the association of SOR participation and birth outcomes. The aOR from 2010-2019 for C-section included multiple births, birthweight, preeclampsia, and county. Because we were unable to adjust for BMI category before 2014, we calculated a second adjusted OR for C-section to include BMI with a subsample from 2014-2019. Adjusted OR for preterm birth from 2010-2019 included age, smoking, race, multiple births, preeclampsia, insurance type, and county. To additionally include WIC participation in the model, we calculated an aOR for preterm birth in the subsample from 2014-2019. Adjusted OR for NICU admission included birthweight, preeclampsia, multiple births, smoking, insurance type, and county, and additionally included gestational diabetes in the subsample from 2014-2019.

Birthweight was categorized into low (<2,500 g), normal (2,500-4,000 g), and high (>4000 g) birthweight. Multinomial regression was used to calculate ORs for low birthweight. The aOR for low birthweight included gestational age, smoking, multiple births, insurance type, race, and county. WIC participation was additionally included in a subsample from 2014-2019. Adjusted OR for breastfeeding included insurance type, multiple births, preterm, NICU, WIC participation, smoking, preeclampsia, and county. All potentially confounding variables were selected a priori based on the literature and were included in the model. All statistical analyses were calculated with STATA version 16.0 (StataCorp 2019).

Results

Demographics

The sample included 2,309 births from teens who participated in the SOR program and 23,644 births from teens who did not participate in the SOR program (Table 11). Among SOR participants, approximately 32% gave birth in Pima County, 60% in Maricopa County, 3% in Gila County, and 4% outside of Pima, Maricopa, or Gila counties. The sample of nonparticipants included approximately 18% from Pima County, 80% from Maricopa County, and 1% from Gila County. The mean age for SOR participants was 17.9 ± 1.3 years, and for nonparticipants 17.7 ± 1.1 years. Approximately 49% of SOR participants were Hispanic, while approximately 67% of nonparticipants were Hispanic. The racial distribution for SOR participants was 81.1% White, 10.5% African American, 4.8% Native American, 2.4% Asian, and 1.2% unknown or other. The racial distribution for nonparticipants was 81.6% White, 8.1% African American, 7% Native American, 1.7% Asian, and 1.6% unknown or other. By county, Gila County had a higher percentage of Native Americans for both SOR participants and nonparticipants (22.4% SOR participants, 55% nonparticipants).

Use of AHCCCS (Arizona Medicaid) insurance was reported for 79.7% of SOR participants and 84.1% of nonparticipants, with significantly less reporting use of AHCCCS in Gila County for both participants (68.7%) and nonparticipants (50.0%) (Table 11). Multiple births were reported for approximately 1% of both SOR participants and nonparticipants. WIC participation was higher for SOR participants (71.7%) than nonparticipants (64.9%), and highest in Gila County compared to Maricopa or Pima for both SOR participants (88.5%) and nonparticipants (76.5%).

Chi-square analysis for health characteristics

The health indicator, smoking, was 1.6% higher among SOR participants than nonparticipants ($p<0.001$) (Table 12). Cigarette smoking was reported at higher levels for both participants and nonparticipants who gave birth in Gila County (11.9% for participants, 11.0% for nonparticipants). Chronic hypertension was reported for 0.2% of SOR participants, and 0.3% of nonparticipants. Preeclampsia was reported for 6.6% of SOR participants and 6.4% of nonparticipants. Eclampsia was reported for 1.1% of SOR participants and 0.9% of nonparticipants. BMI distributions were similar for both SOR participants and nonparticipants with 34.8% of SOR participants overweight or obese, and 35.5% of nonparticipants overweight or obese ($p=0.7$). Gestational diabetes was reported for 2.5% of SOR participants and 2.4% of nonparticipants. STIs were reported for 8.5% of SOR participants, and 9.6% of nonparticipants ($p=0.3$), with higher rates reported in Gila County, 17.3% for SOR participants and 12.1% for nonparticipants.

Month prenatal care began and adequacy of prenatal care are shown in Table 13. Prenatal care began on average approximately a half a month earlier for SOR participants than nonparticipants ($p<0.001$). There was a significant difference in the chi-square analysis for less than adequate prenatal care based on the APNCU, with 12.2% of SOR participants and 15.7% of nonparticipants having less than adequate prenatal care ($p<0.001$) (Table 12). The average month prenatal care began was 3.4 months for SOR participants and 3.8 months for nonparticipants ($p<0.001$). Less than 0.5% of SOR reported no prenatal care while, 1.7% of nonparticipants reported no prenatal care.

Chi-square analysis for birth outcomes

Differences in birth outcomes for SOR participants and nonparticipants from Chi Square analysis are shown in Table 15. The differences in rate of C-section for SOR participants and nonparticipants was not different (15.9% of SOR participants and 15.4% of nonparticipants). Preterm birth was lower in SOR participants (8.1%) than nonparticipants (9.4%) ($p<0.05$).

NICU admissions were slightly lower for SOR participants (6.2%) than nonparticipants (7.2%) (p=0.06). Low birthweight was significantly lower among SOR participants (6.8%) than nonparticipants (8.3%) (p<0.01). Breastfeeding at discharge was slightly higher for SOR participants than nonparticipants, with 88.3% of SOR participants and 86.2% of nonparticipants breastfeeding at hospital discharge (p=0.08).

Logistic regression for health characteristics

Unadjusted and adjusted odds ratios (aOR) to compare SOR participation and nonparticipation in relation to selected health indicators are presented in Table 16. In the unadjusted model, SOR participants had 1.4 times greater odds of having smoked cigarettes around the time of their pregnancy (95% CI 1.2,1.7), adjusted models were nonsignificant. Controlling variables that were significant for smoking were increased age and underweight. There was no difference in the risk for gestational diabetes between SOR participants and nonparticipants (aOR 1.3, 95% CI 0.8,2.0). Variables of significance in the model for gestational diabetes included age, being overweight or obese, Native American race, and Hispanic ethnicity. Both unadjusted and adjusted odds ratios for other health indicators including hypertension, preeclampsia, eclampsia, overweight and obesity, and STIs were not significant between SOR participants and nonparticipants. Controlling variables that were found to be significant for increasing odds of selected health indicators were African American race for hypertension; Native American race and overweight and obesity for preeclampsia and eclampsia; smoking and African American race for STIs; age, African American and Native American race, WIC participation, and Hispanic ethnicity for overweight or obesity. Hispanic ethnicity had reduced odds of smoking compared to non-Hispanic; and African American, Native American, and Asian races all had reduced odds of smoking compared to White race.

Logistic regression for birth outcomes

The odd ratios and aOR for the association of SOR participation and birth outcomes are presented in Table 17. Odds of a C-section were not different by SOR participation. Of the controlling variables for C-section, there was a highly significant odds of C-section with multiple birth (OR 10.7, 95% CI 6.9,16.5). Being overweight or obese and having preeclampsia also significantly increased the odds of C-section.

SOR participants had reduced odds of having a preterm birth, aOR 0.8 (95% CI 0.7,0.9). After adjustment for WIC participation for preterm birth, this no longer reached the threshold of statistical significance, however the magnitude of the effect estimate did not change (aOR 0.8, 95% CI 0.6,1.1). WIC participation was associated with reduced odds of preterm birth (0.8, 95% CI 0.7,0.9). Significant variables in both the 2010-2019 model and 2014-2019 model for preterm birth included younger age of the mom, African American race, multiple birth, and preeclampsia.

Odds of NICU admission were not different for SOR participation. Significant variables that were included in the model for NICU admissions were birthweight, preeclampsia, and multiple births. SOR participants had reduced odds of having a low birthweight baby aOR 0.8(95% CI 0.6,0.9). Significant variables in the model for low birthweight were gestational age, smoking, multiple birth, and African American race.

SOR participants had increased odds of breastfeeding at discharge compared to nonparticipants, aOR 1.3 (95% CI 1.0,1.7). IHS was associated with a 50% reduced odds of breastfeeding. NICU admission and smoking were also associated with reduced odds of breastfeeding.

Discussion

In this study, participation in SOR was associated with a reduced odds for low birthweight and preterm birth and increased odds of breastfeeding at time of discharge from the hospital compared to nonparticipants. This study also indicates the SOR program is reaching teens who have health indicators that present additional risk for negative birth outcomes.

Previous studies have reported similar rates of preeclampsia, eclampsia, and gestational diabetes in a national sample of teen pregnancies to what was found in this sample for both SOR participants and nonparticipants.[6] A national sample of adolescent pregnancies found the rate of smoking to be 8.3% for pregnant teens aged 15-19 in 2017, higher than what was found in this sample (4.0% nonparticipants and 5.6% SOR).[94] Another national study found 11% of teen mothers smoked during pregnancy in 2012.[8] The odds for having smoked cigarettes around the time of pregnancy were greater for SOR participants than nonparticipants. This may be an indication that the SOR program is serving particularly high-risk teens, and/or that when a teen has a high-risk indicator at a prenatal visit, they are being referred to the program more frequently, and/or they may be seeking out additional support on their own. The higher number of SOR participants who reported cigarette use during pregnancy is not an indication of continued smoking during pregnancy, only that cigarettes were smoked at some point either three months prior to pregnancy or during pregnancy.

SOR participants were 1.4 times more likely to participate in WIC. This may be because the SOR program refers participants to WIC, or it may also be that people who are more likely to participate in programs in general are likely to participate in both programs, versus not participating. WIC participation also had a strong association with a decreased risk for preterm birth.

SOR participants were likely to start prenatal care 0.4 months earlier than nonparticipants and less likely to have inadequate prenatal care than nonparticipants. A study among teens in Korea found that teen mothers utilized prenatal care less than older age groups.[104] The Health Start program in Arizona, a prenatal program for women with one or more social or medical risk factors (not specific to teens), did not find any differences in adequacy of prenatal care among participants (average age 24.3) and similarly matched nonparticipants (average age 28.2).[105] Teens may consider themselves to be low risk, may delay seeking care, or may be more likely to miss prenatal appointments without having additional support than women who are in their mid-twenties or older. However, younger teens were at greater risk for poorer birth outcomes as age was an important preventive factor related to preterm birth.

The rate of C-section found in this study (15.4%), was similar to C-section rates found in other studies of teen pregnancies, including a sample of military service dependents aged 13 to 19, who reported 15.6-19.9% with C-section births, and a national sample of teens from 2002-2008 that reported 15-21% of births delivered by C-section.[6, 106]

Approximately 8.2% of all births in this study resulted in low birthweight, slightly lower than what has been reported nationally for low birthweight in teen births. Nationally in 2012, 9.6% of infants born to teens 15-17 years old and 9.2% of teens 18-19 years old were low birthweight.[8] Another national sample from 2002-2008 reported 10-11% of births to teen moms low birthweight.[6] The lower rate of low birthweight in this sample may be partially due to having a larger proportion of Hispanics that may have a lower prevalence of low birthweight via the Hispanic paradox, a health advantage seen in some populations of Hispanics living in the United States despite socioeconomic barriers.[107] Because the rate of low birthweight in this sample is already slightly lower than national averages, the findings that SOR participation resulted in a greater odds of reducing low birthweight may be even more meaningful. Previous studies with psychosocial interventions for pregnant teens have also been shown to reduce the risk of low birthweight (based on a much smaller sample size of 684 pregnant teens, pooled risk ratio of 0.6, 95% CI 0.38,0.92).[12]

The rate of preterm birth found in this study (9.2%), was slightly lower than national estimates for preterm birth in teens in 2012 (12.6-14.7%), and another national sample of teens from 2002-2008 which found preterm births in teens to be 12-15%.[6, 8] Previous studies for reducing preterm births among teens have shown a 33% reduced risk of preterm birth in programs providing psychosocial support, although differences between intervention and control groups were not statistically significant.[12] Studies of preterm birth prevention programs among the general population have also seen reductions in preterm birth.[108]

Rates of breastfeeding in teen mothers are generally lower than older aged mothers.[88, 109] The increased odds of breastfeeding in SOR participants may be related to breastfeeding information received in the SOR program, helping moms make decisions and be prepared for breastfeeding earlier in pregnancy than other teens who may not have any breastfeeding information or who have not made decisions about breastfeeding until late in pregnancy or until childbirth.[110] There is evidence that teen moms may not be receiving the same evidence based practices in the hospital setting to support breastfeeding as older moms, emphasizing the need for additional education and support outside of the hospital.[109]

Strengths and Limitations

These data were analyzed from a large sample over a 10-year period for SOR program participants and nonparticipants. All data were from the state of Arizona vital statistics records, therefore there could be a few deliveries from SOR program participants that occurred out of state, although this would probably be rare. The data described characteristics of participants and nonparticipants of the program, highlighting similarities and differences. Participants were defined by the SOR program as teens who had participated in the program and where the date of delivery was available in the program database. Data about the specific level of participation for the SOR sample was not available, but a similar query into participation in the SOR program database where the date of delivery was identified indicated that for 2,232 births from 2010-2019, the mean class attendance was 5.6±2.0 classes.

The data do not provide additional insights into smoking cessation during pregnancy or STI treatment or re-occurrence during pregnancy, which would be valuable for evaluating program efficacy. Breastfeeding is only an indication of breastfeeding at hospital discharge and does not indicate exclusivity of breastfeeding or desired breastfeeding goals.

Conclusion

Participation in SOR was associated with a reduced odds for low birthweight and preterm birth and increased odds of breastfeeding at time of discharge from the hospital compared to nonparticipants. This study also shows that the SOR program is reaching teens who have health indicators that present additional risk for negative birth outcomes. The SOR program should continue to provide these valuable services providing support and education during teen pregnancy and look for ways to draw in more teens that may be less likely to participate in programs or who may be delaying prenatal care.

Table 11. Characteristics of Starting Out Right (SOR) participants and nonparticipants, 2010 to 2019.[1]

	SOR Participants					Comparison Group			
	Total	Pima County	Maricopa County	Gila County	Other Counties	Total	Pima County	Maricopa County	Gila County
2010-2019, Total N	**2,309**	**744**	**1,396**	**67**	**102**	**23,644**	**4,330**	**19,014**	**300**
Age, mean(SD)*	17.9(1.3)	18.0(1.2)	17.9(1.3)	18.3(1.2)	17.9(1.1)	17.7(1.1)	17.7(1.0)	17.7(1.1)	17.6(1.2)
Age, range	12.6-19.9	12.6-19.9	14.1-19.9	14.5-19.8	14.4-19.9	11.8-19.0	11.8-19.0	11.9-19.0	13.8-19.0
Ethnicity									
Hispanic	1,129(48.9)	413(55.5)	664(47.6)	28(41.8)	24(23.5)	15,745(66.6)	3,040(70.2)	12,646(66.5)	59(19.7)
Non-Hispanic	1,180(51.1)	331(44.5)	732(52.4)	39(58.2)	78(76.5)	7,899(33.4)	1,290(29.8)	6,368(33.5)	241(80.3)
Race									
White	1,872(81.1)	608(81.7)	1,126(80.6)	48(71.6)	90(88.2)	19,297(81.6)	3,591(82.9)	15,576(81.9)	130(43.3)
African American	243(10.5)	58(7.8)	181(13.0)	1(1.5)	3(2.9)	1,906(8.1)	223(5.2)	1,681(8.8)	2(0.7)
Native American	111(4.8)	35(4.7)	54(3.9)	15(22.4)	7(6.9)	1,665(7.0)	3479(8.0)	1,152(6.1)	166(55.3)
Asian	56(2.4)	39(5.3)	17(1.2)	--	--	406(1.7)	131(3.0)	275(1.5)	--
Other or Unknown	27(1.2)	4(0.5)	18(1.3)	3(4.5)	2(2.0)	370(1.6)	38(0.9)	330(1.7)	2(0.7)
Cigarette Smoking	130(5.6)	41(5.5)	66(4.7)	8(11.9)	15(14.7)	951(4.0)	173(4.0)	745(3.9)	33(11.0)
Insurance Type									
AHCCCS	1,841(79.7)	591(79.5)	1,115(79.9)	46(68.7)	89(87.3)	19,876(84.1)	3,387(78.2)	16,339(85.9)	150(50.0)
Private	396(17.2)	129(17.3)	248(17.8)	10(14.9)	9(8.8)	2,471(10.5)	561(13.0)	1,892(10.0)	18(6.0)
self-pay	33(1.4)	13(1.8)	18(1.3)	--	2(1.9)	654(2.8)	261(6.0)	392(2.1)	1(0.3)
IHS	25(1.1)	7(0.9)	6(0.4)	11(16.4)	1(1.0)	417(1.8)	91(2.1)	197(1.0)	129(43.0)
unknown	14(0.6)	4(0.5)	9(0.6)	--	1(1.0)	226(1.0)	30(0.7)	194(1.0)	2(0.7)

Chronic Hypertension	4(0.2)	3(0.4)	1(0.1)	--	--	69(0.3)	15(0.4)	53(0.3)	1(0.3)
Preeclampsia	152(6.6)	50(6.7)	91(6.5)	4(5.9)	7(6.9)	1,519(6.4)	300(6.9)	1,192(6.3)	27(9.0)
Eclampsia	25(1.1)	16(2.2)	7(0.5)	--	2(1.9)	221(0.9)	75(1.7)	143(0.8)	3(1.0)
Plurality	24(1.0)	3(0.4)	21(1.5)	--	--	192(0.8)	39(0.9)	151(0.8)	2(0.7)
Month prenatal care began (1-9)						0-9			
mean (SD)	3.4(1.7)	3.5(1.7)	3.2(1.7)	3.8(1.4)	3.7(1.7)	3.8(2.0)	4.2(2.1)	3.7(2.0)	4.4(2.1)
2014-2019, Total N**	**845**	**222**	**538**	**52**	**33**	**11,741**	**2,161**	**9,448**	**132**
STIs	72(8.5)	20(9.0)	42(7.8)	9(17.3)	1(3.0)	1,126(9.6)	232(10.7)	878(9.3)	16(12.1)
Gestational Diabetes	21(2.5)	5(2.3)	15(2.8)	1(1.9)	--	276(2.4)	50(2.3)	223(2.4)	3(2.1)
WIC participation	606(71.7)	154(69.4)	383(71.2)	46(88.5)	23(69.7)	7,618(64.9)	1,328(61.5)	6,189(65.5)	101(76.5)
BMI, total N	**842**	**221**	**536**	**52**	**33**	**11,612**	**2,149**	**9,332**	**131**
BMI, mean(SD)	24.3(5.4)	24.2(5.1)	24.2(5.6)	25.2(5.2)	23.8(5.4)	24.3(5.2)	24.2(5.3)	24.3(5.1)	24.4(4.9)
BMI, range	14.2-54.0	15.5-41.6	14.2-54.0	16.2-37.1	17.2-36.9	11.3-60.9	11.7-60.9	11.3-60.9	16.9-42.9
BMI categories									
<18.5	83(9.9)	14(6.3)	61(11.4)	5(9.6)	3(9.1)	976(8.4)	208(9.2)	808(8.2)	7(5.0)
18.5 to 24.9	466(55.3)	132(59.7)	288(53.7)	25(48.1)	21(63.6)	6,519(56.1)	1,266(55.8)	5,509(55.9)	91(64.5)
25 to 29.9	165(19.6)	42(19.0)	107(20.0)	13(25.0)	3(9.1)	2,589(22.3)	473(20.9)	2,221(22.6)	28(19.9)
≥30	128(15.2)	33(14.9)	80(14.9)	9(17.3)	6(18.2)	1,528(13.2)	322(14.2)	1,306(13.3)	15(10.6)

*all information is n(%), except for age, month prenatal care began, and BMI
**data for BMI, STIs and gestational diabetes were not available before 2014
1. Data for participants and non-participants are from Arizona vital statistics birth records.

Table 12. Difference in prevalence of health indicators between Starting Out Right (SOR) participants and nonparticipants.[1]

	Total N	Health indicator n(%)	p value[2]
Gestational Diabetes			
nonparticipants	11,705	296(2.4)	
SOR	844	21(2.5)	0.8
Hypertension			
nonparticipants	23,632	70(0.3)	
SOR	2,308	4(0.2)	0.3
Preeclampsia			
nonparticipants	23,635	1,585(6.5)	
SOR	2,309	152(6.6)	0.8
Eclampsia			
nonparticipants	23,644	222(0.9)	
SOR	2,309	25(1.1)	0.5
STIs			
nonparticipants	11,741	1,183(9.6)	
SOR	845	72(8.5)	0.3
Overweight or obese			
nonparticipants	11,612	4,365(35.6)	
SOR	842	293(34.8)	0.7
Smoking			
nonparticipants	23,644	1,000(4.0)	
SOR	2,309	130(5.6)	<0.001
Month prenatal care began			
nonparticipants	22,839	3.8(2.0)	
SOR	2,276	3.4(1.7)	<0.001
Less than adequate prenatal care			
nonparticipants	23,644	3715(15.7)	
SOR	2,309	281(12.2)	<0.001

1. Data for SOR participants and non-participants are from Arizona vital statistics birth records.
2. P values are from results of Chi-Square, except for month prenatal care began which was t-test

Table 13. Differences in prenatal care for Starting Out Right (SOR) participants and nonparticipants, 2010 to 2019.[1]

	SOR Participants					Comparison Group			
	Total	Pima County	Maricopa County	Gila County	Other Counties	Total	Pima County	Maricopa County	Gila County
2010-2019, Total N	**2,309**	**744**	**1,396**	**67**	**102**	**23,644**	**4,330**	**19,014**	**300**
Month Prenatal Care Began									
1	241(10.4)	59(7.9)	180(12.9)	--	2(2.0)	1,829(7.7)	195(4.5)	1,628(8.6)	6(2.0)
2	591(25.6)	196(26.3)	358(25.6)	9(13.4)	28(27.5)	5,114(21.6)	718(16.6)	4,344(22.9)	52(17.3)
3	560(24.3)	170(22.9)	343(24.6)	24(35.8)	23(22.6)	4,568(19.3)	821(19.0)	3,679(19.4)	68(22.7)
4	381(16.5)	141(19.0)	206(14.8)	17(25.4)	17(16.7)	3,834(16.2)	723(16.7)	3,067(16.1)	44(14.7)
5	209(9.1)	68(9.1)	118(8.5)	8(11.9)	15(14.7)	2,710(11.5)	546(12.6)	2,124(11.2)	40(13.3)
6	144(6.2)	53(7.1)	76(5.4)	5(7.5)	10(9.8)	1,688(7.1)	324(7.5)	1,338(7.0)	26(8.7)
7	75(3.3)	19(2.6)	49(3.5)	3(4.5)	4(3.9)	1,031(4.4)	224(5.2)	784(4.1)	23(7.7)
8	51(2.2)	21(2.8)	28(2.0)	1(1.5)	1(1.0)	1,000(4.2)	240(5.5)	741(3.9)	19(6.3)
9	15(0.7)	6(0.8)	8(0.6)	--	1(1.0)	673(2.9)	169(3.9)	493(2.6)	11(3.7)
No prenatal care	9(0.4)	5(0.7)	4(0.3)	--	--	392(1.7)	110(2.5)	280(1.5)	2(0.7)
Prenatal care info not available	33(1.4)	6(0.8)	26(1.9)	--	1(1.0)	805(3.4)	260(6.0)	536(2.8)	9(3.0)
Less than adequate prenatal care	281(12.2)	117(15.7)	135(9.7)	14(20.9)	15(14.7)	3,715(15.7)	859(19.8)	2,771(14.6)	85(28.3)

1. Data for SOR participants and non-participants are from Arizona vital statistics birth records.

Table 14. Summary of birth outcomes for Starting Out Right (SOR) participants and nonparticipants, 2010 to 2019.[1]

	SOR Participants					Comparison Group			
	Total	Pima County	Maricopa County	Gila County	Other Counties	Total	Pima County	Maricopa County	Gila County
2010-2019, Total N	**2,309**	**744**	**1,396**	**67**	**102**	**23,644**	**4,330**	**19,014**	**300**
Delivery Method									
Vaginal	1,942(84.1)	641(86.2)	1,159(83.0)	56(83.6)		19,983(84.5)	3,743(86.4)	15,987(84.1)	253(84.3)
C-Section	366(15.9)	103(13.8)	236(16.9)	11(16.4)		3,623(15.3)	583(13.5)	2,993(15.7)	47(15.7)
missing	1(<0.1)	--	1(0.1)	--		38(0.2)	4(0.1)	34(0.2)	--
Preterm Birth	356(15.4)	117(15.7)	225(16.1)	4(6.0)	10(9.8)	4,181(17.7)	783(18.1)	3,363(17.7)	35(11.7)
NICU admission	142(6.2)	52(7.0)	87(6.2)	--	3(2.9)	1,708(7.2)	333(7.7)	1,364(7.2)	11(3.7)
Birthweight									
Low birthweight	156(6.8)	49(6.6)	99(7.1)	3(4.5)	5(4.9)	1,968(8.3)	388(9.0)	1,569(8.3)	11(3.7)
Normal birthweight	2,044(88.5)	666(89.5)	1,228(88.0)	59(88.1)	91(89.2)	20,657(87.4)	3,753(86.7)	16,628(87.5)	276(92.0)
High birthweight	109(4.7)	29(3.9)	69(4.9)	5(7.5)	6(5.9)	1,019(4.3)	189(4.4)	817(4.3)	13(4.3)
2014-2019, Total N	**845**	**222**	**538**	**52**	**33**	**11,741**	**2,161**	**9,448**	**132**
Breastfeeding at discharge	739(87.5)	202(91.0)	469(87.2)	40(76.9)	28(84.9)	9,980(85.0)	1,871(86.6)	8,040(85.1)	69(52.3)

1. Data for SOR participants and non-participants are from Arizona vital statistics birth records.

Table 15. Difference in selected birth outcomes between Starting Out Right (SOR) participants and nonparticipants.[1]

	Total	Birth Outcome n(%)	p value
C-section			
nonparticipants	23,606	3,623(15.4)	
SOR	2,308	366(15.9)	0.5
Preterm birth			
nonparticipants	23,644	2,210(9.4)	
SOR	2,309	187(8.1)	<0.05
NICU admission			
nonparticipants	23,644	1,708(7.2)	
SOR	2,309	142(6.2)	0.06
Low birthweight			
nonparticipants	23,644	1,968(8.3)	
SOR	2,309	156(6.8)	<0.01
Breastfeeding at discharge			
nonparticipants	11,580	9,980(86.2)	
SOR	837	739(88.3)	0.08

1. Data for participants and non-participants are from Arizona vital statistics birth records.
2. P values are from results of Chi-Square

Table 16. Comparison of Starting Out Right (SOR) participants and nonparticipants related to health indicators.[1]

	2010-2019				2014-2019			
	Total	Health Indicator n(%)	Unadjusted; OR (95% CI)	Adjusted[2]; OR (95% CI)	Total	Health Indicator n(%)	Unadjusted; OR (95% CI)	Adjusted[3]; OR (95% CI)
Gestational Diabetes								
nonparticipants					11,705	276(2.4)		
SOR					844	21(2.5)	0.9(0.6,1.5)	1.3(0.8,2.0)
Hypertension								
nonparticipants	23,632	69(0.3)						
SOR	2,308	4(0.2)	0.6(0.2,1.6)	0.6(0.2,1.6)[4]				
Preeclampsia								
nonparticipants	23,635	1,519(6.4)			11,732	914(7.8)		
SOR	2,309	152(6.6)	1.0(0.9,1.2)	1.0(0.9,1.2)	780	62(7.9)	1.0(0.9,1.2)	0.9(0.7,1.2)
Eclampsia								
nonparticipants	23,644	221(0.9)			11,741	51(0.4)		
SOR	2,309	25(1.1)	1.2(0.8,1.8)	1.0(0.7,1.6)	845	3(0.4)	1.2(0.8,1.8)	0.7(0.2,2.9)
BMI overweight or obese								
nonparticipants					11,612	4,117(35.5)		
SOR					842	293(34.8)	1.0(0.8,1.1)	1.0(0.8,1.2)
Cigarette Smoking								
nonparticipants	23,644	951(4.0)			11,741	610(5.2)		
SOR	2,309	130(5.6)	1.4(1.2,1.7)	0.9(0.7,1.1)	845	79(9.3)	1.4(1.2,1.7)	1.2(0.9,1.6)
STIs								
nonparticipants					11,741	1,126(9.6)		
SOR					845	72(8.5)	0.9(0.7,1.1)	0.9(0.7,1.1)

1. Data for participants and non-participants are from Arizona vital statistics birth records.
2. 2010-2019 adjusted OR: age, smoking, race, ethnicity, county, insurance type, multiple births, and month prenatal care began.
3. 2014-2019 adjusted OR: age, BMI category, smoking, race, ethnicity, county, WIC participation, insurance type, multiple births, and month prenatal care began.
4. Hypertension adjusted OR: smoking and race.

Table 17. Effects of Starting Out Right (SOR) participation related to birth outcomes.

	2010-2019				2014-2019			
	Total	Birth Outcome n(%)	Unadjusted; OR (95% CI)	Adjusted; OR (95% CI)	Total	Birth Outcome n(%)	Unadjusted; OR (95% CI)	Adjusted; OR (95% CI)
C-Section								
nonparticipants	23,606	3,623(15.4)	ref	ref	11,703	1,734(14.8)	ref	ref
SOR	2,308	366(15.9)	1.0 (0.9,1.2)	1.0(0.9, 1.2)	844	118(13.9)	1.0 (0.9,1.2)	0.9(0.7, 1.1)
Preterm Birth								
nonparticipants	23,644	2,210(9.4)	ref	ref	11,741	1041(8.9)	ref	ref
SOR	2,309	187(8.1)	**0.9(0.7,0.9)**	**0.8(0.7,0.9)**	845	65(7.7)	0.9(0.7,1.1)	0.8(0.6,1.1)
NICU admission								
nonparticipants	23,644	1,708(7.2)	ref	ref	11,741	970(8.3)	ref	ref
SOR	2,309	142(6.2)	0.8(0.7,1.0)	0.9(0.8,1.1)	845	58(6.9)	0.8(0.6,1.1)	0.9(0.7,1.2)
Birthweight								
low birthweight								
nonparticipants	23,644	1,968(8.3)	ref	ref		984(8.4)	ref	ref
SOR	2,309	156(6.8)	**0.8(0.7,0.9)**	**0.8(0.6,0.9)**		53(6.3)	**0.7(0.6,0.9)**	0.7(0.5,1.0)
high birthweight								
nonparticipants	23,644	1,019(4.3)	ref	ref		494(4.2)	ref	ref
SOR	2,309	109(4.7)	1.1(0.9,1.3)	1.1(0.9,1.4)		40(4.7)	1.1(0.8,1.5)	1.0(0.7,1.5)
Breastfeeding at discharge								
nonparticipants					11,580	9,980(86.2)	ref	ref
SOR					837	739(88.3)	1.2(1.0,1.5)	**1.3(1.0,1.7)**

2010-2019 Adjusted models:
C-section: multiple births, birthweight, preeclampsia, and county (unable to adjust for BMI category)
Preterm birth: age, smoking, race, multiple births, preeclampsia, insurance type, and county (unable to adjust for WIC participation)
NICU: birthweight, preeclampsia, multiple births, smoking, insurance type, and county (unable to adjust for gestational diabetes)
Birthweight: gestational age, smoking, multiple births, insurance type, race, and county
2014-2019 Adjusted models:
C-section: multiple births, BMI category, birthweight, preeclampsia, and county
Preterm birth: age, smoking, race, WIC participation, multiple births, preeclampsia, insurance type, and county
NICU: birthweight, preeclampsia, multiple births, smoking, gestational diabetes, insurance type, and county
Breastfeeding: insurance type, multiple births, preterm, NICU, WIC participation, smoking, preeclampsia, and county

CHAPTER 5

CONCLUSIONS, RECOMMENDATIONS, AND REFLECTIONS

Programs that are well-designed for pregnant teens have the potential to positively influence health and well-being for families and communities over a lifetime. There are a wide variety of approaches to programs for pregnant teens, and the Starting Out Right (SOR) program is one approach that provides a wide range of services. The SOR program curriculum addresses important health needs identified in this study, including smoking, healthy eating, prevention of sexually transmitted infections (STIs), and breastfeeding education. SOR program participation was also associated with several positive birth outcomes for teen moms in Arizona.

Key Findings

Demographic information

The average age for teen births in Arizona has been consistently around 17 years old over the past ten years. Programs for primary prevention of teen pregnancy need to consider ways of reaching people to prevent pregnancy well before the age of 17. Smoking was reported for 4.2% of pregnant teens in the total sample and as high as 11.2% for Gila County. This does not include estimates for second-hand smoke exposure or for vaping use or exposure. Smoking is a significant concern for pregnant teens. Smoking is associated with low birthweight infants, preterm birth, and was associated with reduced breastfeeding in this study. Smoking prevention and cessation for youth, specifically pregnant youth is important for preventing negative birth outcomes.

Preeclampsia

Preeclampsia in this sample (6.4%) was similar to national estimates for preeclampsia (2-8%), however, the percentage of pregnancies with preeclampsia increased over time from 4.4% in 2010 to 9.6% in 2019. The trend in increasing preeclampsia in teens in Arizona may be due to the increasing trend in the overall sample for overweight and obesity. Preeclampsia is associated with multiple negative health consequences including increased risk for hypertension, maternal mortality, cardiovascular disease, gestational diabetes, type 2 diabetes, and increased risk of preterm birth. In this sample, Native Americans had the highest risk for preeclampsia and eclampsia compared to other races. Preventing preeclampsia or teaching teens to seek medical care for signs of preeclampsia can potentially prevent multiple negative effects. Pregnant teens should be supported to eat a variety of healthy foods to gain appropriate weight during pregnancy and help minimize the risk of preeclampsia.

Sexually transmitted infections

There was an increase in STIs over time mirroring national trends for increasing STIs. Teaching about prevention, screening, and treatment for STIs will continue to be important for teens.

Birth outcomes

Participation in the SOR program was associated with reduced low birthweight and preterm birth compared to nonparticipants. This is one of a few studies to show a statistically significant reduction in the odds of preterm birth in a population of teens. African American race had the highest risk for low birthweight and preterm birth. When preterm birth and low birthweight can be prevented there is a major lifelong benefit for the baby and family, as well a benefit to society through cost savings in medical care and overall productivity.

Breastfeeding

SOR participation was associated with an increased odds of breastfeeding at hospital discharge compared to nonparticipants for all counties. The biggest difference in breastfeeding initiation between SOR participants and nonparticipants was in Gila County, where 52.3% of nonparticipants initiated breastfeeding and 76.9% of SOR participants initiated breastfeeding.

Rural areas where breastfeeding rates are typically lower stand to have the largest gains when providing breastfeeding education and support.

Participation in SOR

Teens were found to engage and participate in the SOR program at similar levels whether they enrolled earlier or later in pregnancy. Teens should continue to be referred to programs when they are eligible regardless of the stage of pregnancy. Teen programs may also want to strengthen referral connections, as those referred from a doctor or community agency were more likely to enroll and attend than those who were self-referred. Also, some teens may seek out support from teen pregnancy programs before seeking medical care and referrals can be made in both directions.

High risk populations

Native American and African American races and rural populations appear to have the highest risk for negative birth outcomes in this population of teen pregnancies in Arizona. Programs in Arizona may seek increase outreach to these populations as a priority. The SOR program may consider whether their media campaigns to recruit participants include images with which priority populations may identify.

Recommendations for the Starting Out Right Program

Database

Improving the AzYP database by tracking additional variables that are directly tied to the program outcomes will be valuable for program improvement and providing data for funding opportunities. Table 18 summarizes additional variables (smoking, sexually transmitted infections, and breastfeeding) that the SOR Program may consider collecting as part of the program database.

The program may benefit from utilizing a screening tool, such as the Multidimensional Scale of Perceived Social Support (Appendix C).[111] This screening tool has been validated in both pregnant and adolescent populations and could be used to assess level of perceived support, instead of or in addition to the question asking "Do you have support from your family/families?" Adding a validated questionnaire to assess support is one way that the outcome to "improve well-being" could be measured. The scale score could be used to show improvements in perceived social support over time for SOR participants, or to identify participants who could benefit from additional support and follow up. Tracking these additional variables will allow the program to more easily provide data for funding opportunities and ongoing program evaluation and improvement.

A fair amount of information was missing from some of the individual files even when participants had attended at least one class. It is recommended to obtain staff input for why the fields are missing to reduce missing data, for example, whether fields are easy to miss when staff are entering information or teens are reluctant to provide certain information. Race and ethnicity had 23% of information missing. The program should continue to collect insurance information, but the data should be included as part of the demographic report for ease of use. Insurance type is a useful variable to document additional social disadvantage, ensure referrals are given as needed, and prenatal care is not delayed.

Outreach

The program should consider outreach to specific populations, including Native Americans. SOR participants were 4.8% Native American (nonparticipants 7.0% Native American). The SOR program participants were 48.9% Hispanic (nonparticipants 66.6% Hispanic), therefore the program may also consider trying to reach more Hispanic teens in Pima and Maricopa counties.

Gila County nonparticipants had the highest rates of preeclampsia and lowest rates of breastfeeding initiation. The SOR program in Gila County had the most active participation and engagement compared to Pima and Maricopa, and it serves a higher percentage of teen births than Pima or Maricopa. Engaging more teens from Gila County will likely provide the most significant improvements in the long-term health of teen moms and babies. Less than adequate prenatal care was highest in Gila County for both SOR participants and nonparticipants.

The program may consider ways to increase enrollment earlier in pregnancy. Are there consent barriers that could be reduced? Some participants may reach out to SOR before they have their first prenatal visit. Others may be referred from a physician's office. Teens may not enroll in their first trimester because they are delaying prenatal care and think they need a positive pregnancy test to enroll. Teens may also be concerned about confidentiality.

Referral systems

- Strengthen ties with the WIC program for both referrals and reducing the risk of preterm birth.
- Strengthen and develop new relationships with physicians and community-based organizations including school nurses, and community college and university health centers
- Consider whether the current referral forms need updating and the ease of which referrals may be made.

Future evaluation

Continued program evaluation will provide guidance for program improvement. Potential future program evaluation ideas include:

- Effect of case management on program outcomes (more detailed collection of program implementation for each teen)

- Qualitative information about what program participants say was most useful for them.
- Changes in support scale score from program enrollment to delivery of baby or beyond.
- Exclusivity and duration of breastfeeding.
- Staff self-perceived competencies and what training staff need for their job.
- Rates of smoking or vaping cessation.
- Rates of STI re-infection.
- Evaluate referral systems:
    a. Are self-referred enrollments enrolling earlier than referrals from doctors or community agencies.
    b. Communication methods with referral partners and differences over time.
- Utilizing hospital discharge data to consider cost savings for preterm or low birthweight babies at delivery.

These key findings and program recommendations were summarized in a document provided to the AzYP program (Appendix D).

Reflections

With a concentration in Maternal and Child Health and an interest in program management and evaluation, I was presented with the opportunity to work with the Starting Out Program in Fall 2017. The program was interested in utilizing their database of information to document an evidence base for the work they had been doing over the past decade. I was interested in building my skills for data management and analysis to support programmatic improvements.

I was able to build my skills in negotiating a research question. There is a balance between the program guiding the research question versus the researcher guiding the question. The program may have some ideas about what they would like the research to show, but a wellinformed researcher may be more equipped to present different approaches and clarify research questions that would be most beneficial for the program and generalizable to a larger scale. It was not until I was editing the introduction (after the research was complete), that I realized I did not, and the program did not, have a current logic model to represent the goals of the program. It was not until mapping out the logic model that I had a clear grasp of the program content and objectives and realized how beneficial this would have been to have from the beginning of the process.

I was also able to build my skills in data collection, even though I did not collect data directly, I developed a better understanding for the way variables may be collected and how that affects the ease of analysis. Also, I obtained a better insight with writing code for statistical programs and learned that the order that it is written can make it easier to complete tables.

Programs may be confident of the benefits of their program, and the thought of the results not showing a statistically significant difference is something to consider. For example, how to present and communicate that information and what we may still learn from nonsignificant results can be emphasized. Programs have limited funding, and even with the best curriculum, if adequate funding does not provide for sufficient staff training, facilities, or concrete supports, participation and therefore, effectiveness of the program may decrease. Without guaranteed funding, programs may also spend a great deal of time trying to find ways to secure funding taking away time that could be spent on the program itself.

Table 18. Recommended additions to the Arizona Youth Partnership Starting Out Right Database

Prenatal:

Smoking			Rationale
Have you smoked or vaped in the 3 months prior to your pregnancy or during pregnancy?	y/n	if yes, date last smoked or vaped	Case management can provide support and encouragement, referrals as needed to quit or if have already quit, support to maintain smoking cessation.
Are you currently smoking or vaping?	y/n	if yes, date last smoked or vaped	Continue to ask this question with additional follow up questions to reduce prenatal exposure to tobacco products and document cessation when applicable.
Does anyone smoke or vape inside your home?	y/n		Educate on ways to avoid second-hand exposure
Does anyone smoke in indoor areas where you go?	y/n		Educate on ways to avoid second-hand exposure
Sexually Transmitted Infections			
Have you been screened/tested for STIs during this pregnancy?	y/n		STIs have increased for all age groups nationally. It may help to have follow up to ensure screening and treatment.
Breastfeeding			
What are your plans for feeding your baby?	breastfeeding/ breastfeeding and formula/ formula only		Documenting breastfeeding goals would allow for an evaluation of how well breastfeeding goals align with actual breastfeeding.
If breastfeeding: what is your breastfeeding goal/how long would you ideally like to breastfeed your baby?	number of months, range from 0 to 24+		

APPENDICES

APPENDIX A – STARTING OUT RIGHT LOGIC MODEL

Starting Out Right Logic Model

Inputs

Organizational Capacity of Arizona Youth Partnership and Pregnancy and Parenting Teen Programs

Program Oversight and Delivery
- Chief Initiatives Officer/RN
- Program Director
- Case Managers
- Health Educators

Community Partners and Service Linkages
- Obstetric Providers
- Child welfare (AZ DCS)
- Schools
- GED prep and testing agencies
- Mental, physical, and dental health insurance/providers
- Supplemental income services
- WIC

Program Design
- Age appropriate and relevant
- Community based

Activities

Healthy Pregnancy Class Series
1. Starting Out Right
2. Eating for Two with Healthy Eating Habits
3. Healthy Relationships
4. Baby Care and Safety

Childbirth Education Class Series
1. Labor and Delivery
2. Postpartum Care and Medical Procedures
3. Introduction to Infant Nutrition and Comfort Measures for Labor
4. Infant Feeding and Newborn Behaviors

Case Management

Support Groups and Special Events

Outputs

Participants develop health related goals

Participants practice journaling to understand feelings and reactions and reduce stress

Participants practice communication skills

Participants engage in peer support

Participants screened and referred for postpartum depression

Outcomes

Improve Well-Being
- Physical health
- Mental health
- Relationship satisfaction
- Stress management

Reduce Rapid Repeat Pregnancy and STIs
Increased use of birth control and condoms

Build Confidence in Ability to Give Birth and Care for Newborn
- Actively participate in prenatal care
- Identify signs of preterm labor
- Identify stages of labor
- Communicate birth plan with hospital staff
- Practice safe sleep habits
- Utilize calming techniques for baby

Increase Breastfeeding
Increase the initiation and duration of breastfeeding

Develop Self-Sufficiency
- Education/employment
- Increase use of health, social, and other resources
- Connect with friends/peers

Long Term Goals

Reduced health care costs

Improved community health

Improved relationships within families and communities

Improved parenting skills

APPENDIX B - KEY VARIABLES: DEFINITIONS, AVAILABILITY, AND COMBINED VARIABLES FROM 2010 TO 2019

Health Characteristics	**2010-2013 Definition**	**2014-2019 Definition**	**Variable in the data set**
Cigarette Smoking	Tobacco usage during pregnancy yes/no	Three months before pregnancy average number of cigarettes smoked per day First three months of pregnancy, average number of cigarettes per day. Second three months of pregnancy, average number of cigarettes per day. Last three months of pregnancy, average number of cigarettes smoked per day	If any of the four questions from 2014-2019 reported 1 or more, this was coded as "yes," 0 reported for all four questions was categorized as "no" yes/no
Hypertension	Elevation of blood pressure above normal for age, gender, and physiological condition diagnosed prior to the onset of this pregnancy.		yes/no
Preeclampsia or Pregnancy Induced Hypertension	Elevation of blood pressure above normal for age, gender, and physiological condition diagnosed during this pregnancy. May include proteinuria (protein in the urine) without seizures or coma and pathologic edema (generalized swelling, including swelling of the hands, legs and face). (aka, pregnancy induced hypertension (PIH), Preeclampsia)		yes/no
Eclampsia	Pregnancy induced hypertension with proteinuria with generalized seizures or coma. May include pathologic edema.		yes/no

Health Characteristics	2010-2013 Definition	2014-2019 Definition	Variable in the data set
Gestational diabetes	not collected	Gestational diabetes diagnosed in this pregnancy	yes/no
Sexually transmitted infections	not collected	Positive test for any one of the following: gonorrhea, syphilis, chlamydia, hepatitis B, or hepatitis C. Infection present at the time of pregnancy diagnosis or confirmed diagnosis during the pregnancy with or without documentation of treatment.	yes/no
BMI	not collected	Mother's pre-pregnancy weight in pounds, mother's height in feet and inches: used to calculate BMI	continuous variable; categorized by: <18.5 18.5-24.9 25-29.9 ≥30; categorized by: y/n for BMI ≥25

Health Characteristics	2010-2013 Definition	2014-2019 Definition	Variable in the data set
Prenatal variables			
Month prenatal care began	month of pregnancy that prenatal care began	date of first prenatal visit	variable ranging from 0-9 for month prenatal care began (0=no prenatal care)
Prenatal care adequacy	Calculated: (number of prenatal visits/expected visits)*100; greater than or equal to 80% is considered adequate based on the Adequacy of Prenatal Care Utilization Index		yes/no
Number of prenatal visits	total prenatal visits (0-16)		ranges from 0-16
Expected prenatal visits by gestational age	calculated based on month prenatal care began and weeks of gestation at delivery		ranges from 1-16
Plurality	more than one child is born, number of infants recorded (possible range 1-12)		ranges from 1-3
WIC participation	not collected	Did mother get WIC food for herself during this pregnancy (y/n)	yes/no

Health Characteristics	2010-2013 Definition	2014-2019 Definition	Variable in the data set
Birth Outcomes			
Delivery method	vaginal delivery (y/n) primary c-section (y/n), defined as extraction of the fetus, placenta, and membranes through an incision in the maternal abdominal and uterine walls	final route and method of delivery (vaginal/spontaneous, vaginal/forceps, vaginal/vacuum, cesarean)	C-Section yes/no
Preterm birth	clinical estimate of gestation in weeks	obstetric estimate of gestation in weeks	yes/no (birth at <37 weeks of gestation)
NICU admission	newborn was transferred to intensive care	NICU admission within 24 hours of delivery	yes/no
Birthweight	birthweight reported in pounds and ounces or grams		continuous variable: grams categorized: normal (≥2500 to ≤4000) low birthweight (<2500) high birthweight (>4000)
Breastfeeding	not collected	infant breastfed discharge (y/n)	yes/no

Health Characteristics	2010-2013 Definition	2014-2019 Definition	Variable in the data set
Demographic Variables			
Mother's age	months of age on date of delivery		continuous variable: age in years (on date of delivery)
Ethnicity	mother is Hispanic origin (y/n)		yes/no
Race	28 race fields	28 race fields, each assigned own field	Categorized (5): White Black Native American Asian Other
Insurance type	Intended to provide a measure of socioeconomic status, as well as an indication of program participation. Self-pay will provide an indication of the number of women for whom no source of payment was identified at the time of admission.		Categorized: AHCCCS private insurance self-pay HIS unknown

APPENDIX C - MULTIDIMENSIONAL SCALE OF PERCEIVED SOCIAL SUPPORT

Multidimensional Scale of Perceived Social Support (Zimet, Dahlem, Zimet & Farley, 1988)

Instructions: We are interested in how you feel about the following statements. Read each statement carefully. Indicate how you feel about each statement.

Circle the "1" if you **Very Strongly Disagree**
Circle the "2" if you **Strongly Disagree**
Circle the "3" if you **Mildly Disagree**
Circle the "4" if you are **Neutral**
Circle the "5" if you **Mildly Agree**
Circle the "6" if you **Strongly Agree**
Circle the "7" if you **Very Strongly Agree**

1.	There is a special person who is around when I am in need.	1	2	3	4	5	6	7	SO
2.	There is a special person with whom I can share my joys and sorrows.	1	2	3	4	5	6	7	SO
3.	My family really tries to help me.	1	2	3	4	5	6	7	Fam
4.	I get the emotional help and support I need from my family.	1	2	3	4	5	6	7	Fam
5.	I have a special person who is a real source of comfort to me.	1	2	3	4	5	6	7	SO
6.	My friends really try to help me.	1	2	3	4	5	6	7	Fri
7.	I can count on my friends when things go wrong.	1	2	3	4	5	6	7	Fri
8.	I can talk about my problems with my family.	1	2	3	4	5	6	7	Fam
9.	I have friends with whom I can share my joys and sorrows.	1	2	3	4	5	6	7	Fri
10.	There is a special person in my life who cares about my feelings.	1	2	3	4	5	6	7	SO
11.	My family is willing to help me make decisions.	1	2	3	4	5	6	7	Fam
12.	I can talk about my problems with my friends.	1	2	3	4	5	6	7	Fri

The items tended to divide into factor groups relating to the source of the social support, namely family (Fam), friends (Fri) or significant other (SO).

APPENDIX D - CONSULTATIVE SUMMARY

THE UNIVERSITY OF ARIZONA
Mel & Enid Zuckerman
College of Public Health

Consultative Summary

Prepared for the Arizona Youth Partnership, Starting Out Right (SOR) Program
By Allison Root as part of the fulfillment of the DrPH degree in Maternal and Child Health

The study aimed to:

- describe participation in the SOR program in 2018 and 2019
- describe prenatal health characteristics including the prevalence of smoking, hypertensive disorders of pregnancy, overweight and obesity, gestational diabetes, and sexually transmitted infections in teens who gave birth in Arizona from 2010-2019
- compare the health characteristics, prenatal services, and birth outcomes of SOR participants and nonparticipants from 2010-2019 using state vital statistics records.

Key Findings

Participation:

- Most teens enrolled in SOR in the second trimester of pregnancy.
- Referrals from a doctor or community agency were more likely to attend than self-referred or referred from a friend. Referrals were more important for new enrollments than for high attendance (i.e. once people were enrolled and attended one class, referral type was less important).
- Gila County and Maricopa County had higher attendance compared to Pima County.
- Missing information in the database was related to non-attendance and low-attendance (i.e. missing demographic information, zip code of residence, race, etc).

Prenatal Health:

- Gila County participants had higher cigarette use, PIH/preeclampsia, and STIs than Maricopa County and Pima County.

Prenatal Services and Birth Outcomes of SOR participants and comparison sample:

- SOR participation was associated with a ***20% reduced odds*** of both ***preterm birth*** and having ***low birthweight*** baby compared to nonparticipants in the sample.
- SOR participants had ***30% increased odds of breastfeeding*** than nonparticipants.
- SOR participants were more likely to participate in WIC (40% increased odds), and initiate prenatal care earlier than nonparticipants.
- Teens with greater odds of preterm birth included younger age, African American race, pregnant with twins or triplets, and preeclampsia/PIH.
- Teen with greater odds of low birth weight included those who reported smoking, pregnant with twins or triplets, and African American race.
- IHS was associated with 50% reduced odds of breastfeeding.

Recommendations for the Starting Out Right Program

Outreach and Referral Systems

Native American and African American races and rural populations had higher odds of negative birth outcomes in this population of teen pregnancies in Arizona compared to other races and to urban counties. Gila County participants had a higher percentage of smoking, PIH, preeclampsia, and STIs than Pima or Maricopa, signifying a potential increased risk for negative birth outcomes. Gila County had the best attendance compared to the other counties. Gila County participants also had the biggest difference in breastfeeding between participants and nonparticipants. The SOR program should continue efforts to reach even more teens in Gila County and in all areas that services are provided.

- Strengthen referral systems with doctor offices, school nurses, community college and university health centers to enroll more teens in the first trimester of pregnancy
- Utilize media ads for program recruitment, aim to target
  - Native American teens in Gila county
  - Hispanic teens in Pima and Maricopa counties
- Consider having a designated outreach and marketing staff person

Program Database and Evaluation

A wealth of information is collected within the program database, but it may not all be utilized for program evaluation or to provide data for funding opportunities.

Ensure ease of use of program database and ability to pull reports for critical information for program improvement and for funding opportunities. Ensure program outcomes are being measured and easy to analyze within the program database.

Ideas for ways to measure program outcomes (see next page):

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Measuring Program Outcomes

Potentially utilize a centering model during classes, where teens self-monitor and record their own information into an SOR I-pad that is linked to the program database.

Outcomes	Measures
Improve Well-Being • Physical health • Mental health • Relationship satisfaction • Stress management	Weight, blood pressure, perceived stress levels. Multidimensional scale of perceived social support. Smoking/vaping cessation or second-hand exposure. Post-partum depression screening.
Reduce Rapid Repeat Pregnancy and STIs Increased use of birth control and condoms	Documentation of intended birth control method and STI screening.
Build Confidence in Ability to Give Birth and Care for Newborn • Actively participate in prenatal care • Identify signs of preterm labor • Identify stages of labor • Communicate birth plan with hospital staff • Practice safe sleep habits • Utilize calming techniques for baby	Post-test scores for Healthy Pregnancy and Childbirth Education Series.
Increase Breastfeeding Increase the initiation and duration of breastfeeding	Goals for breastfeeding / actual breastfeeding.
Develop Self-Sufficiency • Education/employment • Increase use of health, social, and other resources • Connect with friends/peers	Goals for school completion / actual completion. Participation in other programs (WIC & others).

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