I. Introduction

a. Nature of the research problem

Teen parenting is an extraordinarily common phenomenon in the United States, with significant consequences for mothers and children. Teen mothers are less likely to complete school, more likely to be single parents, and have high rates of depression. Children born to teen mothers are at increased risk for having higher levels of developmental, behavioral, and school adjustment problems, being victims of abuse and neglect, and becoming adolescent parents themselves. Teen mothers who have more than one child face even greater challenges. Studies have reported repeat pregnancy rates for adolescent mothers ranging from 35% to 63% within 24 months of a birth. Repeat pregnancy among teenage mothers, particularly when closely spaced, is associated with adverse birth and child health outcomes, delayed or foregone maternal education, decreased likelihood of marriage and economic self-sufficiency, and a greater likelihood of physical or sexual violence. Despite these clear and compelling risks, little work has been done to establish standards of care for teen parent families. Numerous programs have been developed, but very few have been rigorously evaluated in a manner that informs programmatic and policy decisions about program implementation across diverse settings.

b. Purpose, scope, and methods of investigation

The purpose of this study was to evaluate a promising model of care for teen parent families that combines comprehensive primary care, including social work and mental health services, for teen parents and their children in a single setting. Because of its potential as an intervention that can have a significant impact for a vulnerable group of mothers and children, and one that can be widely implemented, there is a critical need to clearly define, test, and document the effectiveness of this model. This project serves urban, African American, low-income mothers under age 20 and their young children who receive primary care from one of several community-based clinics in Washington, DC. The study aims to test whether teen mothers who participate in this program have more positive maternal reproductive health, education, emotional well-being, and child health outcomes than those who receive standard community-based pediatric primary care. A total of 150 teenage mothers with infants aged 6 months or younger were recruited from one of five primary care sites serving demographically comparable populations. Self-report data were collected from participating mothers via home-based structured interviews at program enrollment (baseline) and at 12 and 24 months post-enrollment. Detailed process data were also collected from service providers.

c. Nature of the findings

Analyses of the longitudinal data are still continuing, so the full nature of the findings cannot be described here. To date, baseline findings have described the sample demographically and in terms of outcome variables of interest. In addition, analysis of baseline data found that maternal depression was associated with infant distress and that father involvement protected infants from this impact. Analyses of 12 month follow-up data indicate that the intervention had a significant effect on increasing effective contraceptive use among participants. Analyses also indicate that the intervention prevented the onset of depression among mothers during the first year of their children’s lives. Additional analyses examined the role of social
support relationships on important outcomes including maintenance of contraceptive use, maternal depression, child behavior problems, and education trajectories. Analyses of 24 month data found that participation in the Generations program cut in half the likelihood of a repeat pregnancy at 24 months. Ongoing analyses are exploring the role of public assistance resources in maternal outcomes, the relationship between maternal attachment style and child behavior, and the effect of participation in the intervention on child health and behavior.

II. Review of the Literature

Despite recent declines, the United States continues to rank first among industrialized nations in rates of teen childbearing. In 2013, there were 26.5 births for every 1,000 adolescent females ages 15-19 in the US. Within this number, significant racial disparities exist. The rate of teen births among Non-Hispanic White teens was 19 per 1,000, whereas the rate for Non-Hispanic Black teens was 39 per 1,000, the rate for Hispanic teens was 42 per 1,000, and the rate for American Indian teens was 31 per 1,000. Teen pregnancy rates were even higher. In 2010, the rate was 57 pregnancies per 1,000 girls age 15-19, with similar patterns showing substantially higher rates particularly among African American teens (100 pregnancies per 1,000 girls).2

Teen childbearing has significant consequences for mothers and children and can perpetuate economic disadvantage in families and communities. Adolescent mothers are at increased risk for pregnancy complications and premature delivery.3 They also are less likely to complete high school and attain a college degree,4,5 more likely to be single parents,6 and have high rates of depression,7,8 which can lead to decreased contraceptive use9 and impairments in parenting.10 Children born to adolescent mothers are at increased risk for higher levels of morbidity, developmental and behavioral problems, academic disadvantages, and adolescent parenthood themselves.11-14 Children of adolescent mothers are also at increased risk of being maltreated.15 Regardless of root causes, adolescent mothers face developmental and psychosocial challenges, which influence their parenting and can negatively affect outcomes for their children.16

Teen mothers with multiple children face even greater challenges. Lower educational achievement or disengagement from employment after a first birth is associated with a greater risk of a second birth and a shorter inter-pregnancy interval.17,18 Moreover, repeat pregnancy among teenage mothers, particularly when closely spaced, is associated with adverse birth outcomes,19 delayed or foregone maternal education,20 decreased likelihood of marriage and economic self-sufficiency,21 and a greater likelihood of physical or sexual violence.17

Parenting teens are a group at extremely high risk for teen pregnancy. In 2013, 21% of births to 18-19 year olds and 8% of births to 15-17 year olds were second or higher order births,22 and studies have reported repeat pregnancy rates for adolescent mothers ranging from 35% to 42% within 24 months of a prior birth.17,23,24 Effective contraceptive use among first-time adolescent mothers can reduce the risk of a repeat pregnancy as well as associated negative maternal and child health outcomes.23,25 Many adolescent mothers begin using a highly effective method after delivery, but rates of contraceptive discontinuation are high.26 Teen mothers may not experience continuity of care, in terms of specific providers or in
terms of broader access and coverage. Such loss of continuity of care is a predictor of rapid repeat pregnancy.\textsuperscript{17} The instability of adolescent relationships may also cause adolescent mothers to discontinue contraceptive use between partners.\textsuperscript{17,26}

The Generations program, implemented in an academic medical center in Washington, DC, is a family-centered medical home intervention that specifically provides care, including pregnancy prevention, for teen parent families. Designed as a teen-tot program in which teen mothers and their children are cared for by the same medical provider, this model aims to prevent repeat pregnancies in teen mothers, among other goals. There are three primary components of the Generations intervention that are tailored to the specific age-appropriate needs of mothers and infants: (1) Family Centered Primary Care, (2) Comprehensive Social Work Services, and (3) Mental Health Screening and Treatment. Medical providers are able to spend more time with teen mother patients, because they see them at every well-child visit for their children. Providers can therefore address pregnancy prevention far more frequently and actively, and develop a much closer relationship with their patients than is typical in standard gynecological care.

The current evidence base regarding teen pregnancy prevention contains studies primarily of short-term curricula-based interventions. This study expands our repertoire of preventive interventions by examining the efficacy of this model.

III. Study Design and Methods

a. Study design

This study used a prospective treatment-comparison design. The design incorporated extensive measurement of baseline attributes to assess the comparability of intervention and control groups at inception and to test and control for group differences over time. We recruited comparison group participants from sites that serve the same geographic and demographic community as our intervention sites. Participants in the comparison condition received standard pediatric primary care services, including well-child care, sick care, anticipatory guidance, and referrals to specialty medical care and community-based services as needed. Both groups completed baseline data collection upon enrollment into either the Generations program or the comparison pediatric primary care clinic. Follow-up data collection was conducted approximately 12 and 24 months after baseline data collection.

b. Sample selection

Participants were recruited from three intervention sites and three comparison sites, all of which were community-based primary health care clinics serving primarily urban, low-income, African American families. Patients were eligible for enrollment into the study if: (1) the mother was age 19 or under; (2) the child was under 6 months of age; (3) the family was newly seeking care from one of the intervention or comparison sites (meaning the family was enrolled before their second visit); (4) the mother had physical custody of her child; (5) the mother did not have any physical, psychological, or cognitive impairments that would prohibit her from participating in the informed consent process; and (6) the infant did not have any significant health problems. The baseline sample was enrolled over a two year time period, and consisted of 150 teen mother-child dyads (85 intervention group, 65 comparison group), which was 83\% of the eligible mothers invited to
participate. The 12-month follow-up sample consisted of 124 teen mothers, which is a retention rate of 83%, particularly high compared to other longitudinal research with a similar population. There were no significant differences in attrition between the intervention (13%) and comparison groups (23%), and the sample retained at follow-up (82%) did not significantly differ from those lost to follow-up (73%) in terms of effective contraceptive use at baseline.

c. **Instruments used**

The following is a list of instruments used at all data collection time points:
- Demographic questionnaire
- Social Support Network Questionnaire (SSNQ)
- Center for Epidemiologic Studies – Depression (CES-D)
- Contraceptive use questions from National Longitudinal Study of Adolescent Health
- Infant Toddler Social Emotional Assessment (ITSEA)
- Parenting Stress Index (PSI)
- Father involvement questions
- Attachment Style Questionnaire (ASQ)
- Service Utilization questions
- Pregnancy and Sexual history questions

d. **Statistical techniques employed**

To investigate questions of intervention effectiveness, first intervention and comparison groups were compared on variables used in analyses with chi-square tests and one-way ANOVAs to describe bivariate associations with group status before conducting multivariate analyses. Next, unadjusted regression models were run to predict outcomes at follow-up from group membership. Then, a series of adjusted regression models were run adding baseline values for outcome variables and other covariates to the previous models. In some cases, interaction terms were also included in subsequent models to examine moderating factors.

IV. **Detailed Findings**

Our primary research question was whether the Generations program is effective at preventing rapid repeat pregnancies in teen mothers. To answer this question we first examined the outcome of contraceptive use at 12 months (a more proximal outcome). We found that being enrolled in the Generations program was associated with greater use of effective contraception at 12 months, controlling for baseline contraceptive use and other related covariates (AOR = 2.59, p = 0.08, n = 121). Mothers in the Generations program had relative steady use of contraception over time, whereas there was a significant decline in use among comparison mothers. We next examined repeat pregnancy at 24 month follow-up and found that mothers in the Generations program had approximately half the likelihood of a repeat pregnancy compared to comparison group mothers (AOR = 0.55, CI = 0.24-1.29, n = 96).

We also examined maternal depression as an outcome and found that mothers in the Generations group were less likely than comparison group mothers to report clinically significant levels of depression at 12 months, but that this difference was eliminated by 24 months. Early examinations of child outcomes show some differences between treatment and comparison group but these analyses have not yet been completed.
In addition to investigating treatment effects, we also examined other relationships between important variables in our dataset. Specifically, we examined predictors of maintaining contraceptive use over time, and found that teens who perceived any emotional support from their own mothers were nearly four times more likely to maintain contraceptive use (AOR = 3.74), and teens who lived with their own mothers were more than five times more likely to maintain contraceptive use (AOR = 5.49). However, teens who reported tangible support from their own mothers were less likely to maintain contraceptive use over time (AOR = 0.27).

We also examined predictors of maternal depression and found that teen mothers who were in school or had graduated from high school at baseline were 79% less likely to report being depressed at any point during the study period (AOR = 0.21), and teen mothers who perceived support from their baby’s father were also less likely than those reporting no support from the father to report depression (AOR = 0.37). Teen mothers who perceived high strain with the father of the baby were three times more likely than those who perceived low strain to report depression (AOR = 3.13). Similarly high support from the father of the baby was negatively associated with child externalizing behavior problems and high strain with the father of the baby was positively associated with child externalizing behavior problems when children were a year old.

We also investigated prenatal father involvement as a predictor of outcomes for mothers. We found that higher prenatal father involvement was associated with decreased odds of maternal depression in the first year (AOR = 0.91), and low strain with the father in the postpartum period (AOR = 1.428). Low strain in the parents’ relationship partially mediated the relationship between prenatal father involvement and maternal postpartum depression.

We also examined predictors of positive school trajectories for teen mothers in our sample. We found in multivariate analyses that having parents as a main source of financial support at baseline was uniquely associated with mothers’ returning to school at some point during the study period (AOR = 11.93), and staying in school throughout the study period (AOR = 7.92). Also, having tangible support from the father of the baby reduced the odds of teen mothers staying in school (AOR = 0.16), independent of parental financial support.

V. Discussion and Interpretation of Findings
   a. Conclusions to be drawn from data

There are a number of important conclusions to be drawn from the findings presented above. First, the Generations intervention is effective at preventing rapid repeat pregnancies in teen mothers. This reduction is primarily accomplished through the increased use of contraceptives by mothers in the Generations program compared to mothers receiving standard pediatric primary care. We also found that two key support relationships play important roles in outcomes for teen mothers and their young children. The teen mother’s relationship with her own mother has a complex relationship to her ability to maintain contraceptive use over time, and also plays a role in her ability to stay in school, but does not have any effect on her depressive symptoms or her child’s behavior. On the other hand, the quality of a teen mother’s relationship with the father of her baby has a significant influence on her depression and her child’s behavior.
b. **Explanation of study limitations**

This study has a number of limitations. First, small sample sizes limited our ability to separate clinically meaningful group differences from sampling error. This is a common problem in studies of teen parents. Second, our measures were limited to maternal report, which is susceptible to the influence of social desirability. However, data were collected without the data collector seeing the participants’ responses, and data were not collected by, or shared with, program staff. Third, contraceptive behavior, a primary outcome variable was only measured at two points in time, so we don’t know about consistency of use between data collection time points. Fourth, there were concerns about the validity of our process data. Right in the middle of the time period in which we collected data for this study, Children’s National (the institution in which Generations is located) transitioned from paper to electronic medical records. Thus, when we began the study we were collecting process data on paper, and by the end of the study the process data were collected electronically. Unfortunately, during the time of transition to electronic medical records, data were recorded incorrectly and inconsistently as clinicians learned the system, problems were worked out, and the infrastructure was improved. We did have a period of collecting both paper and electronic data during this transition, but doing both was burdensome to an already taxed staff. However, when we compared paper to electronic data we found many inconsistencies, leading us to question the reliability and validity of the electronic data in particular. We therefore don’t have the process data that we would ideally like to use in order to better understand our outcome data.

c. **Comparison with findings of other studies**

To date, there have been a small number of studies specifically evaluating teen-tot programs. They have found positive outcomes in terms of mothers’ educational attainment and prevention of repeat pregnancies. However, these studies were small, conducted decades ago, and have numerous methodological flaws that preclude any meaningful conclusions about the model’s effectiveness. The current study is the first to test the effectiveness of the full teen-tot model as implemented in Generations. The findings of increased contraceptive use and decreased rapid repeat pregnancies among Generations participants are consistent with these earlier studies.

Our other findings, particularly those regarding predictors (other than intervention participation) of outcomes for teen mothers, had some consistency with previous research, but also were significant expansions of previous research. Specifically, our finding that living with her own mother after the birth of the baby is by far the strongest predictor of a teen mother maintaining contraceptive use is consistent with previous research, but our disentangling of the differential effects of tangible and emotional support from the teen’s own mother is an extension of previous work. Similarly, by disaggregating both type of support and source of support, we found that teen mothers without parental financial support, who are dependent on the father of the baby for material needs, are at significantly greater risk for falling behind in their education. This is a significant advance over previous research that looks at family support as a monolithic entity. We also found that support from the father of the baby, but not from the teen mother’s own mother, is
predictive of maternal depression. Again, previous research has found general relationships between social support and mental health, but our research was able to delve further into this relationship and distinguish sources of support, which has important implications for intervention.

d. Possible application of findings to actual MCH health care delivery

Most teen pregnancy prevention programs to date are curriculum-based, delivered in after school or community-based organizations, or in school during the regular school day. Such programs have an important role in the prevention repertoire, but they also have some significant limitations. They are less likely to reach those teen parents who are not in school or who are disconnected from community-based services. With a focus on individual-level factors, they are also less likely to address family and community factors that may influence teens’ sexual behaviors and decision-making.

The Generations intervention offers a promising, innovative approach to pregnancy prevention for a high-risk group of teens. It has a wide reach since its based in pediatric primary care – a universal and non-stigmatized setting. It intervenes on numerous levels from individual to family to social determinants. The basic infrastructure for its implementation already exists in many healthcare settings across the country. It is therefore a model that can be integrated into existing primary care settings, which makes it highly feasible, potentially relatively low cost, and sustainable. While more research is needed, this study is the first step in determining whether this model should be a standard of care for teen parent and similarly vulnerable families. It not only informs teen pregnancy prevention interventions, but also adds support to ongoing efforts to increase implementation of patient and family-centered medical homes as a gold standard of care.

Our other findings also point to the importance of the quality of the relationships that teen mothers have with the fathers of their babies and with their own mothers. MCH care for teen mothers and their children should work to strengthen these relationships and to include fathers and teen mothers’ own mothers as coparents and as important sources of support.

e. Policy implications

Findings from this study have significant policy implications. Changes in policies regarding third party payment structures are needed to better support the implementation of patient-centered medical homes and integration of mental health services into primary care. An example is Medicaid policies regarding billing by more than one provider for one patient in one day. Additionally, current funding for most integrated models of care depend on philanthropic and grant funding, both of which are not sustainable over the long term. Upfront investment by institutions, governments, and/or third party payors may offer clear cost benefit by reducing costly repeat pregnancies and care for additional children. Also, cost-effectiveness analyses of patient-centered medical home models should, based on these findings, include the cost savings of reducing unintended pregnancies.

f. Suggestions for further research

This study leads to a number of important directions for future research. First, this study represents an efficacy trial – a testing of an intervention in an ideal setting and implemented by the practitioners who developed it. The next step in this line of
research is an effectiveness trial – implementing and evaluating the intervention in other settings to determine whether it can be implemented with fidelity and whether implementation can achieve similar outcomes across settings. In addition to implementing it in other hospital-based primary care clinics in other communities, our team would like to also evaluate its implementation in Federally Qualified Health Centers, school-based health centers, and other community-based primary care settings in which teen parents are served. Second, additional process data about program implementation are clearly needed. Changes to existing primary care infrastructures, intervention dosage, the degree of integration that occurs, and implementation challenges must all be carefully assessed and documented. Third, cost-effectiveness analysis must be built into future research about this intervention model. Some of this work has been begun (see VI.e. “additional grants obtained” below), but because cost data were not collected prospectively, conclusions at this point are limited. Such cost information is critical in informing both future health care delivery (institutional level) as well as policy (third party payor and government levels) decisions.

VI. List of Products
   a. Conference Presentations:


b. Peer reviewed manuscripts published:

c. Peer reviewed manuscripts under review:
1. Street, T.M., Mitchell, S.J., & Lewin, A. The role of key support relationships in psychosocial outcomes for teen mothers and their young children. *Family Relations* (revise and resubmit).

d. Peer reviewed manuscripts in progress (tentative list):

e. Additional grants obtained (to analyze and supplement data collected from this study):
*Title:* A Cost-Effectiveness Analysis of an Innovative Care Model for Teen Parent Families
*Funder:* University of Maryland ADVANCE Program Interdisciplinary and Engaged Research Seed Grant (NSF award HRD1008117)
*Dates of Award:* April 2015-March 2016
*Amount of Award:* $20,000
References

5. Shuger L. Teen pregnancy and high school dropout: What communities can do to address these issues. Washington, DC: The National Campaign to Prevent Teen and Unplanned Pregnancy and America’s Promise Alliance;2012.


