Heterogeneity among adolescent mothers and home visiting program outcomes☆

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A B S T R A C T

Despite the challenges of early parenting, many adolescents navigate motherhood successfully, underscoring an overlooked heterogeneity among adolescent mothers. The present study used Latent Class Analysis (LCA) to identify subgroups of adolescent mothers (n = 704) enrolled in a randomized controlled trial (RCT) evaluation of a home visiting program for young parents. The model incorporated demographic and background characteristics, as well as indicators of psychological vulnerability. Analyses revealed four distinct subgroups: (a) non-Hispanic high vulnerability (n = 209, 30%); (b) Hispanic high vulnerability (n = 98, 14%); (c) non-Hispanic moderate vulnerability (n = 241, 34%); and (d) Hispanic moderate vulnerability (n = 156, 22%). Mothers in the two high vulnerability subgroups exhibited the poorest personal and parenting functioning outcomes measured approximately two years postpartum, particularly in terms of child maltreatment (non-Hispanic high vulnerability) and depressive symptoms (Hispanic high vulnerability). Analyses revealed positive effects of the home visiting program within specific latent classes on such outcomes as healthy baby at birth, high school or GED attainment, and repeat birth.

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1. Introduction

In 2013, there were 27 births for every 1000 adolescent females aged 15 to 19 years of age in the U.S., with Hispanic (41.7 per 1000) and Black (39.0 per 1000) teens exhibiting the highest rates (Child Trends, 2014). Although these rates have declined over the past two decades (Yang & Gaydos, 2010), adolescent parenthood remains a significant concern for policymakers and practitioners. The literature suggests that young mothers, especially those with difficult life circumstances, often are not well-prepared to simultaneously negotiate the developmental tasks of adolescence and parenthood (Coyne & D’Onofrio, 2012; Meade, Kershaw, & Ickovics, 2008). Research indicates that adolescent mothers typically demonstrate less sensitive and responsive parenting, have lower school achievement and poorer mental health (Beers & Hollo, 2009; Child Trends, 2014; Coley & Chase-Lansdale, 1998; Lachance, Burrus, & Scott, 2012) compared to women who become mothers later in their development. Nonetheless, many do navigate these transitions successfully, underscoring a heterogeneity of responses to young motherhood that is often overlooked (Jaffee, Caspi, Moffitt, Belsky, & Silva, 2001; Oxford et al., 2005).

1.1. Heterogeneity among adolescent mothers

An ample body of research has revealed a host of individual and family background and demographic characteristics and circumstances that are commonly associated with adolescent motherhood. On average, adolescent mothers are more likely to be Black or Hispanic relative to their peers; they frequently grow up in single parent and low-income households, experience residential mobility and challenging family relationships, and have mothers who were young parents themselves (Child Trends, 2014; Coley & Chase-Lansdale, 1998; Coyne & D’Onofrio, 2012; Jaffee et al., 2001; Manlove, Steward-Streng, Peterson, Scott, & Wildsmith, 2013; Meade et al., 2008). Young parenthood is also linked to various indicators of psychological vulnerability, including childhood maltreatment, depression, social isolation and association with deviant peers, and risky behavior and substance use (Coley & Chase-Lansdale, 1998; Coyne & D’Onofrio, 2012; Manlove et al., 2013; Meade et al., 2008).

While this past research presents a troubling portrait of adolescent mothers, it is important to consider that these prior studies were based largely on variable-centered approaches that compare groups of

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adolescent mothers to older mothers, thereby masking the diversity in young parents’ backgrounds and risk factors (Coyne & D’Onofrio, 2012). Indeed, one study utilizing a person-centered analysis of adolescent mothers found that 43% fit into a “normative” profile, exemplified by financial independence, avoidance of high-risk behaviors, and average health and mental health outcomes (Oxford et al., 2005). A further 42% were considered psychologically vulnerable, and 15% faced problems across most domains of adult development. Many adolescent mothers do not experience unfavorable outcomes, particularly those with fewer problems and more stable families pre-pregnancy, as well as young women who remained in school, had aspirations for the future, delayed having subsequent children, and had family or partner support post-pregnancy (Chase-Lansdale, Brooks-Gunn, & Paikoff, 1991; Jaffee et al., 2001; Oxford, Gilchrist, Gillmore, & Lohr, 2006; Oxford et al., 2005). Even young women exposed to significant pre-pregnancy risks, such as a history of parental abuse and poverty, do not necessarily demonstrate unfavorable outcomes (Easterbrooks, Chaudhuri, Bartlett, & Copeman, 2011). The trajectory of failure that is often stereotypically assigned to ethnic minority and poor teenagers who give birth was countered by Leadbeater and Way (2001) who documented multiple pathways to success, including pursuit of education and work, and building relationships with competent partners.

Thus, heterogeneity is apparent in background circumstances and vulnerabilities, as well as in personal and parental functioning outcomes among adolescent mothers. Identifying individual background characteristics and experiences that differentiate patterns of adaptation to adolescent parenting, then, is a useful empirical endeavor, both to challenge stereotypically negative portrayals of adolescent mothers, and to enable programs to develop more appropriate, targeted services and supports for those mothers who need them.

1.2. Programs for adolescent mothers

In general, successful programs for young mothers apply a preventive approach, intervene early and at multiple points in time, incorporate a range of components or services, and support young mothers’ children past infancy (Chase-Lansdale & Brooks-Gunn, 2014; Seitz & Apfel, 1999). Home visiting is one such service modality used with young mothers. While home visitation encompasses a range of approaches, the service typically offers an individualized approach by taking place within clients’ homes, involving participants in their own goal-setting, and including other family members (Beers & Hollo, 2009). Due to its flexibility, this service modality is especially useful with vulnerable families, including those headed by young mothers, even though few home visiting programs to date have specifically targeted teen parents (Barlow et al., 2015).

Home visiting has been supported by an increasing body of high-quality evidence, including several randomized controlled trials (RCTs), which have documented favorable, albeit somewhat inconsistent, findings across several relevant domains, including maternal health and well-being, child health and development, economic self-sufficiency, and reproductive health (for reviews see e.g., Azzi-Lessing, 2011; Howard & Brooks-Gunn, 2009; Peacock, Konrad, Watson, Nickel, & Muhajarine, 2013; Sweet & Appelbaum, 2004). While the use of RCTs and other rigorous study designs have helped to establish overall program impact of home visiting – and have thus been instrumental in the recent national expansion of home visiting programs in the U.S. – they do not necessarily allow for examination of the complexity and diversity of participating families and the ways they use home visiting programs. Specifically, when there is no overall program impact, it does not mean that the program is not effective for specific subgroups. Indeed, it has been documented that effects of home visiting programs may be dependent on exposure to risk factors, including depression, history of child maltreatment, and income variations, though findings vary in terms of whether mothers with more risks benefited more – or less – from home visiting than mothers facing fewer risks (Easterbrooks et al., 2013; Howard & Brooks-Gunn, 2009; Peacock et al., 2013; Sweet & Appelbaum, 2004).

Increasingly evaluations of intervention programs have incorporated participants’ background circumstances and contexts and risk factors as important moderators of program effects (Weiss, Bloom, & Brock, 2013). Yet, traditional subgroup analyses may be plagued by Type 1 error, low statistical power, and difficulties exploring higher-order interactions, particularly when multiple subgroup indicators are of interest (Lanza & Rhoades, 2013). Our recent assessment of impacts of a statewide home visiting program for young mothers found several overall program effects (Jacobs et al., 2016), yet further examination is needed to determine variations in program effects according to specific subgroups of young mothers. Towards this end, we systematically examine the heterogeneity of adolescent parenthood by using a person-centered method to identify subgroups of participants based on multiple indicators and then assess variations in program impact among the subgroups.

1.3. The current study

The study reported in this paper is based on an RCT of a statewide home visiting program for young parents. Given the diversity among young mothers suggested by the literature, the first objective of this study was to identify subgroups of adolescent parents with varying configurations of background circumstances and psychological vulnerability using Latent Class Analysis (LCA), a person-centered method that identifies underlying (unobserved) population subgroups using observed indicators. Based on an initial assessment of influential subgroups in this sample (Tufts Interdisciplinary Evaluation Research, 2015), the LCA model incorporated several baseline (Time 1) indicators, including demographic and background characteristics and circumstances, such as maternal age at child’s birth, race/ethnicity, place of birth, financial difficulties, residential mobility, living arrangements, receipt of public programs; as well as indicators of psychological vulnerability, such as clinical depression, post-traumatic stress, history of childhood maltreatment, and low social connection. These indicators cover a range of ecological domains and risk factors hypothesized to differentiate young mothers and, as described below, predict a varied response to the home visiting intervention (Lanza & Rhoades, 2013; Monsen, Banerjee, & Das, 2010). We hypothesized that there would be at least two subgroups or classes of mothers: a psychologically vulnerable class with co-occurring exposure to challenging background circumstances, and a class of mothers with lower to moderate levels of psychological vulnerability, less stressful circumstances, and more social support. Demographic variables, such as race/ethnicity and place of birth were included in analyses due to their potential to serve as proxies for particular groups’ experiences of supports and social connections and/or of ecological risks and disadvantage that could be useful differentiators of the subgroups (Rogoff & Angelillo, 2002; Schwartz et al., 2014).

A second objective was to examine whether effects of a statewide home visiting program for young parents facilitated a successful transition to adulthood and parenting for particular subgroups of young mothers compared with others. We examined the extent to which personal and parenting functioning varied among the subgroups of participants, as well as whether impacts of the home visiting program on personal and parenting functioning were conditional on subgroup membership. We expected that membership in the vulnerable class would be associated with less optimal parenting and personal functioning outcomes relative to the other class. We also predicted that the strongest home visiting program effects would be observed among mothers in the highly vulnerable group, thereby attenuating some of the deleterious influence of risk and vulnerability on their personal and parenting functioning.
2. Materials and methods

Data were drawn from a randomized controlled trial (RCT) evaluation of Healthy Families Massachusetts (HFM). The focal program, an affiliate of Healthy Families America (HFA), is a statewide, universal, voluntary newborn home visiting program for first-time young parents under 21 years of age living in Massachusetts; it provides home visits, goal-setting activities, group-based activities, and referral services to young parents, beginning prenatally or until the child turns one year of age, and continuing until the child’s third birthday. The program’s stated goals are to: (a) prevent child abuse and neglect by supporting positive, effective parenting; (b) achieve optimal health, growth, and development in infancy and early childhood; (c) encourage educational attainment, job, and life skills among parents; (d) prevent repeat pregnancies during the teen years; and (e) promote parental health and well-being. Eligibility requirements for participating in the RCT included being a consenting English–Spanish-speaking female aged 16 years or older who had not received any HFM services in the past (i.e., no transfers or re-enrollments). Full details of the evaluation study have been presented elsewhere (Tufts Interdisciplinary Evaluation Research, 2015); methods relevant to the present analysis are presented here.

2.1. Participants

Eligible women who consented to participate in the study were randomly assigned to either the program group or the control group. A total of 837 participants were recruited for the study (62% program group, n = 517); however, 16% (n = 133) did not participate in the evaluation due to ineligibility, refusal, or change of contact details. Evaluation activities included granting access to administrative public agency data and participating in telephone interviews at three time points: about one month after enrollment (Time 1, T1; n = 704), about 12 months after enrollment (T2; n = 585, 83%), and about 24 months after enrollment (T3; n = 614, 87%). Participants were also offered the option of participating in an additional 2-2.5 hour in-depth, in-person interview, completed by 473 mothers at T1 (67%), 401 at T2 (69%), and 409 at T3 (67%).

Participants were mostly U.S. born (81%) and reported their race/ethnicity as non-Hispanic White (37%), Hispanic (36%), Black (19%), and other (8%). Participating mothers were 19 years of age ($M = 18.76, SD = 1.28$) at the time of their first child’s birth; two thirds (65%) enrolled into the study prenatally. Target children (53% male) were 2 years of age ($M = 24.58$ months, $SD = 6.67$) at T3, when personal and parenting functioning outcomes were assessed.

2.2. Measures

Descriptive statistics for study measures are presented in Table 1 (for further detail on all measures, see Tufts Interdisciplinary Evaluation Research, 2015).

2.2.1. Indicators of latent classes

Indicators of background and demographic characteristics and psychological vulnerability were used to identify the latent classes, as described in Sections 2.2.1.1 and 2.2.1.2.

Table 1

<table>
<thead>
<tr>
<th>Background and demographic characteristics (T1)</th>
<th>%</th>
<th>M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White, Non-Hispanic</td>
<td>36.8</td>
<td></td>
</tr>
<tr>
<td>Black, Non-Hispanic</td>
<td>19.0</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>36.1</td>
<td></td>
</tr>
<tr>
<td>Other, Non-Hispanic</td>
<td>8.1</td>
<td></td>
</tr>
<tr>
<td>U.S. born</td>
<td>80.8</td>
<td></td>
</tr>
<tr>
<td>Moved in past year</td>
<td>57.5</td>
<td></td>
</tr>
<tr>
<td>Received 1 public program since pregnancy</td>
<td>43.0</td>
<td></td>
</tr>
<tr>
<td>Experiencing financial difficulties</td>
<td>59.4</td>
<td></td>
</tr>
<tr>
<td>18 or older at child’s birth</td>
<td>69.9</td>
<td></td>
</tr>
<tr>
<td>Lives with adult relative or legal guardian</td>
<td>73.1</td>
<td></td>
</tr>
<tr>
<td>Maternal depression</td>
<td>37.6</td>
<td></td>
</tr>
<tr>
<td>Maternal depression</td>
<td>62.5</td>
<td></td>
</tr>
<tr>
<td>Mothers’ childhood history of maltreatment</td>
<td>55.0</td>
<td></td>
</tr>
<tr>
<td>Low social connection</td>
<td>66.5</td>
<td></td>
</tr>
<tr>
<td>Outcomes (T3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substantiated child maltreatment</td>
<td>20.3</td>
<td></td>
</tr>
<tr>
<td>Healthy baby at birth</td>
<td>78.1</td>
<td></td>
</tr>
<tr>
<td>Child behavioral problems</td>
<td>12.9 (7.1)</td>
<td></td>
</tr>
<tr>
<td>High school or GED</td>
<td>71.7</td>
<td></td>
</tr>
<tr>
<td>College attendance</td>
<td>13.7</td>
<td></td>
</tr>
<tr>
<td>Repeat birth</td>
<td>13.9</td>
<td></td>
</tr>
<tr>
<td>Maternal depression</td>
<td>32.0</td>
<td></td>
</tr>
</tbody>
</table>

2.2.1.1. Background and demographic characteristics. The following self-reported data pertaining to mothers’ background and demographic characteristics were collected during the T1 telephone interview: maternal race/ethnicity (White non-Hispanic, non-Hispanic Black, Hispanic, and other non-Hispanic); nativity (U.S. born or born in U.S. territory/foreign born); whether mother moved in year prior to interview (yes, no); whether mother received two or more public programs including cash assistance, food/nutritional assistance, Women, Infants, and Children (WIC), Supplemental Security Income (SSI), teen living program or shelter, housing vouchers, Section 8 housing or public housing, child care vouchers, or other public assistance programs since pregnancy; whether mother experienced difficulties paying expenses ($0 = “no or very few difficulties” and $1 = “some or major difficulties”); whether mother was younger than 18 at the time of her first birth; and whether mother lived with an adult relative or legal guardian at T1. Most of the sample (96%) had data on all of the background and demographic characteristics or were missing data on only one item.

2.2.1.2. Indicators of psychological vulnerability. We assessed several indicators of maternal psychological vulnerability, including (a) depressive symptoms, (b) post-traumatic stress disorder (PTSD), (c) childhood history of maltreatment, and (d) low social connection. Mothers’ clinical depression was assessed during the T1 telephone interview using the Center for Epidemiological Studies-Depression (CES-D; Radloff, 1977), a 20-item scale assessing depressive symptoms experienced during the past week (e.g., “I felt that I could not shake off the blues even with help from my family or friends”) rated on a four-point Likert scale ($0 = “not at all” to $3 = “a lot”). An indicator variable was created reflecting scores of 16 or higher, which signify clinically significant symptoms. Post-Traumatic Stress Disorder (PTSD) symptomatology was assessed during the in-person interview using the adolescent version of the University of California Los Angeles Post Traumatic Stress Disorder Reaction Index for the Diagnostic and Statistical Manual of Mental Disorders IV (PTSD-R; Pynoos, Rodriguez, Steinberg, Stuber, & Frederick, 1998), in which mothers were asked whether they had been exposed to 13 traumatic experiences (e.g., natural disasters, domestic violence, community violence), and, if there was trauma exposure, the frequency of PTSD symptoms ($0 = “none” to $4 = “most of the time”) affiliated with these experiences over the past 30 days. A...
categorical variable was created, indicating whether participants met criteria for full or partial PTSD diagnosis or no PTSD diagnosis (vs. no PTSD). Mothers’ childhood history of child maltreatment pertaining to substantiated reports of physical abuse, neglect, or sexual abuse was ascertained from Massachusetts Child Protective Services (CPS) records. Social connection was assessed during the T2 telephone interview using 21 items from the Positive Youth Development measure (PYD; Lerner et al., 2005), assessing mothers’ connections to family (six items, e.g., “My parents give me help and support when I need it.”), school (seven items, e.g., “I get a lot of encouragement at my school.”), peers (four items; e.g., “My friends care about me.”), and community (five items, e.g., “Adults in my city or town make me feel important.”). Scores ranged from 0 to 100, and an indicator variable denoting low social connection was created for women with scores lower than 75. The majority of the sample (70%) had data on all four vulnerability indicators or was missing data on only one item.

2.2.2.4. Maternal education. Two indicators of mothers’ educational attainment were included in analyses. Mothers reported whether they finished high school or received a GED by T3, as well as whether they completed one or more years of college.

2.2.2.5. Repeat birth. Mothers reported whether they had a repeat birth by T3.

2.2.2.6. Maternal depression. Maternal depressive symptoms were assessed at T3 using the CES-D (described in Section 2.2.1.2).

2.3. Analytic approach

Analyses proceeded in the following steps. To test the first study objective focused on identifying subgroups of adolescent parents, we conducted a Latent Class Analysis (LCA) to detect subgroups or classes of participants with similar configurations of background circumstances and psychological vulnerability. To test the second study objective, exploring whether effects of a statewide home visiting program for young parents facilitated a successful transition to adulthood and parenting for particular subgroups of young mothers compared with others, we first regressed outcomes on the latent classes to examine variability in personal and parenting functioning among the classes. Subsequently, we explored whether program effects (i.e., differences in outcomes between mothers in the program and control groups) were moderated by latent class membership.

LCA is a mixture modeling technique that offers a principled, model-based approach to identifying subpopulations, and rigorous methods for evaluating alternative solutions (Bauer, 2007). LCA uses multiple dichotomous indicators (i.e., variables) to identify the unique combination of variables across individuals, and is used when the number and composition of subgroups in an existing population is not known beforehand (Butera, Lanza, & Coffman, 2014; Lanza, Tan, & Bray, 2013; Lukkhe & Muthén, 2005). Conditional item probabilities (probabilities of endorsing a particular item for individuals within a given class) are used to attach substantive meaning to the latent classes (Nylund, Asparouhov, & Muthén, 2007).

The procedure for conducting LCA involves estimating models with varying numbers of classes, beginning with a 2-class model, until a model with the proper number of classes is identified by comparing model fit indices and assessing theoretical interpretability. The following statistical criteria were used: the Bayesian Information Criterion (BIC; Schwarz, 1978), bootstrap likelihood ratio test (BLRT; Nylund et al., 2007), and Lo–Mendell–Rubin test (LMR; Lo, Mendell, & Rubin, 2001).

A three-step procedure was used to investigate relations between the subgroups identified using LCA and other variables (i.e., program status and outcomes). First, the LCA model was estimated. Second, a categorical class membership variable was created that assigned participants to the particular class in which they had the highest likelihood of membership based on the latent class posterior distribution. Third, the outcomes of interest were regressed on the categorical class membership variable, taking measurement error (i.e., misclassification) into account (Asparouhov & Muthén, 2014). Finally, we tested whether home visiting program effects on personal and parenting functioning outcomes differed within the subgroups by regressing program status on each outcome within each latent class taking into account misclassification. To formally test the moderation of program effects by latent class membership, we used the Model test procedure in Mplus. This procedure compares the model fit statistics of the hypothesized model, in which association between program status and each outcome differs depending on class, against the fit statistics of the model, in which associations are restricted to be the same. Evidence of moderation is confirmed when the Wald Test of parameter constraints is significant, which indicates that we reject the null hypothesis that the association between program status and each outcome is the same in each class.

Analyses were conducted in Mplus 7.3, using Maximum Likelihood estimation with robust standard errors to account for clustering of mothers within recruitment catchment areas. Missing data were addressed using Maximum Likelihood Estimation (ML), in which participants with missing data are classified based on the overall pattern of their observed responses (Enders, 2008, 2010). ML has gained popularity in recent years as a robust and efficient approach to modeling with missing data, allowing analysts to fully utilize all available data. It has been shown to produce unbiased parameter estimates and standard errors under the missing at random (MAR) assumption (Schafer & Graham, 2002). A challenge associated with modeling with missing data is that gains made through ML will be lost when covariates and predictors with missing data are incorporated into the model (Heron et al., 2012); techniques for dealing with this challenge are still being developed. In our study, models with covariates, outcomes, and
moderators suffered from listwise deletion. Covariance coverage was acceptable (73%-100%) for all variables except one (our measure of PTSD had a lot of missingness, 34% to 42%). Missing data on the outcomes, due to sample attrition, ranged from 2% to 16%. Patterns of missingness were comparable across the program and control groups and the LCA groups.

3. Results

The results are organized around specific research aims. The first aim was to determine if there were subgroups of adolescent mothers with varying configurations of background circumstances and psychological vulnerability derived from the LCA analysis. The second aim was to examine if young mothers' personal and parenting functioning varied according to the subgroups identified through the LCA analysis. The final aim was to examine if there were differential impacts of the home visiting program on the outcomes according to the subgroups.

3.1. Subgroups among young mothers

The best fitting model revealed four distinct subgroups differentiated by indicators of background and demographic circumstances, as well as psychological vulnerability. Table 2 shows conditional item probabilities for each class. Specifically, we found two groups of highly vulnerable mothers: non-Hispanic high vulnerability (n = 209, 30% of total sample) and Hispanic high vulnerability (n = 98, 14%); both groups were characterized by high psychological vulnerability (depression, PTSD, childhood victimization, low social connectedness) and indicators of economic and family stress (residential mobility, difficulty covering expenses, receipt of public programs, low family support). The Hispanic high vulnerability subgroup was comprised entirely of Hispanic mothers, of whom more than one third was born in Puerto Rico or outside of the U.S. Among these two highly vulnerable subgroups, the Hispanic participants were more likely to have a history of childhood maltreatment and low social connections.

For mothers in the moderate vulnerability subgroups, the proportion of those assigned to home visiting services reflected the overall study strategy to assign 60% to the program group, but the proportion of mothers assigned to the home visiting program was unequal in the two high vulnerability subgroups: with fewer mothers (55%) in the program group than expected (60%). These two groups of mothers were similar to each other on the psychological vulnerability indicators, and were differentiated from each other primarily by race/ethnicity and nativity. Relative to their more vulnerable counterparts, it is notable that the women in the two moderate vulnerability groups were younger when they had their first child and were more likely to live with adult caregivers at T1.

3.2. Variations in personal and parenting functioning among subgroups

The second analysis examined variation in personal and parenting functioning among the four subgroups of adolescent mothers identified through the LCA analysis. As evident from Table 2, there were differences among mothers in the four subgroups on five out of the seven personal and parenting functioning outcomes; there were no differences between subgroups on healthy birth or on incidence of repeat births. Where there were differences, young mothers in the two moderate vulnerability subgroups generally demonstrated more favorable personal and parenting functioning compared to the high vulnerability subgroups. More specifically, mothers in the moderate vulnerability subgroups were approximately two times less likely to have a substantiated CPS report relative to mothers in the non-Hispanic high vulnerability subgroup, and were less clinically depressed than Hispanic high vulnerability mothers. The two moderate vulnerability subgroups were similar to each other on most indicators of personal and parenting functioning with the exception of high school completion, in which mothers in the non-Hispanic moderate vulnerability subgroup was more likely to have graduated high school or received a GED than the Hispanic moderate vulnerability mothers. Analyses also revealed several other noteworthy differences relevant to the high vulnerability subgroups: The likelihood of having a substantiated maltreatment report was highest among non-Hispanic high vulnerability mothers, whereas Hispanic high vulnerability mothers reported the highest probability (over 50%) of meeting clinical criteria for depression. In addition, Hispanic high vulnerability mothers reported higher levels of child behavior problems and lower high school attainment relative to non-Hispanic mothers with either moderate or high vulnerability. Educational findings varied across subgroups, but indicated that non-Hispanic moderate vulnerability mothers had higher high school/GED attainment compared with both Hispanic subgroups, and were twice as likely to complete at least one year of college compared with non-Hispanic high vulnerability mothers.

3.3. Differences in home visiting program impact among subgroups

Our final analysis step involved testing whether differences in home visiting program impact varied depending on subgroup membership,
summarized in Table 4. We observed significant program impacts within specific subgroups on three outcomes: healthy baby at birth, high school or GED attainment, and repeat birth. A favorable program effect on the healthy birth was apparent for both groups of highly vulnerable mothers. For repeat birth, participation in the home visiting program led to a reduced likelihood in two subgroups: the non-Hispanic moderate vulnerability and the Hispanic high vulnerability subgroups. For high school/GED completion, contrasting program effects were revealed, with higher rates of completion among mothers in the non-Hispanic moderate vulnerability subgroup who participated in the program, and lower rates among mothers in the Hispanic highly vulnerable subgroup who participated in the program.

4. Conclusion

Although adolescent mothers often are represented in the literature as a homogeneous group, with similar characteristics, experiences, and parenting, the present study investigated their heterogeneity, including variation in personal and parenting functioning two years postpartum, as well as differential impacts of a home visiting program for young parents on their personal and parenting functioning. As expected, the LCA yielded different subgroups of mothers distinguished according to psychological vulnerability, but also by race/ethnicity, notably being Hispanic, and nativity. Specifically, four distinct groups were identified: Hispanic high vulnerability, non-Hispanic high vulnerability, non-Hispanic moderate vulnerability, and Hispanic moderate vulnerability. The differentiation of young Hispanic mothers in our analysis, approximately 40% of who were born in Puerto Rico or outside of the U.S., may be due to changing demographic landscape of adolescent mothers in Massachusetts. In 2008 when we were recruiting for this study, the birthrate for adolescent Latinas was 67 per 1000 compared to 20 per 1000 in Massachusetts overall (National KIDS COUNT, 2015). As a result, the home visiting program may have more aggressively recruited young Hispanic women, particularly those with high levels of psychological vulnerability, who may have been flagged in other state systems, such as CPS or juvenile justice.

We also hypothesized that personal and parenting functioning would vary according to the anticipated subgroups, with the less vulnerable mothers doing better on these indices than more vulnerable mothers. In general, this hypothesis was also supported: For example, mothers in the moderate vulnerability subgroups were less likely to have a substantiated maltreatment report than were non-Hispanic high vulnerability mothers, and were less likely to report clinical levels of depressive symptoms than Hispanic high vulnerability mothers. Non-Hispanic moderate vulnerability mothers also had higher educational attainment than more vulnerable mothers. The pattern of findings suggest that young mothers characterized by relatively low levels of psychological vulnerability—who also were slightly younger and more likely to reside with adult relatives—experienced a more favorable transition to parenting than more vulnerable young mothers.

A final point on personal and parenting functioning concerns the Hispanic high vulnerability subgroup. The tendency for this subgroup to report both higher levels of depression and child behavior problems—which are likely related—compared to the other groups may be explained by considering aspects of their pre-pregnancy histories. Mothers in this group were most likely to have histories of childhood maltreatment and low social support. The child maltreatment literature is replete with studies documenting increased risk of maltreatment in the context of a parent’s own childhood history of maltreatment and low social support (see, e.g., Schofield, Lee, & Merrick, 2013). In light of this, the fact that the Hispanic high vulnerability mothers were less likely than the non-Hispanic high vulnerability mothers to have substantiated child maltreatment reports is noteworthy. Perhaps this difference in CPS reports, which were primarily for neglect, is a favorable consequence of prioritizing family building in the context of a network of extended family support activated by childbearing (Diez & Mistry, 2010).

Finally, we predicted that the impact of the home visiting program on outcomes would be stronger for more vulnerable mothers; this prediction received partial support. Mothers in both high vulnerability groups who were enrolled in HFM had more favorable health outcomes (e.g., birth weight, gestational age, newborn physical condition) relative to mothers in the control group, using a relatively high criterion for healthy birth (i.e., Apgar scores > 9). Given the presence of universal health coverage and prenatal care in Massachusetts when the present study took place, we would expect most women in the study to experience a healthy birth—and, indeed, they did; there was no main effect of the program on birth outcomes. That there was a differential impact here suggests that the program may be able to influence the prenatal behaviors, such as diet, smoking, and substance use, of those mothers most at risk for poor birth outcomes. Prevention of

Table 3
Means and probabilities for personal and parenting functioning by latent class.

<table>
<thead>
<tr>
<th>Substantiated child maltreatment</th>
<th>Healthy baby at birth</th>
<th>Child behavioral problems</th>
<th>High school or GED</th>
<th>Repeat birth</th>
<th>Maternal depression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hispanic moderate vulnerability</td>
<td>.14 (.03)</td>
<td>.78 (.03)</td>
<td>12.08 (.082)</td>
<td>.78 (.03)</td>
<td>.30 (.03)</td>
</tr>
<tr>
<td>Hispanic moderate vulnerability</td>
<td>.14 (.04)</td>
<td>.76 (.03)</td>
<td>13.08 (1.05)</td>
<td>.67 (.04)</td>
<td>.20 (.06)</td>
</tr>
<tr>
<td>Non-Hispanic high vulnerability</td>
<td>.32 (.04)</td>
<td>.78 (.03)</td>
<td>12.29 (1.09)</td>
<td>.09 (.02)</td>
<td>.34 (.05)</td>
</tr>
<tr>
<td>Hispanic high vulnerability</td>
<td>.22 (.05)</td>
<td>.83 (.04)</td>
<td>16.01 (1.65)</td>
<td>.11 (.05)</td>
<td>.53 (.06)</td>
</tr>
</tbody>
</table>

Notes. Within the same row, * different from Class 1; † different from Class 2; ‡ different from Class 3; ‡‡ different from Class 4 at p < .05.

Table 4
Home visiting program effects on personal and parenting functioning within subgroups.

<table>
<thead>
<tr>
<th>Substantiated child maltreatment</th>
<th>Healthy baby at birth</th>
<th>Child behavioral problems</th>
<th>High school or GED</th>
<th>Repeat birth</th>
<th>Maternal depression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hispanic moderate vulnerability</td>
<td>1.56</td>
<td>0.94</td>
<td>−1.29 (0.82)</td>
<td>2.83 **</td>
<td>0.52 **</td>
</tr>
<tr>
<td>Hispanic moderate vulnerability</td>
<td>0.94</td>
<td>0.39</td>
<td>−0.80 (1.81)</td>
<td>0.50</td>
<td>3.38</td>
</tr>
<tr>
<td>Non-Hispanic high vulnerability</td>
<td>0.94</td>
<td>2.34 **</td>
<td>0.37 (1.48)</td>
<td>0.70</td>
<td>1.70</td>
</tr>
<tr>
<td>Hispanic high vulnerability</td>
<td>0.32</td>
<td>9.59 **</td>
<td>−0.30 (2.82)</td>
<td>0.52 **</td>
<td>7.29</td>
</tr>
</tbody>
</table>

Notes. Table presents unstandardized coefficients (standard errors) for the continuous outcome (child behavioral problems), and odds ratios for binary outcomes.

* Denotes significant program effect at p < .05.
** Denotes significant program effect at p < .01.
repeat birth within two years of study enrollment also was more likely among home visiting participants, but only among two subgroups (non-Hispanic moderate vulnerability and Hispanic high vulnerability mothers). It is not clear why the program was differentially effective here, perhaps some mothers were on a “family track” and the program supported them in this endeavor. Finally, the educational attainment goal (receipt of high school or GED) showed diverging program effects, with non-Hispanic moderate vulnerability mothers more likely to attain this educational goal if they were enrolled in the program, but Hispanic high vulnerability mothers less likely if they were enrolled in the program. Although speculative, the program may have encouraged the Hispanic high vulnerability mothers to focus on their parenting functioning at the cost of – at least in the short-term – their educational attainment (Diez & Mistry, 2010).

4.1. Strengths and limitations

The strengths of this research include a large, diverse sample of young women and an RCT research design. The design of the study allowed us to establish program effects for four subgroups of mothers, thus adding to the growing field of evidence-based home visiting programs. Moreover, our results were strengthened by the use of an empirically rigorous analytic approach to identifying underlying subgroups in the sample.

While the present study makes an important contribution to our understanding of the heterogeneity of adolescent mothers and how this heterogeneity moderates the effects of a home visiting program on their personal and parenting functioning, several limitations merit attention. Results reported are limited to young mothers 16–20 years of age who lived in Massachusetts. While we expect the LCA analysis is robust and likely replicable with other samples of young mothers of similar ages, caution should be used in generalizing program effects to adolescent parent populations not represented in our study, including very young mothers, non-English or -Spanish speaking mothers, young mothers with severe disabilities, and young fathers, all of whom were ineligible for the present study.

Finally, non-equivalence between the program and control groups was observed in the two high vulnerability subgroups, with relatively fewer mothers in the program group in the non-Hispanic high vulnerability group, and more program mothers in the Hispanic one. This difference perhaps reflects the higher likelihood of Hispanic and foreign-born mothers in the program group within the larger RCT. That the mothers in Hispanic high vulnerability group had worse outcomes than the non-Hispanic high vulnerability group for three of the seven outcomes examined, suggests that the greater proportion of home visiting program recipients in the Hispanic high vulnerability subgroup relative to the non-Hispanic high vulnerability subgroup did not bias the findings.

4.2. Future directions

The study reported in this paper extends prior analysis of overall program impacts of the home visiting program on young mothers. Evidence of heterogeneity among the young mothers and variations in program impact precipitated the need for more in-depth analyses to generate and test possible explanations and mechanisms that may account for these differences. Although we expected latent classes differentiated by vulnerability, we did not expect the differentiation by Hispanic ethnicity (and nativity) for both high and moderate vulnerability classes. We are pursuing further analysis of the circumstances of participants in the Hispanic subgroups to understand the basis for observed findings. For example, how might membership in minority and immigrant communities, with their more expansive views of family and prioritizing of goals for particular groups or vulnerability profiles, influence outcomes?

4.3. Policy implications

Public policy is often described as a “blunt instrument,” resulting from consensus among disparate constituencies, not attuned to nuances in the conditions it is meant to address. Adolescent parenting is a case in point. There is consensus that it is a problem, and that preventing these births should be the first public line of defense. As for those adolescents who are pregnant or who already are raising children, the goals of programs and policies directed to this population range from preventing rapid repeat births, to preventing child maltreatment, to promoting child growth and development and parental wellbeing, to increasing parental education and employment. With the advent of the Affordable Care Act, home visitation has received federal endorsement as one of the promising programmatic approaches to increasing child well-being among vulnerable families, including these young families.

But the devil is in the details. Our analyses highlight significant heterogeneity among adolescent mothers. This raises questions about whether or not all the program's goals should be core for all young families in all programs serving this population (the blunt instrument approach), or whether programs should consider focusing particular messages on particular subgroups of families, or on individual families at special risk. For example, the Hispanic high vulnerability mothers apparently responded well to the program's advice about forestalling repeat births. Perhaps the program should expend additional efforts toward this subgroup, rather than attempting to reduce repeat births among all young mothers, some of whom may be in stable relationships, with ample familial supports ready to carry the burden as needed.

It might be more useful for programs to keep in mind the overarching goal of promoting the healthy growth and development of these babies and their parents, allowing for different strategies for different subpopulations at different stages of parenting in order to achieve these ends. We know that parental educational achievement, for example, promotes economic self-sufficiency and predicts more advantageous life trajectories for children, but perhaps allowing that strategy to lag behind (for some period of months, or years) what appears more immediate to some mothers — notably, becoming good parents — would make more strategic sense. For vulnerable participants it may well be necessary to prioritize among program goals, for example, focusing on parenting support over pursuit of education, understanding that a “successful” transition to parenthood may look very different for these more vulnerable mothers. Policymakers and program personnel would do well to better integrate the goals and timetables that families hold for themselves into program and policy design.

Interestingly, program effects on healthy birth, rapid repeat birth, and high school attainment were not achieved for the full sample in the overall impact analysis (Jacobs et al., 2016). The approach taken in the current paper — to examine variability in outcomes according to differences in participant characteristics and circumstances — uncovered these unique program effects not seen in the full sample. Thus, the impact of the program is actually broader than was initially established when the sample was treated as a single group, but as we argue in this paper, this breadth is achieved only for particular constellations of moms. Heterogeneity among the young mothers and differences in program impacts have significant implications for further customization of services and efforts, diversifying strategies and eligibility requirements, and prioritizing of goals for particular groups or vulnerability profiles.