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Personality and adolescent pregnancy outcomes

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Abstract

Aims—To examine the relationship between personality, pregnancy and birth outcomes in adolescents

Background—Personality has been shown to be a strong predictor of many health outcomes. Adolescents who become pregnant have worse birth outcomes than adults.

Design—Cross-sectional study using data from the National Longitudinal Study of Adolescent Health (baseline, 1994-1995; follow-up, 2007-2008).

Methods—The study sample was 6529 girls, 820 of whom reported on pregnancy outcomes for a teenage birth. Personality data was taken from the Mini International Personality Item Pool personality tool, which measures the five-factor personality traits of neuroticism, conscientiousness, intellect/imagination, extraversion and agreeableness. Logistic regression was used to predict teen pregnancy and linear regression was used to predict birth weight and gestational age with adjustment for confounders and stratification by race.

Results—Agreeableness and intellect/imagination were associated with a reduced likelihood of becoming pregnant as an adolescent, while neuroticism, conscientiousness and extraversion were all associated with an increased likelihood of becoming pregnant. Higher neuroticism was associated with lower birth weight and gestational age among Black girls, but not non-Black. Conscientiousness was associated with lower gestational age among non-Black girls. No

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DECLARATIONS OF INTEREST

The authors have no conflict of interest to report.

Author Contributions:

All authors have agreed on the final version and meet at least one of the following criteria (recommended by the ICMJE*):

1. substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;
2. drafting the article or revising it critically for important intellectual content.

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relationships were found with extraversion or agreeableness and birth outcomes. Receiving late or no prenatal care was associated with higher intellect/imagination.

Conclusions—Personality is understudied with respect to pregnancy and birth outcomes compared with other health outcomes. Such research could help professionals and clinicians design and target programs that best fit the characteristics of the population most likely to need them, such as those with high neuroticism.

Keywords

birth weight; continental population groups; pregnancy in adolescence; premature birth; prenatal care; nurses/midwives/nursing

INTRODUCTION

As a group, adolescents have worse birth outcomes than adults (Chen *et al.* 2007, World Health Organization 2008), but the factors that predict birth outcomes in this adolescent group are much less studied. Personality has been shown to be related to several health outcomes, a finding consistent across several countries and cultures (Fry *et al.* 2009, Iwasa *et al.* 2008, Schrier *et al.* 2013, Voracek 2006), but few researchers have examined its associations with pregnancy and birth outcomes.

BACKGROUND

Personality is a robust, longitudinal predictor of many health outcomes. One of the most common and broad personality inventories incorporates five factors: conscientiousness (reliability, conventionality, industriousness), neuroticism (emotional stability), extraversion, openness (intellectual curiosity, appreciation for art, imagination) and agreeableness. Studies of this five-factor inventory find that higher conscientiousness is strongly related to reduced mental and physical disorders, fewer physical limitations, slower disease progression and longevity (Friedman 2000, Goodwin *et al.* 2006, Jokela, Batty, *et al.* 2013, O’Cleirigh *et al.* 2007) and has also been associated with a reduced risk of hypertension, sciatica, stroke, hernia, tuberculosis, joint problems, renal failure and mental illness (Goodwin *et al.* 2006). Reviews and meta-analyses indicate that conscientiousness, but not other personality factors, are associated with lower obesity (Jokela, Hintsanen, *et al.* 2013) and diabetes risk (Jokela, Elovainio, *et al.* 2013). Neuroticism predicts worse physical health and mental health, including coronary heart disease (Jokela, Pulkki-Raback, *et al.* 2013), as well as worse subjective well-being (Friedman *et al.* 1995, Goodwin *et al.* 2006). Extraversion is associated with lower risk of some mental health issues (Goodwin *et al.* 2006) and stroke death (Jokela, Pulkki-Raback, *et al.* 2013). Centenarians score high on conscientiousness, extraversion and openness (Masui *et al.* 2006) and these factors have been prospectively associated with mortality (Fry *et al.* 2009, Iwasa *et al.* 2008). Openness has also been associated with reduced metabolic risk (van Reedt Dortland *et al.* 2012). Cancer incidence and mortality seem largely unaffected by personality, however (Jokela *et al.* 2014).

Some of the reasons for these associations are clear. Generally, conscientiousness is associated with a reduced likelihood of harmful health behaviors and an increased likelihood of health-promoting behaviors. The subfacets of conscientiousness, including conventionality, sense of duty and industriousness, predispose to forming intentions in line with societal values (such as health) and being able to carry them out (Bogg 2008). A meta-analysis of 194 studies concluded that conscientiousness was associated with a reduced likelihood of drug use, excessive alcohol use, unhealthy eating, risky driving, risky sex, suicide, tobacco use and violence (Bogg *et al.* 2004). They also found that many of these relationships were stronger in those <30 years (Bogg *et al.* 2004), especially in women (Hampson *et al.* 2006, Kashdan *et al.* 2005). The strongest associations are seen with drug and alcohol use, risky driving, violence and physical activity, with weaker associations (though still significant) with eating behaviors, smoking and risky sexual behavior (Bogg *et al.* 2004, Rhodes *et al.* 2006). Women with high conscientiousness are less likely to smoke during pregnancy (Maxson *et al.* 2012). Neuroticism is also consistently associated with less health-promoting behavior, including sexual risk-taking and physical activity (Hoyle *et al.* 2000, Rhodes *et al.* 2006). Extraversion tends to have mixed associations: greater physical activity (de Bruijn *et al.* 2005, Rhodes *et al.* 2006) and wellness behavior (Booth-Kewley *et al.* 1994), but increased likelihood of smoking, alcohol use and not getting enough sleep, demonstrated in both college students and Navy personnel (Booth-Kewley *et al.* 1994, Raynor *et al.* 2009). The combination of high extraversion and low conscientiousness is also associated with alcohol use during pregnancy (Ystrom *et al.* 2012). Agreeableness has generally been associated with better health behaviors, including reduced sexual risk taking (Hoyle *et al.* 2000), increased vegetable consumption (de Bruijn *et al.* 2005) and less traffic risk-taking (Booth-Kewley *et al.* 1994). These associations are quite stable: personality in childhood predicts adult health behaviors, even after 40 years (Hampson *et al.* 2006).

Personality also relates to health care seeking and compliance. Some studies have found that adherence to a treatment regimen, associated with conscientiousness, was more strongly associated with health than treatment assignment (active vs. placebo) (Friedman 2008). Diabetic children and their mothers who demonstrated high conscientiousness, low neuroticism and high agreeableness had better glycemic control (Vollrath *et al.* 2007). Conscientiousness is also associated with better disease progression in people with HIV, partly due to medication adherence (O'Cleirigh *et al.* 2007). Neuroticism can be characterized by pessimism and lack of adherence to treatment regimens, or obsessive adherence and vigilance (Friedman 2008). For instance, neuroticism has been associated with use of anxiolytics and antidepressants during pregnancy, but also with quitting smoking during pregnancy (Ystrom *et al.* 2012). Neuroticism can also affect how symptoms are presented to clinicians and the treatment patients receive (Ellington *et al.* 1999). However, personality, particularly conscientiousness, has been shown to be related to outcomes such as overall health status and mortality, beyond the known associations with behavior and health care compliance (Friedman *et al.* 1995, Hampson *et al.* 2007, Lodi-Smith *et al.* 2010).

Despite the numerous associations seen with health behaviors and other health outcomes, personality has not been extensively studied with respect to pregnancy. Only a handful of pregnancy-related studies on a variety of topics can be mentioned. Higher extraversion,

openness, conscientiousness and emotional stability are associated with women having more children (Jokela *et al.* 2011). Unplanned pregnancy is associated with higher neuroticism and lower agreeableness and conscientiousness (Berg *et al.* 2013, Bouchard 2005). Neuroticism has been associated with more somatic symptoms during pregnancy, while agreeableness is associated with fewer symptoms (Puente *et al.* 2011). The only study of birth outcomes that we are aware of found that higher neuroticism was associated with fetal growth restriction and smaller head circumference; extraversion was not associated with birth outcomes, nor was there an association between personality and preterm birth (Chatzi *et al.* 2012). Another study found that women with higher neuroticism and introversion were more likely to have Caesarean deliveries and labor/birth complications, but found no associations with agreeableness or conscientiousness (Johnston *et al.* 2012). Mothers who score high on conscientiousness and extraversion and low on neuroticism are more likely to breastfeed (Brown 2013).

AIMS

The purpose of this study was to examine the association of personality with adolescent pregnancy and birth outcomes among adolescents. We hypothesized that personality traits associated with more favorable health outcomes (conscientiousness, extraversion) would be associated with a reduced risk of adolescent pregnancy and better birth outcomes, while personality traits associated with more negative health outcomes (neuroticism) would be associated with worse outcomes.

DESIGN

The National Longitudinal Study of Adolescent Health (Add Health) is a cohort study of youth enrolled in grades 7-12 (Harris *et al.* 2011). Data were collected at this baseline (1994-95 school year; Wave I), with follow-ups in 1996 (Wave II), 2001 (Wave III) and 2007-08 (Wave IV). To obtain a nationally-representative sample, a multistage probability clustered sampling was used for the initial sample: the first stage was a stratified, random sample of all public and private high schools in the U.S. and a middle school/junior high that was a feeder school for the each selected high school was also included. The project attempted to survey all students attending the selected schools. The second stage (detailed in-home interviews) consisted of a random core sample plus selected special oversamples. The resident mother (or other parent if not available) of the in-home sample was also interviewed. Sampling weights were used to adjust for the study design and loss to follow-up. We report a cross-sectional study of personality and birth outcomes, both measured at Wave IV.

Sample

90,118 in-school interviews and 20,745 in-home interviews with adolescents were conducted, with 17,669 parents of the in-home sample interviewed (85% response rate). All participants in the Wave I in-home interview were eligible for re-interview at Wave IV; 15,701 such interviews were conducted (80.3% response rate). Mean and median age at Wave IV was 28 (range 24-32). For our analysis, a dataset relevant to adolescent pregnancy was created. First, we limited to females who participated in Wave IV, as that was the only

Wave by which all participants were old enough to have provided complete data on teen pregnancies. Second, we limited our analysis to participants with valid sampling weights, to allow for statistically accurate models and extrapolations to a national population. This gave us 6529 participants with complete data (covariates described below) for the analyses of adolescent pregnancy. Analyses of birth outcomes were limited to 938 singleton livebirths from first pregnancies that occurred during adolescence and after Wave I; 820 participants had complete data on predictors and covariates.

Data collection

Measures

Outcomes: At Wave IV girls were asked about previous pregnancies and their outcomes. If they had gotten pregnant, they were asked ‘How did this pregnancy end?’, with options of abortion, ectopic/tubal, miscarriage, stillbirth and livebirth. If they indicated they had given birth, they were asked ‘How much did the baby weigh at birth?’, ‘Was [baby’s name] born before or after [his/her] due date?’ and then ‘How many weeks or days early/late was [baby’s name] born?’ This was subtracted from 40 weeks to calculate gestational age.

Validity and reliability: Mother’s report of birth outcomes is generally reliable (Adegboye *et al.* 2008, Hakim *et al.* 1992).

Predictors: Personality was measured using the Mini International Personality Item Pool (Mini-IPIP),(M. Brent Donnellan *et al.* 2006) administered at Wave IV. Respondents are given a list of statements such as ‘I am the life of the party’ and ‘I don’t talk a lot’ and asked ‘How much do you agree with each statement about you as you generally are now, not as you wish to be in the future?’, with responses ranging from 1 (strongly agree) to 5 (strongly disagree).

Validity and reliability: This instrument has previously been tested for reliability, factor structure and criterion validity in this study; results generally supported a five-factor scale of conscientiousness, extraversion, agreeableness, intellect/imagination and neuroticism. (Baldasaro *et al.* 2012) The analysis also found metric invariance across races for the factors, but scalar invariance was not supported for extraversion, intellect/imagination and neuroticism. This means that the scores can be used to examine relationships between personality traits and other variables for both Blacks and Whites, but that scores cannot be directly compared across race for the three scales on which scalar invariance was not supported.(Baldasaro *et al.* 2012)

Some personality-related questions were also administered at Wave I. These are not a standardized personality scale, though they can be used to examine the neuroticism, extroversion and conscientiousness facets of personality (Young *et al.* 2011). We chose to focus on the mini-IPIP questions, because 1) it was a standard scale, 2) it examined the entire five-factor personality scale and 3) its psychometric properties have been characterized more extensively. Personality is generally stable across time, particularly when characteristics are examined in rank order (Roberts *et al.* 2000). We examined the Wave I personality measurement as a secondary analysis.

Although the sample weighting adjusts for variable loss to follow-up across demographic groups, it is possible that it is less precise in accounting for other factors. Personality has been associated with loss to follow-up in previous research, with those showing higher levels of openness, conscientiousness and agreeableness less likely to be lost to follow-up (Jerant *et al.* 2009). In these data, there was no relationship between personality measured at Wave I and participation in Wave IV: ORs=1.00 (0.97, 1.04), $p=0.75$; 1.00 (0.97, 1.04), $p=0.94$; and 1.00 (0.96, 1.04), $p=0.90$, were found for indicators of neuroticism, extroversion and conscientiousness, respectively.

Confounders/mediators: Except where otherwise indicated, all confounders were measured at Wave I. Self-reported race was specified as Black / non-Black. Pre-pregnancy body mass index (BMI) was measured (an analysis substituting BMI at other waves closer in proximity to pregnancy did not affect results). Pregnancy-specific behaviors were reported at Wave IV, including smoking during pregnancy (yes/no) and receipt and trimester of prenatal care initiation (first, coded as early and second/third or no prenatal care, coded as late/none). Family poverty was based on parental report of income and household size; if the annual household income was below the national threshold for the poverty status, then the family was considered in poverty. Health insurance was based on the parent's answer to the question 'What kind of health insurance does [NAME] (i.e., the adolescent) have?' Medicaid and Medicare were categorized as public insurance; 'individual or group private coverage', 'prepaid health plans (such as an HMO or CHAMPUS)' and 'other' were categorized as private insurance; and 'none' was categorized as no health insurance. Parent education was based on the higher reported of either co-residential mother or father. Educational achievement at Wave IV was categorized as high school or greater, or less than high school. Child's overall perception of relationship with mother was measured by asking adolescents how much they agree or disagree with the question 'Overall, you are satisfied with your relationship with your mother' on a 1 to 5 scale. Parental disapproval of child having sex was measured by parent's reporting how much they agree or disagree with the statement 'You disapprove of [adolescent's name] having sexual intercourse at this time in [his/her] life' (Deptula *et al.* 2010), on a 5-point scale. Parental control was measured by summing the (reverse-coded) responses to seven questions asking adolescents whether parents let them make their own decisions, such as the food respondents eat, the clothes they wear, their curfew and the shows that they watch on television (Deptula *et al.* 2010, Vaughn *et al.* 2011).

Data analysis

All analyses were conducted in SAS (SAS Institute, Cary, North Carolina) using survey procedures, which apply population weights to the statistical tests and models. Bivariate relationships between personality and becoming pregnant, as well as birth outcomes (birth weight and gestational age) were examined using logistic regression for dichotomous outcomes (Wald chi-square tests to calculate p-values) and linear regression for continuous outcomes (t-tests for the beta coefficients to calculate p-values). The standard errors used in calculating all statistics are weighted for the complex survey design, incorporating the non-independence between respondents due to school-based sampling.

Bivariate relationships between personality and potential confounders/intermediates were also run. Baseline age, age at pregnancy, BMI and parental education were included a priori in all models and mother-child relationship, parental control and parental disapproval of child having sex additionally in models of adolescent pregnancy, based on their predictive value in previous analyses (Harville *et al.* 2012, in press). Other potential confounders/mediators were tested for inclusion: health insurance, smoking during pregnancy, family poverty, prenatal care and educational achievement. None of these changed the effect estimate or the statistical significance for the personality variables and so they were omitted from final models. Because of the known differences in the context of adolescent pregnancy between racial groups (Casares *et al.* 2010), also indicated in our previous work with this sample (Harville *et al.* 2012), interactions with race (Black vs. non-Black), data for birth outcomes are presented stratified on this variable, with p-values for interactions associated with product terms. Multivariable logistic and linear regression was used, with all personality factors entered simultaneously into the models.

Ethical considerations

The Add Health Study was approved by the Institutional Review Board of the University of North Carolina at Chapel Hill and this secondary analysis was deemed exempt by the Institutional Review Board of Tulane University.

RESULTS

Fifteen percent of the overall sample was Black (Table 1). When the Black and non-Black girls who gave birth as adolescents were compared, mean agreeableness scores were higher in the non-Black girls (Table 2). Although mean neuroticism scores were also somewhat higher and extraversion scores lower in the Black girls, such score differences should not be interpreted as indicating significant differences due to a lack of scalar invariance (Baldasaro *et al.* 2012).

First, we examined the relationship between personality factors and the likelihood of getting pregnant as an adolescent, regardless of pregnancy outcome (Table 3). Neuroticism, conscientiousness and extraversion were all associated with an increased likelihood of becoming pregnant as an adolescent, while agreeableness and intellect/imagination were associated with a reduced likelihood of becoming pregnant. There were no significant interactions between race and personality for teen pregnancy. Extraversion was marginally associated with an increased likelihood of having an abortion vs. other options (aOR 1.07, 1.00-1.15), but no other personality factors were associated with pregnancy resolution (data not shown).

Personality factors were then examined for their associations with potential predictors of birth outcomes. None of the personality factors were associated with BMI or age at pregnancy. Receiving late or no prenatal care was associated with higher intellect/imagination ($p=0.02$; Table 4) and lower neuroticism ($p=0.06$). Smoking during pregnancy was not associated with personality. Family poverty was associated with lower conscientiousness, extraversion, agreeableness and intellect/imagination, as was having public health insurance (with the exception of extraversion). Having parents with less than a

high school education was associated with lower extraversion, agreeableness, and intellect/openness, while the girl's own lower educational achievement was associated with lower agreeableness and intellect/imagination. There were no significant interactions between race and personality in predicting the factors listed in Table 4.

Next, the relationships between personality and birth outcomes were examined. Higher neuroticism was associated with lower birth weight and gestational age among Black girls, but not non-Black (Tables 5 & 6). Conscientiousness was associated with lower gestational age among non-Black girls (Table 5). There were less strong tendencies for intellect/imagination to be associated with lower gestational age and conscientiousness to be associated with higher birth weight in Black girls. Adjustment for the potential confounders/mediators listed in Table 4 did not have a major effect on these results.

Use of the Wave I personality factors indicated that neuroticism increased the likelihood of adolescent pregnancy (aOR 1.04, 1.01-1.07, $p < 0.01$), but that there was no relationship with extraversion or conscientiousness. Conscientiousness was associated with increased likelihood of abortion in Black women only (aOR 1.11, 1.00-1.22), but there was no relationship with extraversion or neuroticism. There was no relationship between this measurement of personality and birth outcomes (data not shown).

DISCUSSION

Our data showed that personality, measured with a validated personality instrument, was a strong predictor of adolescent pregnancy. Neuroticism, conscientiousness and extraversion were all associated with an increased likelihood of becoming pregnant as an adolescent, while agreeableness and intellect/imagination were associated with a reduced likelihood of becoming pregnant. These results are consistent with previous research showing that neuroticism is associated with increased likelihood of unplanned pregnancy (Bouchard 2005) and unprotected sex (Hoyle *et al.* 2000); extraverted people are more likely to have multiple sex partners (Raynor *et al.* 2009); and agreeableness is associated with reduced unplanned pregnancy (Bouchard 2005) and sexual risk taking (Hoyle *et al.* 2000). A study of unmarried Indian mothers also found they scored higher on extraversion and neuroticism than controls (Singh *et al.* 1981). However, it is surprising that conscientiousness, generally associated with less unplanned pregnancy and less sexually risky behavior (Bogg *et al.* 2004, Bouchard 2005, Hagger-Johnson *et al.* 2011), was associated with an increased risk of adolescent pregnancy. A somewhat old study found that adolescents who became pregnant and kept the baby had higher neuroticism levels than those who had an abortion (Kane *et al.* 1973), which we did not confirm.

For birth outcomes, overall, our results are more consistent with the hypotheses for the Black adolescents than the non-Black ones. This analysis found neuroticism to be associated with lower birth weight and gestational age in Black adolescents, consistent with other studies showing neuroticism associated with worse health outcomes generally and worse birth outcomes in particular (Chatzi *et al.* 2012, Johnston *et al.* 2012). Conscientiousness was associated with lower gestational age in non-Black girls, which is not consistent with studies of most health outcomes (Friedman 2000, Goodwin *et al.* 2006, O'Cleirigh *et al.*

2007). The direction of association with conscientiousness for Black girls was more consistent with studies of other health outcomes (Friedman 2000, Goodwin *et al.* 2006, O’Cleirigh *et al.* 2007). Few studies have directly assessed the role of personality in predicting birth outcomes (Chatzi *et al.* 2012, Johnston *et al.* 2012). Some related concepts, such as self-esteem [low self-esteem may overlap with neuroticism (Robins *et al.* 2001)] have been studied; most studies have found that higher self-esteem is associated with better birth outcomes (Bodecs *et al.* 2011), at least in some groups (Edwards *et al.* 1994, St-Laurent *et al.* 2008), though not every study agrees (Copper *et al.* 1996). Adolescents born low birth weight have been shown to have personality differences (higher conscientiousness, lower agreeableness, lower openness) compared with controls (Pesonen *et al.* 2008), so there is also the possibility of some shared genetic variance.

Likely causes for relationships between personality and pregnancy outcomes are healthcare-seeking and health behaviors. A priori, one would hypothesize that conscientiousness would be associated with receiving early prenatal care, but in our data conscientiousness was unassociated with prenatal care receipt. Neuroticism could be associated with both increased and decreased care-seeking in general (Friedman 2008); in our data, higher neuroticism was associated with earlier prenatal care, so this would not account for the associations seen. Adjustment of the models for receipt of prenatal care did not seem to have an effect and smoking during pregnancy was not related to personality in this sample. However, it is still possible that conscientious adolescents have a healthier lifestyle in other ways and practice better self-care. Negative life events have been related to poor birth outcomes in some studies (Dunkel Schetter 2011), and people who score high on neuroticism experience more negative events in their lives (Friedman 2000). In addition, openness, agreeableness and neuroticism have been associated with cardiovascular and metabolic health (van Reedt Dortland *et al.* 2012), which are correlated with pregnancy outcomes (Harville *et al.* 2011).

Limitations

Strengths of the study include the large initial cohort and the nationally-representative sample. Limitations of the study include a fairly narrow range of outcomes, which precluded analyzing dichotomous outcomes like preterm birth or low birth weight and the associations, though statistically significant, are not large in absolute terms. Another limitation is that personality and birth outcomes were both reported at Wave IV. Personality is generally a stable trait, though more change may occur in early adulthood than later (Roberts *et al.* 2000). Conscientiousness is the factor that tends to change the most, increasing over the lifespan (M. B. Donnellan *et al.* 2008). Still, personality as a child predicts health outcomes as an adult (Friedman 2000) and many previous studies, related to both reproductive outcomes and other health outcomes, have measured personality simultaneously or after the outcome in question (Berg *et al.* 2013, Bouchard 2005, Brown 2013, Johnston *et al.* 2012, Jokela *et al.* 2011, Jokela, Hintsanen, *et al.* 2013, Masui *et al.* 2006, Singh *et al.* 1981, Whitfield *et al.* 2010).

It is possible that becoming a mother would be associated with personality changes, though the limited evidence does not suggest that this is strongly the case. In this sample, personality did not differ between women who had a miscarriage and women who had a

child (data not shown). One study found that having children was not associated with changes in sociability (relevant to extraversion), but was associated with increases in emotionality, especially among those with already high levels of emotionality (relevant to neuroticism) (Jokela *et al.* 2009); the other personality factors were not examined. Birth of a child was not associated with significant differences in mean personality traits (five-factor personality) among men or women in one study, but was associated with a less strong increase in conscientiousness over the life course (Specht *et al.* 2011). Another study found that women in their first year post-pregnancy were more impulsive but less socialized; however, overall, personality was relatively stable across the time period (Wiklund *et al.* 2009). Similarly, a short-term study of sex-typed personality measures before and after the birth of a child found rank-order stability in the 6 months after the birth of the child (Feldman *et al.* 1983). For the results of our study to be valid, personality does not have to be unchanging; the relationship between the personality factor and the outcomes needs not to change. In a study where personality data was collected at a time point prior to some and after some other reproductive history data collection (Jokela *et al.* 2010), the relationship between personality and childbearing was not different in the prospective and the retrospectively collected data.

CONCLUSIONS

Personality is understudied with respect to pregnancy and birth outcomes compared with other health outcomes. This line of research can help professionals and clinicians design and target programs that best fit the characteristics of the population most likely to need them. For instance, neuroticism is partially defined by experiencing feelings of irritability, anxiety, worry, hostility, vulnerability and personal inadequacy. Therefore, if girls with higher neuroticism are more likely to become pregnant, adolescent prevention programs may need to focus on managing emotions, especially those that might lead to vulnerability to poor sexual decisions. Similarly, if women with higher trait neuroticism are more likely to have worse birth outcomes, clinicians can support and encourage these women's propensity to seek medical care, but provide reassuring support to reduce the associated anxiety. Future research should examine how personality relates to birth outcomes among all pregnant women, not just adolescents, and should incorporate a prospective design to better establish causality. More research is also needed as to the mechanisms of these associations. Such research can provide insight into how mind, body and behavior interact to affect pregnancy health.

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References

- Adegboye AR, Heitmann B. Accuracy and correlates of maternal recall of birthweight and gestational age. *BJOG*. 2008; 115(7):886–893. [PubMed: 18485168]
- Baldasaro RE, Shanahan MJ, Bauer DJ. Psychometric Properties of the Mini-IPIP in a Large, Nationally Representative Sample of Young Adults. *Journal of Personality Assessment*. 2012 doi: 10.1080/00223891.2012.700466.
- Berg V, Rotkirch A, Väisänen H, Jokela M. Personality is differentially associated with planned and non-planned pregnancies. *Journal of Research in Personality*. 2013; 47(4):296–305. doi: 10.1016/j.jrp.2013.01.010.
- Bodecs T, Horvath B, Szilagyi E, Gonda X, Rihmer Z, Sandor J. Effects of depression, anxiety, self-esteem, and health behaviour on neonatal outcomes in a population-based Hungarian sample. *European Journal of Obstetrics, Gynecology, and Reproductive Biology*. 2011; 154(1):45–50. doi: 10.1016/j.ejogrb.2010.08.021.
- Bogg T. Conscientiousness, the transtheoretical model of change, and exercise: a neo-socioanalytic integration of trait and social-cognitive frameworks in the prediction of behavior. *J Pers*. 2008; 76(4):775–802. doi: 10.1111/j.1467-6494.2008.00504.x. [PubMed: 18482356]
- Bogg T, Roberts BW. Conscientiousness and health-related behaviors: a meta-analysis of the leading behavioral contributors to mortality. *Psychological Bulletin*. 2004; 130(6):887–919. doi: 10.1037/0033-2909.130.6.887. [PubMed: 15535742]
- Booth-Kewley S, Vickers RR Jr. Associations between major domains of personality and health behavior. *Journal of Personality*. 1994; 62(3):281–298. [PubMed: 7965560]
- Bouchard G. Adult Couples Facing a Planned or an Unplanned Pregnancy: Two Realities. *Journal of Family Issues*. 2005; 26(5):619–637. doi: 10.1177/0192513x04272756.
- Brown A. Maternal trait personality and breastfeeding duration: the importance of confidence and social support. *Journal of Advanced Nursing*. 2013 doi: 10.1111/jan.12219.
- Casares WN, Lahiff M, Eskenazi B, Halpern-Felsher BL. Unpredicted trajectories: the relationship between race/ethnicity, pregnancy during adolescence, and young women's outcomes. *Journal of Adolescent Health*. 2010; 47(2):143–150. doi: 10.1016/j.jadohealth.2010.01.013 [doi]. [PubMed: 20638006]
- Chatzi L, Koutra K, Vassilaki M, Vardiampasis A, Georgiou V, Koutis A, Kogevinas M. Maternal personality traits and risk of preterm birth and fetal growth restriction. *European Psychiatry*. 2012 doi: 10.1016/j.eurpsy.2011.11.006.
- Chen XK, Wen SW, Fleming N, Demissie K, Rhoads GG, Walker M. Teenage pregnancy and adverse birth outcomes: a large population based retrospective cohort study. *International Journal of Epidemiology*. 2007; 36(2):368–373. [PubMed: 17213208]
- Copper RL, Goldenberg RL, Das A, Elder N, Swain M, Norman G, Meier AM. The preterm prediction study: maternal stress is associated with spontaneous preterm birth at less than thirty-five weeks' gestation. National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. *American Journal of Obstetrics and Gynecology*. 1996; 175(5):1286–1292. [PubMed: 8942502]
- de Bruijn GJ, Kremers SP, van Mechelen W, Brug J. Is personality related to fruit and vegetable intake and physical activity in adolescents? *Health Educ Res*. 2005; 20(6):635–644. doi: 10.1093/her/cyh025. [PubMed: 15781444]
- Deptula DP, Henry DB, Schoeny ME. How can parents make a difference? Longitudinal associations with adolescent sexual behavior. *Journal of Family Psychology*. 2010; 24(6):731–739. doi: 10.1037/a0021760. [PubMed: 21171771]
- Donnellan MB, Lucas RE. Age differences in the Big Five across the life span: evidence from two national samples. *Psychol Aging*. 2008; 23(3):558–566. doi: 10.1037/a0012897. [PubMed: 18808245]
- Donnellan MB, Oswald FL, Baird BM, Lucas RE. The Mini-IPIP Scales: Tiny-yet-effective measures of the Big Five Factors of Personality. *Psychological Assessment*. 2006; 18(2):192–203. doi: 10.1037/1040-3590.18.2.192. [PubMed: 16768595]

- Dunkel Schetter C. Psychological science on pregnancy: stress processes, biopsychosocial models, and emerging research issues. *Annu Rev Psychol.* 2011; 62:531–558. doi: 10.1146/annurev.psych.031809.130727 [doi]. [PubMed: 21126184]
- Edwards CH, Cole OJ, Oyemade UJ, Knight EM, Johnson AA, Westney OE, Westney LS. Maternal stress and pregnancy outcomes in a prenatal clinic population. *Journal of Nutrition.* 1994; 124(6 Suppl):1006S–1021S. [PubMed: 8201440]
- Ellington L, Wiebe DJ. Neuroticism, symptom presentation, and medical decision making. *Health Psychology.* 1999; 18(6):634–643. [PubMed: 10619537]
- Feldman SS, Aschenbrenner B. Impact of parenthood on various aspects of masculinity and femininity: A short-term longitudinal study. *Developmental Psychology.* 1983; 19(2):278–289. doi: 10.1037/0012-1649.19.2.278.
- Friedman HS. Long-term relations of personality and health: dynamisms, mechanisms, tropisms. *Journal of Personality.* 2000; 68(6):1089–1107. [PubMed: 11130733]
- Friedman HS. The multiple linkages of personality and disease. *Brain, Behavior, and Immunity.* 2008; 22(5):668–675. doi: 10.1016/j.bbi.2007.09.004.
- Friedman HS, Tucker JS, Schwartz JE, Martin LR, Tomlinson-Keasey C, Wingard DL, Criqui MH. Childhood conscientiousness and longevity: health behaviors and cause of death. *Journal of Personality and Social Psychology.* 1995; 68(4):696–703. [PubMed: 7738772]
- Fry PS, Debats DL. Perfectionism and the five-factor personality traits as predictors of mortality in older adults. *Journal of Health Psychology.* 2009; 14(4):513–524. doi: 10.1177/1359105309103571. [PubMed: 19383652]
- Goodwin RD, Friedman HS. Health status and the five-factor personality traits in a nationally representative sample. *Journal of Health Psychology.* 2006; 11(5):643–654. doi: 10.1177/1359105306066610. [PubMed: 16908463]
- Hagger-Johnson G, Bewick BM, Conner M, O'Connor DB, Shickle D. Alcohol, conscientiousness and event-level condom use. *British Journal of Health Psychology.* 2011; 16(4):828–845. doi: 10.1111/j.2044-8287.2011.02019.x. [PubMed: 21988067]
- Hakim RB, Tielsch JM, See LC. Agreement between maternal interview- and medical record-based gestational age. *American Journal of Epidemiology.* 1992; 136(5):566–573. [PubMed: 1442720]
- Hampson SE, Goldberg LR, Vogt TM, Dubanoski JP. Forty years on: teachers' assessments of children's personality traits predict self-reported health behaviors and outcomes at midlife. *Health Psychology.* 2006; 25(1):57–64. doi: 10.1037/0278-6133.25.1.57. [PubMed: 16448298]
- Hampson SE, Goldberg LR, Vogt TM, Dubanoski JP. Mechanisms by which childhood personality traits influence adult health status: educational attainment and healthy behaviors. *Health Psychol.* 2007; 26(1):121–125. doi: 10.1037/0278-6133.26.1.121. [PubMed: 17209705]
- Harris, K.; Udry, JR.; Bearman, PS. The National Longitudinal Study of Adolescent Health: Study Design. 2011. Retrieved September 22, 2011, from <http://www.cpc.unc.edu/projects/addhealth/design/>
- Harville EW, Madkour AS, Xie Y. Predictors of birth weight and gestational age among adolescents. *American Journal of Epidemiology.* 2012; 176(Suppl 7):S150–163. doi: 10.1093/aje/kws231. [PubMed: 23035139]
- Harville EW, Madkour AS, Xie Y. Parent-child relationships, parental attitudes towards sex, and birth outcomes among adolescents. *J Pediatr Adolesc Gynecol.* in press.
- Harville EW, Viikari JS, Raitakari OT. Preconception cardiovascular risk factors and pregnancy outcome. *Epidemiology.* 2011; 22(5):724–730. doi: 10.1097/EDE.0b013e318225c960. [PubMed: 21709559]
- Hoyle RH, Fejfar MC, Miller JD. Personality and sexual risk taking: a quantitative review. *J Pers.* 2000; 68(6):1203–1231. [PubMed: 11130738]
- Iwasa H, Masui Y, Gondo Y, Inagaki H, Kawaai C, Suzuki T. Personality and all-cause mortality among older adults dwelling in a Japanese community: a five-year population-based prospective cohort study. *The American Journal of Geriatric Psychiatry.* 2008; 16(5):399–405. doi: 10.1097/JGP.0b013e3181662ac9. [PubMed: 18403571]

- Jerant A, Chapman BP, Duberstein P, Franks P. Is personality a key predictor of missing study data? An analysis from a randomized controlled trial. *Annals of Family Medicine*. 2009; 7(2):148–156. doi: 10.1370/afm.920. [PubMed: 19273870]
- Johnston RG, Brown AE. Maternal trait personality and childbirth: The role of extraversion and neuroticism. *Midwifery*. 2012 doi: 10.1016/j.midw.2012.08.005.
- Jokela M, Alvergne A, Pollet TV, Lummaa V. Reproductive behavior and personality traits of the Five Factor Model. *European Journal of Personality*. 2011; 25(6):487–500. doi: 10.1002/per.822.
- Jokela M, Batty GD, Hintsala T, Elovainio M, Hakulinen C, Kivimäki M. Is personality associated with cancer incidence and mortality? An individual-participant meta-analysis of 2156 incident cancer cases among 42 843 men and women. *Br J Cancer*. 2014 doi: 10.1038/bjc.2014.58.
- Jokela M, Batty GD, Nyberg ST, Virtanen M, Nabi H, Singh-Manoux A, Kivimäki M. Personality and all-cause mortality: individual-participant meta-analysis of 3,947 deaths in 76,150 adults. *Am J Epidemiol*. 2013; 178(5):667–675. doi: 10.1093/aje/kwt170. [PubMed: 23911610]
- Jokela M, Elovainio M, Nyberg ST, Tabak AG, Hintsala T, Batty GD, Kivimäki M. Personality and Risk of Diabetes in Adults: Pooled Analysis of 5 Cohort Studies. *Health Psychology*. 2013 doi: 10.1037/hea0000003.
- Jokela M, Hintsala T, Hintsanen M, Keltikangas-Järvinen L. Adult temperament and childbearing over the life course. *European Journal of Personality*. 2010; 24(2):151–166.
- Jokela M, Hintsanen M, Hakulinen C, Batty GD, Nabi H, Singh-Manoux A, Kivimäki M. Association of personality with the development and persistence of obesity: a meta-analysis based on individual-participant data. *Obes Rev*. 2013; 14(4):315–323. doi: 10.1111/obr.12007. [PubMed: 23176713]
- Jokela M, Kivimäki M, Elovainio M, Keltikangas-Järvinen L. Personality and having children: A two-way relationship. *Journal of Personality and Social Psychology*. 2009; 96(1):218–230. doi: 10.1037/a0014058. [PubMed: 19210076]
- Jokela M, Pulkki-Raback L, Elovainio M, Kivimäki M. Personality traits as risk factors for stroke and coronary heart disease mortality: pooled analysis of three cohort studies. *J Behav Med*. 2013 doi: 10.1007/s10865-013-9548-z.
- Kane FJ, Lachenbruch PA. Adolescent pregnancy: A study of aborters and non-aborters. *American Journal of Orthopsychiatry*. 1973; 43(5):796–803. doi: 10.1111/j.1939-0025.1973.tb00852.x. [PubMed: 4742821]
- Kashdan TB, Vetter CJ, Collins RL. Substance use in young adults: associations with personality and gender. *Addictive Behaviors*. 2005; 30(2):259–269. doi: 10.1016/j.addbeh.2004.05.014. [PubMed: 15621397]
- Lodi-Smith J, Jackson J, Bogg T, Walton K, Wood D, Harms P, Roberts BW. Mechanisms of health: Education and health-related behaviours partially mediate the relationship between conscientiousness and self-reported physical health. *Psychol Health*. 2010; 25(3):305–319. doi: 10.1080/08870440902736964. [PubMed: 20204934]
- Masui Y, Gondo Y, Inagaki H, Hirose N. Do personality characteristics predict longevity? Findings from the Tokyo Centenarian Study. *Age (Dordr)*. 2006; 28(4):353–361. doi: 10.1007/s11357-006-9024-6. [PubMed: 22253501]
- Maxson PJ, Edwards SE, Ingram A, Miranda ML. Psychosocial differences between smokers and non-smokers during pregnancy. *Addict Behav*. 2012; 37(2):153–159. doi: 10.1016/j.addbeh.2011.08.011. [PubMed: 22000409]
- O’Cleirigh C, Ironson G, Weiss A, Costa PT Jr. Conscientiousness predicts disease progression (CD4 number and viral load) in people living with HIV. *Health Psychology*. 2007; 26(4):473–480. doi: 10.1037/0278-6133.26.4.473. [PubMed: 17605567]
- Pesonen A-K, Räikkönen K, Heinonen K, Andersson S, Hovi P, Järvenpää A-L, Kajantie E. Personality of young adults born prematurely: The Helsinki study of very low birth weight adults. *Journal of Child Psychology and Psychiatry*. 2008; 49(6):609–617. doi: 10.1111/j.1469-7610.2007.01874.x. [PubMed: 18341548]
- Puente CP, Carmona Monge FJ, Abellán IC, Morales DM. Effects of personality on psychiatric and somatic symptoms in pregnant women: The role of pregnancy worries. *Psychology of Women Quarterly*. 2011; 35(2):293–302. doi: 10.1177/0361684310384105.

- Raynor DA, Levine H. Associations between the five-factor model of personality and health behaviors among college students. *Journal of American College Health*. 2009; 58(1):73–81. doi: 10.3200/jach.58.1.73-82. [PubMed: 19592356]
- Rhodes RE, Smith NE. Personality correlates of physical activity: a review and meta-analysis. *British Journal of Sports Medicine*. 2006; 40(12):958–965. doi: 10.1136/bjsm.2006.028860. [PubMed: 17124108]
- Roberts BW, DeVecchio WF. The rank-order consistency of personality traits from childhood to old age: a quantitative review of longitudinal studies. *Psychological Bulletin*. 2000; 126(1):3–25. [PubMed: 10668348]
- Robins RW, Tracy JL, Trzesniewski K, Potter J, Gosling SD. Personality correlates of self-esteem. *Journal of Research in Personality*. 2001; 35(4):463–482. doi: 10.1006/jrpe.2001.2324.
- Schrier AC, de Wit MA, Krol A, Fassaert TJ, Verhoeff AP, Kupka RW, Beekman AT. Similar associations between personality dimensions and anxiety or depressive disorders in a population study of Turkish-Dutch, Moroccan-Dutch, and native Dutch subjects. *Journal of Nervous and Mental Disease*. 2013; 201(5):421–428. doi: 10.1097/NMD.0b013e31828e110d. [PubMed: 23595096]
- Singh S, Singh A. Psycho-social correlates of unwed mothers. *Indian Journal of Clinical Psychology*. 1981; 8(1):9–13.
- Specht J, Egloff B, Schmukle SC. Stability and change of personality across the life course: The impact of age and major life events on mean-level and rank-order stability of the Big Five. *Journal of Personality and Social Psychology*. 2011; 101(4):862–882. doi: 10.1037/a0024950. [PubMed: 21859226]
- St-Laurent J, De Wals P, Moutquin JM, Niyonsenga T, Noiseux M, Czernis L. Biopsychosocial determinants of pregnancy length and fetal growth. *Paediatric and Perinatal Epidemiology*. 2008; 22(3):240–248. doi: 10.1111/j.1365-3016.2008.00926.x. [PubMed: 18426519]
- van Reedt Dortland AK, Giltay EJ, van Veen T, Zitman FG, Penninx BW. Personality traits and childhood trauma as correlates of metabolic risk factors: the Netherlands Study of Depression and Anxiety (NESDA). *Progress in Neuro-psychopharmacology and Biological Psychiatry*. 2012; 36(1):85–91. doi: 10.1016/j.pnpbp.2011.10.001. [PubMed: 22001949]
- Vaughn MG, Beaver KM, Wexler J, DeLisi M, Roberts GJ. The effect of school dropout on verbal ability in adulthood: a propensity score matching approach. *Journal of Youth and Adolescence*. 2011; 40(2):197–206. doi: 10.1007/s10964-009-9501-1. [PubMed: 20047084]
- Vollrath ME, Landolt MA, Gnehm HE, Laimbacher J, Sennhauser FH. Child and parental personality are associated with glycaemic control in Type 1 diabetes. *Diabet Med*. 2007; 24(9):1028–1033. doi: 10.1111/j.1464-5491.2007.02215.x. [PubMed: 17593242]
- Voracek M. Suicide rate and national scores on the Big Five personality factors. *Perceptual and Motor Skills*. 2006; 102(2):609–610. [PubMed: 16826683]
- Whitfield KE, Jonassaint C, Brandon D, Stanton MV, Sims R, Bennett G, Edwards CL. Does coping mediate the relationship between personality and cardiovascular health in African Americans? *J Natl Med Assoc*. 2010; 102(2):95–100. [PubMed: 20191921]
- Wiklund I, Edman G, Larsson C, Andolf E. First-time mothers and changes in personality in relation to mode of delivery. *Journal of Advanced Nursing*. 2009; 65(8):1636–1644. doi: 10.1111/j.1365-2648.2009.05018.x. [PubMed: 19602011]
- World Health Organization. Adolescent Pregnancy. *MPS Notes*. 2008; 1(1):1–4.
- Young JK, Beaujean AA. Measuring personality in wave I of the national longitudinal study of adolescent health. *Frontiers in Psychology*. 2011; 2:158. doi: 10.3389/fpsyg.2011.00158. [PubMed: 21808628]
- Ystrom E, Vollrath ME, Nordeng H. Effects of personality on use of medications, alcohol, and cigarettes during pregnancy. *Eur J Clin Pharmacol*. 2012; 68(5):845–851. doi: 10.1007/s00228-011-1197-y. [PubMed: 22189674]

SUMMARY

Why is this research or review needed?

- Extensive research links personality with many health outcomes, but personality has not been well-studied with respect to pregnancy and birth outcomes
- Risk factors for poor birth outcomes among adolescents specifically are not well-characterized

What are the key findings?

- Neuroticism (low emotional stability) is associated with a greater likelihood of teenage pregnancy and worse birth outcomes (among Black women)

How should the findings be used to influence policy/practice/research/education?

- Future research studies should address personality and birth outcomes prospectively.
- Personality may be useful to consider in designing adolescent pregnancy prevention programs and interventions for pregnant teens.
- Clinicians should provide additional support for those whose personality traits put them at higher risk for poor pregnancy outcomes, particularly those with high neuroticism.

Table 1
Characteristics of women who participated in Waves I and IV (n=6529)

	N (%) ^a
Race	
Non-black	5032(84.54)
Black	1497(15.46)
Teen pregnancy	
No	5093(77.96)
Yes	1436(22.04)
Baseline age	15.82(0.12)
BMI group	
Underweight	926(15.34)
Normal weight	4250(64.64)
Over weight	917(13.87)
Obese	436(6.16)
Parental education	
less than HS	5666(87.64)
HS	863(12.36)
	Mean (SE) ^a
Conscientiousness	14.88(0.05)
Extraversion	13.38(0.06)
Agreeableness	15.99(0.05)
Intellect	14.26(0.05)
Neuroticism	10.84(0.05)

^a All percentages and standard errors are weighted, incorporating population weights that adjust for the survey design, sampling frames and non-independence between respondents due to the school-based sampling

Table 2
Singleton livebirths from women whose first pregnancy occurred after Wave 1 and during adolescence at the Add Health Study, 1996-2007
(N=938)

	Black (n=297)	Non-black (n=641)	P-value ^b
Baseline age (mean[se]) ^a	15.5(0.25)	15.47(0.15)	0.89
Age at pregnancy (mean[se])	17.6(0.14)	17.82(0.09)	0.13
Baseline BMI category (n [%])			0.01
Underweight	29(9.93)	85(15.76)	
Normal weight	176(60.39)	411(66.9)	
Over weight	60(22.56)	90(12.41)	
Obese	19(7.11)	32(4.93)	
Parental education (n [%])			0.32
high school	232(81.83)	440(77.61)	
less than high school	41(18.17)	155(22.39)	
Neuroticism (mean[se])	11.72(0.19)	11.32(0.13)	0.09
Conscientiousness (mean[se])	14.87(0.16)	14.94(0.14)	0.76
Extraversion (mean[se])	12.81(0.18)	13.39(0.19)	0.04
Agreeableness (mean[se])	15.09(0.13)	15.62(0.11)	<0.01
Intellect (mean[se])	13.73(0.14)	13.64(0.12)	0.60

^a All percentages and standard errors are weighted, incorporating population weights that adjust for the survey design, sampling frames and non-independence between respondents due to the school-based sampling

^b Calculated by t-test for continuous variables and Wald chi-square test for categorical and dichotomous variables. The standard errors used in calculating all tests are weighted for population weights due to the complex survey design.

Table 3
Multivariable logistic regression model of personality variables and teen pregnancy (n= 6529)

	Odds Ratio (95% CI)	p-value ^a
Neuroticism	1.08 (1.05, 1.12)	<.001
Conscientiousness	1.03 (1.00, 1.07)	0.05
Extraversion	1.06 (1.03, 1.10)	<.001
Agreeableness	0.95 (0.92, 0.99)	0.02
Intellect	0.93 (0.91, 0.96)	<.001

^aCalculated by Wald chi-square test for categorical and dichotomous variables, with a null hypothesis of beta=0 or odds ratio=1. The standard errors used in calculating all tests are weighted for the complex survey design.

Table 4
Bivariate linear regression of personality and potential predictors of birth outcomes in Add Health, 1996-2007 (N=938)

	Conscientiousness			Extraversion			Agreeableness			Intellect			Neuroticism		
	Mean (se)	P ^a	Mean (se)	P	Mean (se)	P	Mean (se)	P	Mean (se)	P	Mean (se)	P	Mean (se)	P	
Age at pregnancy	-0.03(0.10)	0.72	-0.09(0.12)	0.46	0.06(0.1)	0.53	-0.05(0.09)	0.55	-0.09(0.09)	0.34					
Baseline BMI category		0.56		0.94				0.91		0.10					
Underweight	14.62(0.38)		13.39(0.32)		14.86(0.31)		13.79(0.21)		11.51(0.30)						
Normal weight	15.03(0.14)		13.26(0.17)		15.65(0.12)		13.77(0.13)		11.32(0.13)						
Over weight	14.85(0.28)		13.17(0.52)		15.48(0.24)		13.61(0.34)		11.54(0.27)						
Obese	15.49(0.46)		13.52(0.59)		15.18(0.45)		13.57(0.32)		12.50(0.50)						
Initiation of prenatal care visit		0.66		0.96				0.95		0.06					
None or late initiation (i.e. 2nd or 3rd trimester)	15.09(0.33)		13.25(0.37)		15.48(0.24)		14.31(0.28)		10.95(0.28)						
Early initiation	14.93(0.13)		13.27(0.18)		15.49(0.10)		13.61(0.10)		11.56(0.13)						
Smoking during pregnancy		0.57		0.19				0.98		0.38					
No	15.01(0.14)		13.16(0.18)		15.50(0.11)		13.80(0.11)		11.50(0.14)						
Yes	14.86(0.21)		13.62(0.3)		15.49(0.20)		13.56(0.21)		11.23(0.26)						
Adolescents' health insurance		0.02		0.59				0.02		0.10					
No health insurance	15.38(0.35)		13.12(0.33)		15.45(0.26)		14.19(0.24)		11.32(0.25)						
Private insurance	15.09(0.15)		13.35(0.20)		15.66(0.12)		13.74(0.13)		11.36(0.15)						
Public insurance	14.29(0.27)		12.93(0.40)		14.97(0.21)		13.44(0.24)		12.13(0.34)						
Family poverty status		0.00		0.05				0.02		0.33					
No	15.25(0.16)		13.58(0.19)		15.72(0.13)		13.99(0.14)		11.30(0.13)						
Yes	14.17(0.27)		12.71(0.37)		15.00(0.26)		13.21(0.20)		11.61(0.29)						
Parental education		0.23		0.04				0.02		0.37					
high school	15.04(0.13)		13.44(0.17)		15.64(0.10)		13.87(0.11)		11.38(0.11)						
less than high school	14.72(0.24)		12.66(0.35)		14.97(0.26)		13.25(0.23)		11.63(0.27)						
Highest education in Wave IV		0.51		0.54				0.03		0.36					
high school	15.01(0.12)		13.33(0.15)		15.61(0.10)		13.86(0.10)		11.39(0.12)						
less than high school	14.74(0.39)		12.99(0.54)		14.84(0.34)		13.07(0.32)		11.72(0.35)						

^aCalculated by t-test, with a null hypothesis of beta=0. The standard errors used in calculating all tests are weighted for the complex survey design.

Table 5
Multivariable linear regression model of personality variables and birth weight (n=820)^a

	Black (n=257)		Non-black (n=563)		
	beta (SE)	P ^b	beta (SE)	P	P for interaction
Neuroticism	-39.04(14.20)	0.01	4.94(13.87)	0.72	0.04
Conscientiousness	27.46(16.56)	0.10	-5.12(12.83)	0.69	0.11
Extraversion	-18.76(14.74)	0.21	5.78(10.98)	0.60	0.16
Agreeableness	22.38(21.25)	0.29	2.27(15.05)	0.88	0.47
Intellect	-17.25(26.27)	0.51	-10.29(13.15)	0.44	0.81

^a Except where otherwise noted, figures presented are regression coefficients and standard errors. Birthweight is modeled in grams and betas are per 1-SD increment in each factor. Adjusted for baseline age, age at pregnancy, BMI and parental education.

^b Calculated by t- test, with a null hypothesis of beta=0. The standard errors used in calculating all tests are weighted for the complex survey design.

Table 6
Multivariable linear regression model of personality variables and gestational age (n=820)^a

	Black (n=257)		Non-black (n=563)		
	beta (SE)	P ^b	beta (SE)	P	P for interaction
Neuroticism	-1.37(0.60)	0.02	-0.14(0.42)	0.74	0.11
Conscientiousness	-0.29(0.62)	0.64	-0.73(0.35)	0.04	0.56
Extraversion	0.03(0.52)	0.95	-0.01(0.32)	0.96	0.93
Agreeableness	0.68(0.59)	0.25	-0.07(0.40)	0.86	0.32
Intellect	-1.25(0.67)	0.07	0.02(0.37)	0.96	0.10

^a Except where otherwise noted, figures presented are regression coefficients with 95% confidence interval. Gestational age is modeled in days and betas are per 1-SD increment in each factor. Adjusted for baseline age, age at pregnancy, BMI and parental education.

^b Calculated by t- test, with a null hypothesis of beta=0. The standard errors used in calculating all tests are weighted for the complex survey design.