Original Contribution

Evidence for Sexually Dimorphic Associations Between Maternal Characteristics and Anogenital Distance, a Marker of Reproductive Development

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Data from animal models, historical cohorts, and modern epidemiologic studies have suggested that maternal characteristics can affect reproductive health of offspring; however, distinguishing between prenatal and postnatal contributions is difficult. Anogenital distance (AGD), the distance from the anus to the genitals, is believed to be a biomarker of prenatal androgen exposure in many species, and in humans it has been associated with several adult reproductive health outcomes. We used data from a pregnancy cohort study conducted in 4 US cities from 1999–2005 to examine whether AGD measurements in infants were associated with maternal self-reported age at conception, age at menarche, age at first birth, parity, and gravidity. AGD was measured in 289 infants (140 male, 149 female) born to study participants. After adjustment for relevant covariates, in linear regression models stratified by infant sex, maternal age was positively associated with AGD in male infants (AGD, anus to penis: \( \beta = 0.50, P = 0.002 \); AGD, anus to scrotum: \( \beta = 0.29, P = 0.02 \)) but not female infants. Parity was inversely associated with AGD (anus to scrotum; \( \beta = -1.68, P = 0.03 \)) in male infants. No other maternal characteristic predicted AGD in either sex. The mechanism underlying the unexpected relationship between maternal characteristics and AGD is unknown; however, we suggest several possibilities for future study.

anogenital distance; maternal age; prenatal hormones; reproduction; sex differences

Abbreviations: AGD, anogenital distance; AGD-AC, the distance from the anus to the clitoral hood; AGD-AF, the distance from the anus to the posterior fourchette; AGD-AP, the distance from the anus to the cephalad insertion of the penis; AGD-AS, distance from anus to posterior base of the scrotum; hCG, human chorionic gonadotropin; SFF, Study for Future Families.

Reproductive health and fertility not only depend on the interaction between genes and current environment but may also reflect the environment and development in previous generations. The clearest examples of this phenomenon come from animal models, in which prenatal exposure to environmental toxins can impact reproductive factors in the offspring, including sperm count (1, 2), pubertal timing (3), and ovarian follicle pool (2, 3). More subtle examples come from studies that have shown that maternal stress is associated with lower testicular weight and altered testosterone activity in male offspring (4, 5), whereas maternal undernutrition is associated with delayed puberty and a decline in number of follicles at maturity in female offspring (6). Although these associations are harder to study in humans, historical and epidemiologic evidence suggests that maternal factors may impact reproductive development and health in the next generation. Data from a Dutch cohort (1812–1922), for instance, suggested that fertility was highest (and childlessness lowest) among daughters born to mothers who were 24–30 years of age, whereas daughters born to older mothers had an increased risk of childlessness (7, 8). Evidence from modern epidemiologic cohorts has shown that daughters born to older mothers and after shorter interbirth intervals have increased odds of menstrual disorders, but not recurrent miscarriage, in adulthood (9, 10). Older maternal age has also been associated with later menopause.
in daughters (11), as well as increased odds of cryptorchidism (12) and lower semen quality (13) in sons. Low maternal parity, meanwhile, has been associated with increased odds of hypospadias (14). Evidence is inconclusive as to whether maternal characteristics predict reproductive cancer risk in offspring. Some studies (though not all) have found positive relationships between breast cancer risk and maternal age, but not parity, at gestation (15–19). Similarly, some studies have linked maternal age and parity to testicular cancer risk in sons (12, 20–24), although a large meta-analysis failed to find a conclusive association (25). The presumed mechanism underlying many of these relationships is atypical prenatal exposure to reproductive hormones, including testosterone and estrogens (26–30).

This body of work suggests that maternal factors, particularly age, may affect reproductive development and function in offspring, possibly through prenatal hormone exposures. However, it is difficult to disentangle prenatal contributions (which are presumably purely biological) from postnatal factors related to maternal characteristics, which may reflect intergenerational similarities in reproductive behavior, lifestyle, or socioeconomic status (31, 32). Identifying early markers of reproductive development could clarify the biological associations between maternal age and reproductive function without confounding by the many postnatal contributors to reproductive health. One possible marker is anogenital distance (AGD).

AGD, the distance from the anus to the genitals, is widely used as a measure of reproductive toxicity in animal models (33–35) and is believed to be a marker of prenatal androgen exposure during a reproductive programming window (36–38). Across numerous species, including humans, AGD is longer in males than in females (33, 37, 39–42). In rodents, prenatal exposure to certain endocrine-disrupting chemicals (notably the antiandrogenic phthalates) is associated with a shorter AGD and reproductive tract anomalies in males at birth, and there is evidence of similar patterns in humans for some, but not all, chemicals studied to date (43–47). In animal models, AGD has predicted several outcomes at reproductive maturity, including sperm count and fertility (36–38). Although the analogous human research is in its infancy, several studies have found associations between AGD and reproductive health outcomes in males, including semen quality (48, 49), azospermia (50), fertility (49), testosterone levels (51), hypospadias (52), and prostate cancer (53). Across these studies, longer (more “masculine”) AGD is typically associated with favorable health outcomes, and shorter AGD is associated with adverse health outcomes. Less is known about clinical correlates of AGD in females, although one study found that in women, longer AGD was associated with increased odds of multifollicular ovaries (54). Thus, in addition to possibly reflecting the prenatal hormonal milieu, AGD could potentially be an early biomarker of the risk of reproductive health conditions linked to that early hormonal environment.

Given that maternal characteristics appear to affect reproductive health in offspring and that AGD may be an early biomarker of reproductive health, we used data from a large pregnancy cohort study to investigate whether maternal characteristics (including maternal age at menarche, age at conception, age at first birth, parity, and gravidity) predicted AGD in the resulting offspring.

MATERIALS AND METHODS

Study population

Pregnant women were recruited into the Study for Future Families (SFFI) from 1999–2002 in 4 US cities (Los Angeles, California; Minneapolis, Minnesota; Columbia, Missouri; and Iowa City, Iowa). Because of methodological differences in AGD measurement, data from Iowa were not included in the present analyses. Eligibility criteria included having a non–medically assisted pregnancy, being 18 years of age or older, and being a Spanish or English speaker. Subjects completed questionnaires and gave blood and urine samples. From 2001 to 2005, subjects and their resulting children were invited to participate in a follow-up study (SFFII). In order to participate, they had to have agreed to be recontacted, have had the index pregnancy end in a live birth, live within 50 miles of a participating study center, and be willing to bring the infant for a face-to-face visit. All study procedures and materials were approved by human subjects committees before implementation and all participants signed informed consent forms before participation. Recruitment and study methods have been described elsewhere (55).

Assessment of maternal characteristics

During pregnancy, SFFI participants completed questionnaires on demographic characteristics, lifestyle, health, and reproductive history (mean gestational age: 25 weeks) and reported their race and ethnicity, current age, age at menarche, number and timing of previous live births, and number and timing of any additional pregnancies. On the basis of the estimated date of conception and the woman’s age at the time of questionnaire completion, maternal age at conception was calculated.

Physical examination

In SFFII, children underwent physical examinations at participating clinics. Because of the timing of grant funding, to maximize participation, examinations were permitted over a wide age range, and the oldest children were nearly 3 years of age at examination. Physical examination measurements were made by trained study staff (under the supervision of study physicians) following standardized protocols. Vernier calipers were used to take the following AGD measurements (40). In male infants, AGD was measured as 1) the distance from the anus to the posterior base of the scrotum (AGD-AS) and 2) the distance from the anus to the cephalic insertion of the penis (AGD-AP). In female infants, AGD was measured as 1) the distance from the anus to the posterior fourchette (AGD-AP) and 2) the distance from the anus to the clitoral hood (AGD-AC) (44) (Figure 1). AGD-AS and AGD-AP will be referred to as the “shorter” AGD measurements, whereas AGD-AP and AGD-AC will be referred to as the “longer” AGD measurements. Infant length, weight, head...
circumference, and skin-fold thickness were measured and age was recorded. For the 26 infants (5.9%) born before 38 weeks of gestation, age at examination was calculated based on estimated date of conception rather than birthdate.

Statistical analysis

We examined descriptive and summary statistics for all variables, including possible maternal predictors and infant AGD measures. Because our population was predominantly white with no other race represented in large numbers, we dichotomized race as white and nonwhite. Parity was considered as an ordinal variable but was also dichotomized as parous or nulliparous. We considered maternal age both continuously and in categories in case relationships were non-linear, as has been found in some related studies (56). We first did bivariate analyses (including Pearson’s correlations) to examine the relationships among the variables in our study. We then fitted 3 sets of models (simple linear regression models, minimally adjusted models, and fully adjusted models) to explore the relationships between potential predictors and our 4 measures of infant AGD: 1) AGD-AP (the longer measure in males); 2) AGD-AS (the shorter measure in males); 3) AGD-AC (the longer measure in females); and 4) AGD-AF (the shorter measure in females). All analyses were stratified by infant sex because AGD is highly sexually dimorphic and may be related to different predictors in males and females.

We used simple linear regression models to examine the relationship between infant AGD and each of the possible predictors independently. Our minimally adjusted models considered each possible predictor independently but also included several covariates selected a priori (based on their importance in previous work): infant’s age at examination, infant weight-for-age percentile, study center, and race. An interaction between maternal age at conception and infant’s age at examination was not significant and was not retained in any models.

Fully adjusted models included the variables from the minimally adjusted models plus any potential predictors that were associated with AGD at \( P \leq 0.15 \) in simple linear regression models. To investigate possible interactions, we fitted an additional adjusted linear regression model stratified by maternal age (median split) to examine the association between AGD and parity. Finally, we conducted a sensitivity analysis that excluded nonwhite women and infants. For each model, we checked traditional model assumptions including linearity between covariates and outcome and normally distributed error with constant variance. All analyses were conducted in SAS, version 9.2 (SAS Institute, Inc., Cary, North Carolina). All \( P \) values reported are 2-tailed, with an \( \alpha \) level of \( P = 0.05 \) unless otherwise noted.

RESULTS

In total, 477 children were eligible for SFFII (excluding those from Iowa), and of those, 346 participated. Of those, 57 children were missing data on 1 or more variables (maternal age at menarche \( n = 48 \), maternal age at conception \( n = 3 \), infant weight percentile \( n = 9 \), or AGD \( n = 42 \)), and 2 boys had data on AGD-AS but not AGD-AP. Thus, 289 children were included in the current analyses. Participants included in the present analyses did not differ from the SFFII participants with missing data with respect to maternal parity, age at menarche, age at conception, gravidity, race, infant weight percentile, or infant AGD. However, subjects from the California center were more likely to be missing questionnaire data. Moreover, there were no significant differences in maternal characteristics (age at conception, parity, gravidity, race, educational level, and age at menarche) between those subjects included in the current analyses and the remainder of the group of 477 women who were eligible to participate in SFFII but did not (not shown).

Overall, the population was fairly homogeneous and was predominantly white and well educated (Table 1). On average, mothers were 29 years of age at the time of conception,
and 51% were parous. There were some differences in demographic characteristics across centers (Appendix Table 1). California mothers tended to be younger, have an earlier age at menarche, and have an earlier age at first birth, and they were less likely to be white. A number of maternal characteristics were interrelated. Older mothers tended to have a later age at menarche (r = 0.13, P = 0.03), later age at first birth (r = 0.75, P < 0.0001), higher parity (r = 0.28, P < 0.0001), and higher gravidity (r = 0.28, P < 0.0001). Age at first pregnancy was inversely associated with parity (r = −0.30, P = 0.0003) and gravidity (r = −0.15, P = 0.09).

Infants were measured at a mean age of 14.8 months. AGD measurements in male and female infants followed a normal distribution and, as expected, were longer in boys. The 2 AGD measurements were highly correlated in both sexes (for boys, r = 0.51, P < 0.0001; for girls, r = 0.58, P < 0.0001).

In crude analyses, in boys, both AGD measures showed trends towards positive associations with maternal age. AGD-AS also was positively associated with age at first birth and negatively associated with parity. There was a trend towards an association between AGD-AP and maternal age at menarche in boys as well. In girls, no associations were found between any maternal characteristics and AGD (Table 2). When considering maternal age at conception categorically, we did not see any sign of a J- or U-shaped relationship with AGD (not shown); thus, we included it as a continuous variable throughout.

In our minimally adjusted models, boys’ AGDs were associated with (or showed a trend towards association with) maternal age at conception (both AGD-AP and AGD-AS), age at first birth (AGD-AS only), and parity (AGD-AS only). No maternal characteristic measured predicted AGD-AC or AGD-AF in girls. Because maternal age at conception and age at first birth were highly correlated in this approximately 50% primigravid population (r = 0.75, P < 0.0001), to avoid multicollinearity, only age at conception was included in the fully adjusted models because its relationship with AGD is more biologically plausible than the relationship between AGD and age at first birth. In the fully adjusted models, in boys, maternal age at conception was positively associated with both the longer and shorter AGD measures (for AGD-AP, β = 0.50, P = 0.002; for AGD-AS, β = 0.29, P = 0.02). Maternal parity was inversely associated with the shorter AGD measure in boys (for AGD-AS, β = −1.68,

<table>
<thead>
<tr>
<th>Characteristic or Measurement</th>
<th>No.</th>
<th>Mean (SD)</th>
<th>Minimum</th>
<th>Maximum</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maternal characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age at conception, years</td>
<td>289</td>
<td>29.1 (5.2)</td>
<td>17</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>Age at menarche, years</td>
<td>249</td>
<td>12.7 (1.5)</td>
<td>9</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Age at first birth, years*a</td>
<td>285</td>
<td>27.0 (5.4)</td>
<td>16</td>
<td>41</td>
<td></td>
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<tr>
<td>Paritya</td>
<td>291</td>
<td>0.7 (0.8)</td>
<td>0</td>
<td>4</td>
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<tr>
<td>Graviditya</td>
<td>291</td>
<td>1.1 (1.3)</td>
<td>0</td>
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<td><strong>Infant characteristics</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age at examination, months</td>
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<td>17.0 (9.0)</td>
<td>2.1</td>
<td>36.9</td>
<td></td>
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<td>Length, cm</td>
<td>280</td>
<td>79.2 (10.5)</td>
<td>56.9</td>
<td>100</td>
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<tr>
<td>Weight, kg</td>
<td>289</td>
<td>10.4 (2.8)</td>
<td>4.4</td>
<td>18.5</td>
<td></td>
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<tr>
<td>Anogenital distance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anus to penisb</td>
<td>140</td>
<td>70.4 (10.8)</td>
<td>41.8</td>
<td>104.4</td>
<td></td>
</tr>
<tr>
<td>Anus to scrotumb</td>
<td>142</td>
<td>36.9 (7.8)</td>
<td>20.8</td>
<td>56.0</td>
<td></td>
</tr>
<tr>
<td>Anus to clitorisc</td>
<td>149</td>
<td>47.4 (7.1)</td>
<td>27.3</td>
<td>68.2</td>
<td></td>
</tr>
<tr>
<td>Anus to fourchettec</td>
<td>149</td>
<td>20.3 (4.4)</td>
<td>8.6</td>
<td>36.7</td>
<td></td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (including white)</td>
<td>281</td>
<td></td>
<td></td>
<td></td>
<td>83.6</td>
</tr>
<tr>
<td>Hispanic</td>
<td>46</td>
<td></td>
<td></td>
<td></td>
<td>13.7</td>
</tr>
<tr>
<td>Black</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td>2.7</td>
</tr>
<tr>
<td><strong>Center</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>California</td>
<td>65</td>
<td></td>
<td></td>
<td></td>
<td>22.5</td>
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<tr>
<td>Minnesota</td>
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<td></td>
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<tr>
<td>Missouri</td>
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<td></td>
<td></td>
<td>33.2</td>
</tr>
<tr>
<td>Parousa</td>
<td>151</td>
<td></td>
<td></td>
<td></td>
<td>51.0</td>
</tr>
</tbody>
</table>

Abbreviation: SD, standard deviation.

*a Does not include index pregnancy.
on 23 April 2018

Maternal Characteristics and Infant AGD 61

Table 2. Simple, Minimally Adjusted\(^a\), and Fully Adjusted\(^b\) Linear Regressions for Maternal Characteristics on Infant Anogenital Distance by Sex, Study for Future Families, 1999–2005

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Infants of All Mothers</th>
<th>Infants of Daughters Only</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Crude</td>
</tr>
<tr>
<td>Age at conception</td>
<td>142</td>
<td>0.24 (0.04)</td>
</tr>
<tr>
<td>Age at menarche</td>
<td>120</td>
<td>0.44 (0.17)</td>
</tr>
<tr>
<td>Age at first birth</td>
<td>142</td>
<td>0.23 (0.04)</td>
</tr>
<tr>
<td>Parity</td>
<td>142</td>
<td>-1.37 (0.08)</td>
</tr>
<tr>
<td>Gravidity</td>
<td>142</td>
<td>-0.78 (0.17)</td>
</tr>
</tbody>
</table>

\(^a\) Minimally adjusted models include as covariates infant’s age, infant’s weight-for-age percentile, race, and study center.

\(^b\) Fully adjusted models include as covariates maternal age at conception, parity, infant’s age, infant’s weight-for-age percentile, race, and study center.

\(P = 0.03\) but not the longer measure. None of the maternal characteristics considered predicted AGD-AC or AGD-AF in girls (Table 2, Figure 2). In analyses stratified by maternal age (median split), associations between parity and AGD (in both boys and girls) were similar in both the younger and older strata (not shown). In a sensitivity analysis (limited to only white participants), the results were unchanged (not shown).

**DISCUSSION**

Among the maternal characteristics considered in this analysis, maternal age and parity significantly predicted infant AGD in boys but not girls. Unexpectedly, although maternal age and parity were correlated in this population (\(r = 0.28, P < 0.0001\)), they were associated with male AGD in opposite directions. Increasing maternal age was associated with longer AGD, whereas higher parity was associated with shorter male AGD. Holding other covariates constant, a 10-year increase in maternal age was associated with a 1.5-mm increase in AGD-AC (the shorter measure) and a 2.9-mm increase in AGD-AS (the longer measure). Therefore, for a boy with a typical (median) AGD-AP of 70.0 mm and AGD-AS of 36.6 mm, a 10-year increase in maternal age would be equivalent to a 7% increase in AGD-AP and an 8% increase in AGD-AS, conditional on fixed values of all other model covariates. By contrast, a 1-child increase in parity was associated with a 1.68-mm shorter AGD-AS (approximately a 5% reduction for a typical boy). These results are surprising in light of previous research, in which older age in mothers and lower parity were typically associated with adverse reproductive health outcomes in sons (12–14, 20, 22, 24, 30, 57). Although AGD is not a health outcome per se, a longer AGD (associated here with older age and lower parity in mothers) has been found to be associated with more favorable clinical outcomes in adult men (49–51, 53, 58, 59). Short AGD is commonly associated with some of the male reproductive disorders that comprise the “testicular dysgenesis syndrome” (including hypospadias, cryptorchidism, and low semen quality) (60); however, our findings on maternal characteristics and AGD are the opposite of those previously reported for the other disorders. Thus, we report these results with caution and suggest further investigation in other cohorts.

Physiological changes associated with maternal age and parity could alter fetal gonadal steroid secretion in boys but not girls. We speculate that fetal androgen production during the critical period for reproductive development (late in the first trimester) may be higher in boys gestated by older or primiparous mothers than in boys gestated by younger or multiparous mothers and that human chorionic gonadotropin (hCG) could drive this higher fetal androgen production. Placental hCG is a luteinizing hormone analogue, and it appears to be the primary driver of fetal testicular androgen production (61–63). If increasing maternal age results in greater fetal exposure to hCG, we might expect upregulation of fetal testosterone in male fetuses carried by older mothers and by extension longer AGD. This could be through increased placental production of hCG, changes in binding and placental transport of hCG, increases in fetal testicular luteinizing receptor density, or even a higher proportion of functional luteinizing receptor isoforms (64). One study did not find an association between maternal age and first trimester hCG concentrations.

Figure 2. Relationship between maternal age at conception and infant anogenital distance (AGD) in the Study for Future Families, 1999–2005. A) Male AGD, anus to penis (n = 140); B) female AGD, anus to clitoris (n = 151); C) male AGD, anus to scrotum (n = 143); and D) female AGD, anus to fourchette (n = 151). Data points are observed values. The lines show the slope and a 95% confidence interval for the slope from the regression models adjusted for infant age at examination, infant weight-for-age, race, study center, and parity.

(65); however, additional research on this question is warranted. At least 1 study has reported lower hCG levels in multiparous women than in primiparous women, which could explain our finding of shorter AGD in sons born to the former (65).

Placental aromatase converts maternal androgens to estrogens and appears to prevent fetal exposure to maternal androgens in all but the most extreme hyperandrogenic pathologies (66–69). Estrogens (present in extremely high concentrations during pregnancy) can cross the placenta and represent another possible mechanism underlying relationships between maternal characteristics and infant AGD. Some, but not all, studies have found that throughout pregnancy, older mothers and parous women have lower estrogen levels than do younger and nulliparous women (70–74). Although the male genital development is primarily under the influence of androgens (such as dihydrotestosterone), it is possible that it reflects estrogenic exposures as well. In some (but not all) studies in animal models, administration of estrogens, phytoestrogens, or synthetic estrogenic chemicals elicited changes in AGD in male offspring (75–80). Analogous human evidence is limited, although in one study, investigators found that prenatal exposure to the environmental chemical bisphenol A was associated with shorter AGD in male infants, which may have been due to estrogenic effects, antiandrogenic effects, or both (81). If older or multiparous mothers have lower estrogen levels and estrogen suppresses growth of the perineal tissues (measured as AGD), then we would expect older and multiparous women to have infants with longer AGD, as seen in our data. Future research could address whether maternal estrogens (or factors affecting those estrogen levels, such as smoking or maternal body size) predict AGD. This mechanism wouldn’t necessarily explain our observed sex differences; however, it could shed further light on how the balance of estrogen and androgens may shape reproductive development.

One limitation of our study was that AGD was measured over a large age range (2–36 months) and might reflect both prenatal and early postnatal influences. Therefore, we adjusted for both infant age and size at examination in our analyses. Recent data from other cohorts showed that in both sexes, AGD at birth is correlated with AGD between ages 1 and 2 years (82), which suggests that we would have found similar...
results with AGD measurements at birth. However, additional research is needed to confirm the longitudinal stability of AGD. Nevertheless, examining children over a narrow age range, ideally right after birth, is optimal.

Finally, our findings are based on a predominantly white population and cannot necessarily be extrapolated to a more diverse population. Two studies have identified possible racial differences in infant AGD, with white infants having longer AGD than non-white infants (40, 82). There is some indication that racial differences in AGD may persist into adulthood (48), but nonwhite sample sizes have been too small to resolve this question. Nevertheless, given that maternal hormones during pregnancy vary by race (83–85) and that fetal hormones may plausibly do so as well, future research on this topic should examine whether these findings hold true in more heterogeneous populations.

Our findings add to the existing literature that suggests that maternal age and parity may impact reproductive development in offspring, and we provide evidence that these associations are evident even very early in childhood. Additional research is needed to examine whether AGD may serve not only as a biomarker of prenatal hormone exposure but also as an early measure of reproductive health and a possible link between maternal characteristics and reproductive outcomes in offspring.

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Conflict of interest: none declared.

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(Appendix follows)
## Appendix Table 1. Demographic Characteristics and Anthropometric Measurements of the Subjects by Study Center, Study for Future Families (n=289), 1999–2005

<table>
<thead>
<tr>
<th>Characteristic or Measurement</th>
<th>California (n=65)</th>
<th>Minnesota (n=128)</th>
<th>Missouri (n=97)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Maternal characteristics</td>
<td></td>
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</tr>
<tr>
<td>Age at conception, years</td>
<td>26.5 (6.0)</td>
<td>30.4 (4.9)</td>
<td>29.2 (4.5)</td>
</tr>
<tr>
<td>Age at menarche, years</td>
<td>12.3 (1.6)</td>
<td>12.9 (1.4)</td>
<td>12.7 (1.5)</td>
</tr>
<tr>
<td>Age at first birth, yearsa</td>
<td>24.4 (5.7)</td>
<td>28.5 (5.2)</td>
<td>26.9 (4.7)</td>
</tr>
<tr>
<td>Paritya</td>
<td>0.6 (0.8)</td>
<td>0.7 (0.8)</td>
<td>0.7 (0.9)</td>
</tr>
<tr>
<td>Graviditya</td>
<td>1.2 (1.2)</td>
<td>1.1 (1.3)</td>
<td>1.1 (1.3)</td>
</tr>
<tr>
<td>Infant characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age at examination, months</td>
<td>14.9 (8.3)</td>
<td>16.5 (8.6)</td>
<td>19.0 (9.9)</td>
</tr>
<tr>
<td>Length, cm</td>
<td>79.1 (9.6)</td>
<td>79.6 (10.2)</td>
<td>81.2 (11.3)</td>
</tr>
<tr>
<td>Weight, kg</td>
<td>10.7 (2.5)</td>
<td>10.4 (2.7)</td>
<td>10.9 (3.0)</td>
</tr>
<tr>
<td>Anogenital distance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anus to penisb</td>
<td>68.0 (8.3)</td>
<td>71.3 (12.9)</td>
<td>70.7 (8.9)</td>
</tr>
<tr>
<td>Anus to scrotumb</td>
<td>35.0 (7.0)</td>
<td>38.8 (7.4)</td>
<td>36.0 (8.4)</td>
</tr>
<tr>
<td>Anus to clitoris</td>
<td>50.0 (7.2)</td>
<td>46.4 (6.8)</td>
<td>47.2 (7.3)</td>
</tr>
<tr>
<td>Anus to fourchettec</td>
<td>20.8 (3.4)</td>
<td>19.1 (4.2)</td>
<td>21.7 (4.7)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (including white)</td>
<td>28 43</td>
<td>127 98</td>
<td>91 94</td>
</tr>
<tr>
<td>Hispanic</td>
<td>33 51</td>
<td>1 1</td>
<td>4 4</td>
</tr>
<tr>
<td>Black</td>
<td>4 6</td>
<td>1 1</td>
<td>2 2</td>
</tr>
</tbody>
</table>

Abbreviation: SD, standard deviation.

a Does not include index pregnancy.
b Male infants only.
c Female infants only.