Fertility decisions have a variety of consequences for women that are not shared by men. Costs to leisure time, educational and labor opportunities, and lost wages have been well documented. However, one cost of having children that has remained unexamined is the effect on the body composition and the physical attractiveness of the mother.

The concept of physical attractiveness is not to be dismissed as one of merely prurient interest; physical attractiveness is associated with a range of positive outcomes including income (Jæger, 2011), educational success (French, Robins, Homer, & Tapsell, 2009), self-confidence (Mobius & Rosenblat, 2006), and positive treatment by others (Patzer, 2008). The effect of childbearing on such an influential characteristic is a valid concern worthy of research attention.

While concerns about the effect of childbearing and rearing are often raised in popular publications (for example, see Hardy 2011), no study has systematically examined whether the underlying premise is true: whether having children does in fact negatively affect the physical attractiveness of women. There are two theoretically plausible mechanisms through which such a relationship could operate: additional weight, either from residual weight gain from pregnancies or from lifestyle factors, or less time for grooming and personal upkeep due to time constraints. Each of these mechanisms has been shown to be affected by parenthood status.

For most women pregnancy is related to a moderate postpartum weight gain relative to pre-pregnancy weight, although the factors mediating this relationship are vigorously debated (Amorim, Rössner, Neovius, Lourenço, & Linné, 2007). Lifestyle changes accompanying parenthood can also directly affect BMI. Vernon, Young-Hyman, & Looney (2010) directly connect heightened maternal stress levels in the first year after the birth of a child to increased BMI. In a systematic review of 25 articles on the subject, Bellows-Riecken & Rhodes (2008) conclude that parenthood has a dramatic, negative effect on activity levels, with the effect being

disproportionately strong for females. Although untangling causality in the obesity/exercise relationship is difficult (Nomaguchi & Bianchi 2004), it is not an unreasonable assumption that the decline in exercise time due to parenthood is attributable to less disposable time and not to naturally lower BMI, and that therefore parenthood causally raises BMI.

Parenthood status could also affect attractiveness through the intermediary of decreased time for grooming and personal upkeep. Ekert-Jaffé (2010) and Mattingly & Bianchi (2003), use time survey data in France and the US,, respectively and find that there is a significant negative relationship between number of children and amount of disposable time available to the mother for personal upkeep.

Methods

I use Wave III and Wave IV of the National Longitudinal Study of Adolescent Health (hereafter Add Health) to investigate the question of whether fertility outcomes affect physical attractiveness, and the mechanisms by which they do so. The waves used represent the sample at the ages of 18-26 from 2001-2002 (Wave III) and 24-32 from 2008-2009 (Wave IV), with many in the sample beginning their reproductive careers during this time. The Add Health Survey is unique in that it includes a series of scales recording the interviewer's perceptions of the respondents, including how well groomed and how physically attractive they are, allowing for empirical analyses of these concepts. While there is some measurement variation among interviewers, inter-rater reliability for attractiveness measures is relatively high (Twenge, Campbell, & Foster, 2003), and whatever variation does exist is random and therefore does not directly affect the utility of these scores as dependent variables of interest. A more thorough defense of the use of this measure is presented in French et al. (2009). Attractiveness was measured on a Likert scale with the mid-point being placed at "average attractiveness."

Therefore, in theory the data should be normally distributed with the peak at "average" and tails at either end for below and above average. However, a frequency table reveals that this is not the case. Interviewees tend to grade their subjects leniently, giving a disproportionate number of them "above average scores."

Table 1: Frequencies: Children since W3 x attractiveness

	Very unattractive	Unattractive	About average	Attractive	Very attractive
0	49 1.79%	68 2.48%	564 20.58%	512 18.68%	163 5.95%
1	34 1.24%	21 0.77%	329 12.00%	276 10.07%	88 3.21%
2	16 0.58%	13 0.47%	215 7.84%	160 5.84%	49 1.79%
3	0 0.00%	4 0.15%	62 2.26%	51 1.86%	11 0.4%
4	2 0.07%	2 0.07%	23 0.84%	13 0.47%	3 0.11%
5	1 0.04%	1 0.04%	3 0.11%	3 0.11%	0 0.00%
6	0 0.00%	1 0.04%	3 0.04%	1 0.00%	0 0.00%
7	0 0.00%	1 0.04%	1 0.04%	1 0.04%	0 0.00%
Total	102 3.72%	111 4.05%	1,198 43.71%	1,016 37.07%	314 11.46%

For women in Wave IV, for example, 48.53% of the respondents are in the two "above average" categories, 43.71% are in the middle "average" category, and 7.77% are in the "below average" category.

Conducting a Brant test reveals that the requirement of equal covariances across values required for an ordered logistic analysis is not met in this case; consequently here I use a logistic

analysis measuring whether the individual is placed in the "above attractive" category. Given the distribution of the data, this is a natural conceptual and empirical divide in the data for a logistic analysis. Since attractiveness measures were taken in both Wave III and Wave IV, I include the Wave III categorization as "above average" as a control, although using the Wave III categories as factorial controls does not significantly affect the results.

The main independent variable of interest is number of children born between Wave 3 and Wave 4, which is calculated simply by subtracting total reported fertility in Wave 4 from total reported fertility in Wave 3. This calculation indicates that between Wave 3 and Wave 4, out of 2,7 female cases that have fertility data for both waves, 748 had one child, 453 had two children, 128 had three children, 43 had four children, eight had five children, two had six children, and three had seven children.

I also include weight change and change in the grooming score as covariates in some models. Weight change is measured by change in BMI between Wave 3 and Wave 4. The grooming score is measured on the same scale as the attractive score and has similar distributional characteristics; therefore, I control for change in grooming by using the "above average" grooming dichotomy to indicate whether the respondent changed out of this category or into this category across time.

I also include controls for age, pregnancy status, and changing marital status from "not married" in Wave 3 to "married" in Wave 4, These three variables have plausible theoretical reason for being associated with both fertility history and perceptions of attractiveness. Controlling for SES is problematic due to both life stage and endogeneity concerns. Virtually all of the literature on the SES/attractiveness connection has assumed unidirectional causality from attractiveness to SES. For the purposes of this study, I assume that any background, long-term

SES effects on attractiveness are absorbed into Wave III attractiveness, which are then controlled for when Wave III attractiveness is included in the model. Change in SES from Wave III to Wave IV is also difficult to calculate because the time period from Wave III to Wave IV represents a time of social and financial transition, making it difficult to compare the SES status of a 19-year old who lives at home with her parents to a 22 year old college student who is living on student loans. Similarly, convoluted educational and occupational changes during this time problematize simplistic attempts to control for “stay-at-home” versus “career” versus “student” categorical effects as intervening mechanisms in the fertility/attractiveness connection.

Results

Table 2: Attractiveness and grooming
Logistic regressions (odds ratios)

	(1) Attractive W4	(2) Attractive W4	(3) Attractive W4	(4) Grooming W4
Attractive W3	1.981***	1.930***	2.960***	
	(7.89)	(7.33)	(11.19)	
Births since W3	0.897*	0.916+	0.910+	0.831***
	(-2.33)	(-1.84)	(-1.93)	(-3.92)
Age W4	0.987	0.991	0.988	0.988
	(-0.53)	(-0.35)	(-0.49)	(-0.51)
Pregnant W4	1.123	1.287	1.198	0.862
	(0.69)	(1.44)	(1.01)	(-0.87)
Married since W3	1.263*	1.331**	1.241*	1.325**
	(2.47)	(2.90)	(2.16)	(2.94)
Δ BMI		0.949***		
		(-4.83)		
Δ Grooming			3.060***	
			(14.00)	
Grooming W3				2.200***
				(9.07)
N	2240	2110	2240	2240
BIC	3070.4	2883.2	2855.1	3035.8
χ^2	79.84	95.17	302.9	114.6
Log-likelihood	-1512.1	-1414.8	-1400.5	-1494.8

+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 3: BMI (OLS)

	BMI W4
Births since W3	0.245*
	(2.47)
BMI W3	0.955***
	(64.95)
Age W4	-0.0895+
	(-1.71)
Pregnant W4	1.180**
	(3.27)
Married since W3	0.909***
	(4.45)
Constant	5.602***
	(3.79)
N	2115
R^2	0.672
adj. R^2	0.671
F	862.3
$Prob > F$	0

t statistics in parentheses

+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

I find that, while controlling for prior physical attractiveness, having children does decrease a woman's rated physical attractiveness (Table 2, Model 1). The separate inclusion of both change in BMI (Table 2, Model 2) and change in grooming (Table 2, Model 3) make this relationship insignificant, but in either case it barely pushes it beyond the .05 threshold. Of the three other controls (pregnancy, becoming married, and age), only becoming married affects attractiveness perception. Falling into the "above average" grooming category is strongly negatively associated with having had children while controlling for Wave 3 grooming score (again, neither using a factorial instead of dichotomous measure for the control nor excluding the non-significant controls, does not change the results).

Table 3 shows more directly that number of births in the interval is directly related to change in BMI when Wave 3 BMI is taken into account. Again, this change, while statistically significant, is not very large.

Discussion

Having children does appear to reduce the odds of being considered "above average" attractive. The increase in BMI from pregnancies does not appear to be a major contributing factor to this, as fertility history is not a significant contributor to current BMI in this sample. The change in level of grooming does appear to be a more major factor. Having children is strongly associated with a decrease in grooming rating (Table 2, Model 4), change in grooming is strongly associated with change in attractiveness (Table 2, Model 3), and the addition of change in grooming makes the children/attractiveness connection insignificant (Table 2, Model 3).

In a separate sensitivity analysis, excluding the two non-significant controls does not significantly affect the results; excluding change of marital status barely pushes the coefficient for number of children born to the other side of the .05 threshold in Table 2, Model 1, but does not significantly affect any of the other models. Treating prior wave Likert scores for both attractiveness and grooming as factorial variables instead of dichotomizing them does not significantly change the results.

Limitations

The Add Health survey only includes information on total fertility, not on the number of children in the actual household. Therefore, I operate under the assumption that a live childbirth means more children in the household. While this assumption is not valid for all cases, I believe the exceptions to the rule do not threaten the overall validity of my design.

Also, as with all attractiveness research, it is difficult to control for the "halo effect," or the association of attractiveness with certain characteristics (Lucker, Beane, & Helmreich, 1981). In this case, it is impossible to know whether the interviewees are really objectively rating

mothers lower, or whether they are imposing preconceived notions of maternal attractiveness and grooming (or lack thereof). Similarly, the one significant control, marital status, could indicate that more attractive people have a higher chance of becoming married—and therefore more opportunities for having children, or it could indicate that married women are generally perceived as more attractive. This would be an interesting topic for future investigation.

Interviewer characteristics are also undoubtedly associated with these ratings. However, since both ratings are used in the regression, the various characteristics of both sets of interviewers would have to be controlled for simultaneously, introducing a lot of noise into the analysis. As previously noted, interviewer effects are random, and should therefore not systematically bias the results.

Finally, my results only apply to the 24-32 age group. Given the positive relationship between education and age at first birth (Rendall et al., 2010), it is possible that the costs of children vary at older ages, as older, more educated mothers may be able to better afford domestic help, and may therefore have more time for grooming, while their bodies may be less capable of recovering after pregnancy. Without longer-range data this is all speculative, but it is a limitation worth noting.

Conclusions

Given the relationship between physical attractiveness and various life outcomes, it is surprising that the relationship between childbearing and physical attractiveness has not been systematically studied before. These results confirm the reality of an important cost of childbearing and childrearing to women. Like virtually all of the other costs incurred with childbearing and rearing, this cost falls disproportionately on the mother: identical regressions (with the exception of the pregnancy control) using the male subsample show no relationship at

all, not even to the .1 level, indicating that the difference lies in gender-specific factors, probably through differential responsibilities.

Furthermore these results suggest that this change in mostly attributable to decreases in grooming. Given the prior research cited on the effect of children on time for personal upkeep, these results are hardly surprising: Women with children have less time available for personal upkeep, leading to less attractiveness overall, potentially leading to negative outcomes in their career or other pursuits.

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