

Estimating the effect of adolescent fertility on educational attainment in Cape Town using a propensity score weighted regression.

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Question

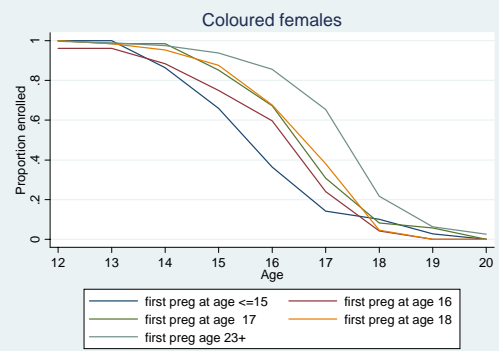
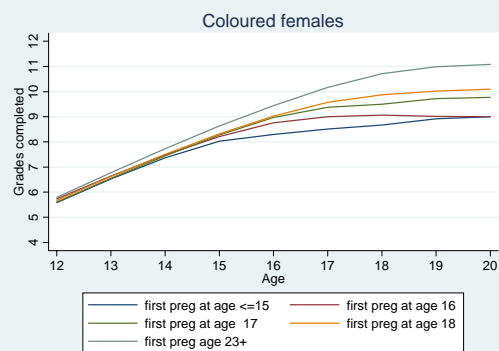
- What is the **causal** impact of adolescent fertility on educational attainment in South Africa.

South African literature

- Kaufman et al.(2001) - while young girls are likely to leave school after a birth, many return subsequently to complete their schooling.
- Madhavan and Thomas (2005) – familial support and flexible childcare is important in returning to school.
- Grant and Hallman (2008) – prior scholastic performance is important in predicting both pregnancy and dropping out of school subsequent to birth.
- Marteleteo et al. (2008) – early life characteristics, eg. Alcohol and drug abuse, are correlated with adolescent pregnancy.
- Gustafsson and Worku (2007) – Discussion paper – use # of doctors and nurses as an instrument for abortion – find negative effects of teen birth on high school graduation.

Data: Cape Area Panel Study

- Waves 1 – 4, about 4800 observations of young adults aged 14 – 22 in wave 1 from the Cape Town metro region.
- Wave 1 in 2002 with approximately annual frequency thereafter
- Fertility data is extensive in every wave:
 - A retrospective pregnancy and birth history in Wave 1
 - Detailed data on pregnancies and births since the last wave in each wave
 - Sexual Behaviour, contraceptive use etc.
- We see women's schooling and other characteristics before and after they have a child
- We have information on many household characteristics such as income, parent's education, & employment status of household members
- Other interesting variables in CAPS
 - Age at menarche
 - Characteristics of sexual partners
- For this study, we restrict attention to African and Coloured females. (White females have very low levels of adolescent fertility.)



Outcome measures

- *educ18*, *educ20* and *educ22* are the number of years of primary and secondary schooling attained at ages 18, 20 and 22 respectively. It is bounded above at 12.
- *matric20* and *matric22* are indicator variables that indicate whether the person has successfully completed high school or not.
- *dropout* is an indicator variable that takes a value of one if at any point a respondent was not enrolled in school prior to successfully completing secondary school.
 - 56.7% of girls who do drop out subsequently return to school.

Summary statistics: Outcomes

By birth_by19

Variable	N	Mean	Teen birth = 0		Teen birth = 1		Diff in means	std. err. (of diff)	t-stat (of diff)
			N	Mean	N	Mean			
dropout	2295	0.724	1766	0.680	529	0.870	-0.190	0.020	-9.407
matric22	1129	0.509	847	0.584	282	0.282	0.302	0.035	8.759
matric20	1735	0.443	1294	0.518	441	0.215	0.303	0.026	11.462
educ22	1129	10.657	847	10.935	282	9.805	1.130	0.139	8.148
educ20	1735	10.450	1294	10.778	441	9.447	1.331	0.122	10.869
educ18	2224	9.961	1701	10.177	523	9.245	0.931	0.101	9.259

Summary statistics: Covariates

Table 1: Summary statistics in dataset, and by birth_by19

Variable	N	Mean	birth by age 19 = 0		birth by age 19 = 1		Diff in means (of diff)	std. err. (of diff)	t-stat (of diff)
			N	Mean	N	Mean			
*5 books in hh (in wave 1)	2295	0.801	1766	0.819	529	0.739	0.079	0.022	3.676
*drinker in hh growing up	2295	0.200	1766	0.179	529	0.273	-0.094	0.024	-3.941
*drug in hh growing up	2295	0.083	1766	0.066	529	0.138	-0.072	0.019	-3.793
* education father	2295	5.435	1766	5.764	529	4.312	1.452	0.262	5.539
*education mother	2295	7.375	1766	7.627	529	6.518	1.109	0.211	5.246
prop. yrs live with mother (0-14)	2295	0.860	1766	0.862	529	0.853	0.010	0.015	0.618
prop. yrs. live with father (0-14)	2295	0.600	1766	0.606	529	0.578	0.028	0.024	1.184
prop. of grades passed (8-14)	2292	0.923	1764	0.925	528	0.916	0.010	0.005	1.785
*contraception 1 st sex	1674	0.590	1174	0.680	500	0.397	0.283	0.028	10.116
*age 1 st sex	1761	17.041	1236	17.455	525	16.147	1.309	0.108	12.163
* Had sex	2295	0.714	1766	0.630	529	1.000	-0.370	0.013	-27.990
age1stperiod	2261	13.298	1734	13.297	527	13.302	-0.005	0.106	-0.049
African	2295	0.368	1766	0.369	529	0.364	0.006	0.024	0.229
Coloured	2295	0.632	1766	0.631	529	0.636	-0.006	0.024	-0.229

Empirical challenge

- Endogeneity due to selection:
 - The teen mothers are different from the non-mothers on a number of characteristics.
 - This leads us to believe they would have had worse educational outcomes than the non-mothers, even in the absence of the birth.
 - Thus, a simple comparison between the two is likely to be confounded, probably with an upward bias.

Econometric methods in US research

- Account for measures of family background & parental involvement, eg. Lee et al, 1994 and Hernstein and Murray, 1994
- Siblings fixed effects estimation method, Geronimus and Korenman, 1993.
- 'almost natural experiments' – eg. Miscarriages, Hotz et al 1997, Hotz et al 1999.
- Instrumental variables approach, eg. Age at menarche, Ribar 1994, Klepinger et al, 1994.
- Propensity score matching estimator – Levine and Painter (forthcoming)

Methods

- We estimate propensity score weighted regressions.
 - Step 1: Estimate probits using covariates, with 'treatment' variable, predict the propensity scores.
 - Step 2: Match untreated observations to treated observations, based on the pscors. We use the Epanechnikov kernel with a bw of 0.06. We also impose a common support condition.
 - Step 3: This generates a set of weights for the untreated group. (treated obs have weight= 1.)
 - Step 4: Estimate regressions by OLS weighted by the (sampling weights x propensity score weights).

Table 3: Summary statistics by birth_by19, after re-weighting due to matching, common support, and sample restriction

Variable	birth by age 19 = 0		birth by age 19 = 1		Diff in means	std. err. (of diff)	t-stat (of diff)
	N	Mean	N	Mean			
books	991	0.736	492	0.735	0.000	0.031	0.003
drinkhh	991	0.271	492	0.270	0.001	0.037	0.035
drughh	991	0.129	492	0.143	-0.014	0.030	-0.450
edfath	991	4.185	492	4.301	-0.116	0.352	-0.329
edmoth	991	6.548	492	6.543	0.005	0.302	0.018
prop. yrs live with mother (0-14)	991	0.825	492	0.849	-0.024	0.025	-0.959
prop. yrs. live with father (0-14)	991	0.541	492	0.576	-0.035	0.035	-1.019
prop. of grades passed (8-14)	991	0.929	492	0.916	0.013	0.007	1.861
Contraception 1 st							
sex	991	0.398	492	0.396	0.003	0.035	0.076
Age 1 st sex	991	16.20	492	16.15	0.053	0.127	0.421
Had sex	991	1.000	492	1.000	0.000		
age1stperiod	991	13.29	492	13.32	-0.027	0.110	-0.244
African	991	0.372	492	0.371	0.002	0.033	0.054
Coloured	991	0.628	492	0.629	-0.002	0.033	-0.054

Regression results, coefficients on `teen birth' variable.

	Dependent Variable	
	educ18	educ22
Specification 1:	-0.931***	-1.130***
No sample restriction, sampling weights only, no covariates	[0.10]	[0.14]
N	2224	1129
Specification 3:	-0.382***	-0.358***
With sample restriction, sampling weights only, with all covariates	[0.096]	[0.13]
N	1467	810
Specification 4:	-0.348***	-0.274*
Sample restriction, sampling and propensity score matching weights, with covariates	[0.11]	[0.16]
N	1464	807

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Estimates of the effect of a first birth at various ages.

	Dependent Variable		
	educ18	educ20	educ22
birth at 16	-0.383	-0.742**	-0.27
	[0.27]	[0.31]	[0.27]
N	638	491	307
R-sq	0.28	0.3	0.49
birth at 17	-0.285*	-0.334*	-0.0483
	[0.15]	[0.19]	[0.25]
Observations	892	699	453
R-squared	0.35	0.34	0.3
birth at 18	-0.299**	-0.502***	-0.402**
	[0.14]	[0.18]	[0.19]
Observations	1060	860	570
R-squared	0.43	0.38	0.43
birth at 19	-0.00119	-0.319	-0.266
	[0.13]	[0.20]	[0.19]
Observations	1067	885	591
R-squared	0.36	0.25	0.38

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Conclusions

- There remain negative and significant effects of teen births on educational attainment.
- Some evidence that there may be heterogeneity depending on actual age at first birth.
- A large proportion of the mean difference, however, is accounted for by the pre-existing covariates.