The Effect of Teenage Pregnancy on Schooling and Labor Force Participation: Evidence From Urban South Africa

CSMGEP Dissertation Session

Natalia Cantet

UIUC

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Impact of Teenage Pregnancy

- In South Africa, 35.1% of women aged 19 reported births (DHS, 1998)
- Concerns over adverse health, social, economic, and demographic effects of teenage pregnancy
- Research has focused on the consequences of teenage childbearing in the US and other high-income countries
- Impact might be different in low and middle income countries:
  1. High youth unemployment rates (Statistics South Africa, 2012; Posel, 2004)
  2. Teenage pregnancy rates were high (DHS 1998)*-
  3. High rates of grade repetition and drop out (Marteleto, Lam & Ranchhod, 2008)

  Different **opportunity cost** of teenage pregnancy

This Paper

Research questions:

1. **What is the impact of teenage pregnancy on education?**
2. **Does teenage pregnancy affect the women's labor force participation?**

Main challenge: selection into motherhood

- My methodology:
  - Instrument teenage pregnancy using teenage fertility
  - Account for unobservables using a Sibling Comparisons approach
- Interaction analysis for factors that attenuate the effects of early pregnancy
- Data: I use a panel from Cape Town, South Africa

South African Youth

1. Youth unemployment rates high
   - Unemployment rate in 2003: 42% (Labour Force Survey, 2003)
   - Women less likely to participate in the labor market and more likely to be unemployed

2. Schooling:
   - Schooling is compulsory until grade 9, and spans 12 grades in total.
     - Higher education is contingent on students siting for a matriculation exam
   - Grade repetition is high, especially for black and coloured population

3. Sexual behavior:
   - Most women become sexually active by age 18 (median age at first sex= 17.8)
   - 25% of the 18 year old and 35.1% of 19 year old women reported births (DHS, 1998) Distribution
   - 78% of woman aged 20 reported that their last birth was unwanted or wanted later

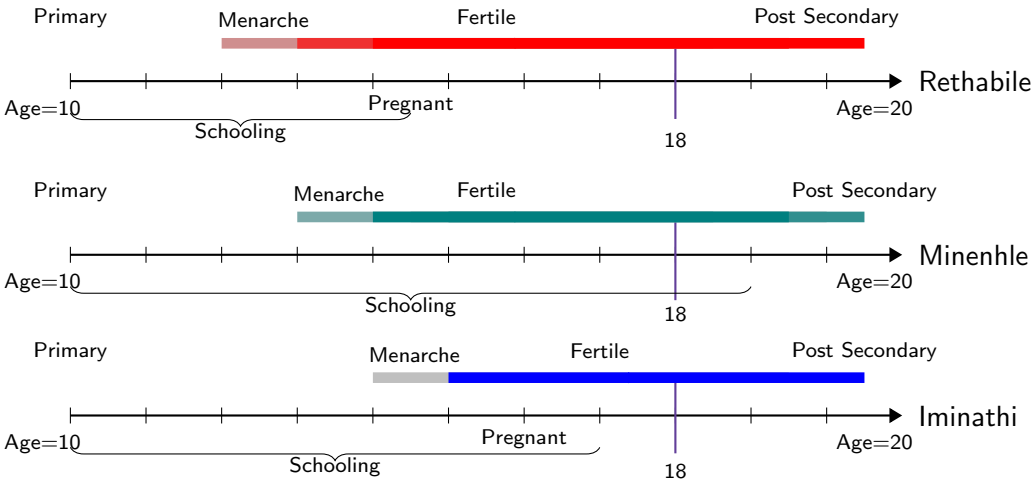
Data Sample

- Cap Area Panel Study: woman aged 14-22 in 2002 living in Cape Town CAPS
- Interviewed on education, labor participation, birth history and demographics:
  - From the year of birth until last observed
- Samples:
  1. Full sample: 1,741 women
     - Age at menarche: 10 and 17 Qn
     - Adult height
  2. Subsample: 418 of sisters
- **Two data structures:** Description Data
  1. Panel
  2. Collapsed panel
- Both methodologies employed in both data-sets

Pregnancy in the full sample Summary Statistics

Data Structure- Panel

Observational unit: woman-year



Data Structure- Collapsed Panel

Observational unit: sampled woman

	Age at menarche (1)	Pregnant ≤ 18 (2)	Education Attainment (3)	Post Sec. attainment (4)	Active at 19 (5)
Rethabile	12	✓	9 yrs	No	✓
Minenhle	13	No	13 yrs	✓	No
Iminathi	14	✓	8 yrs*	No	✓

*Iminathi had repeated a 3 grades

- **Overall** educational attainment
- Labor force participation at ages 19, 20, 21 and 22

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Instrumental Variable Approach

1. In the panel:

$$\textit{First Stage}: \textit{Pregnant}_{icst} = \sigma_1 + \sigma_2 \textit{Post Menarche}_{icst} + \vartheta_i + \varsigma_t + \epsilon_{icst}$$

$$\textit{Second Stage}: \textit{Outcome}_{icst} = \beta_1 + \beta_2 \widehat{\textit{Pregnant}_{icst}} + \vartheta_i + \varsigma_t + \varepsilon_{icst}$$

i=individual c=cohort s=sampling cluster t=time

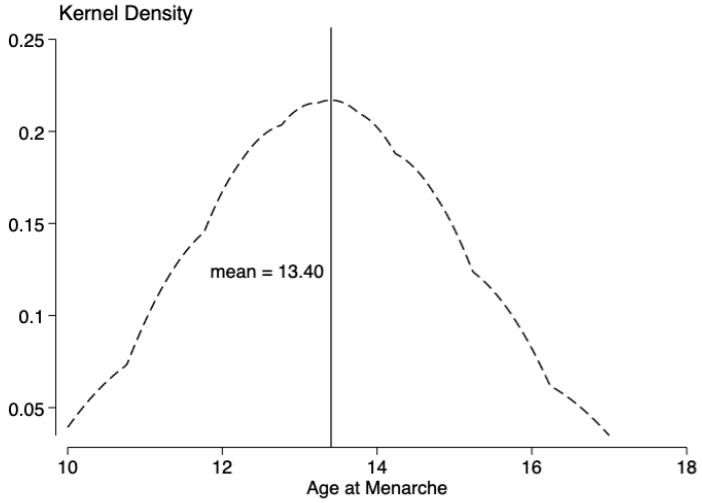
2. In the collapsed panel:

$$\textit{First Stage}: \textit{Pregnant} \leq 18_{ics} = \sigma_1 + \sigma_2 \textit{Fertile Years}_{ics} + \sigma_3 X_i + \vartheta_s + \lambda_c + \epsilon_{ics}$$

$$\textit{Second Stage}: \textit{Outcome}_{ics} = \varphi_1 + \beta_2 \widehat{\textit{Pregnant} \leq 18_{ics}} + \beta_3 X_i + \vartheta_s + \lambda_c + \upsilon_{ics}$$

- *Post Menarche* =1 if age is $\geq$ to the age at menarche
- $\textit{Fertile Years}_{ics} = 17 - \textit{Age at Menarche}_i$
- X_i is the set of individual controls

Distribution of the Age at Menarche



Identification Assumptions

1. Is menarche exogenous?
   - **Random genetic component explain the age at first menstruation** (Jahanfar, Lye, and Krishnarajah, 2013, Srensen et al., 2013, Adair,2001)
   - Association between age at menarche and adult height Graph
     Test whether characteristics are related to the age at menarche Table
   - Other factors: environment Graph, and recall bias Graph

2. Is menarche associated with different schooling levels?
   Unobservable factors don't influence the timing of menarche and later life outcomes.
   - Event Study Analysis Graph

First Stage IV

	Panel Estimation Pregnant$_{itst}$ (1)	Static Estimation Pregnant$\leq 18_{ics}$ (2)
Post Menarche	0.024***	
	(0.002)	
Fertile years		0.032***
		(0.007)
Observations	15,170	1,741
First-stage F stat.	171.2	17.61

Empirical Approach

1. In the panel:

$$Outcome_{icht} = \varphi + \varphi_2 Pregnant_{icht} + \varphi_3 X_i + \psi_h + \eta_t + \upsilon_{icht}$$

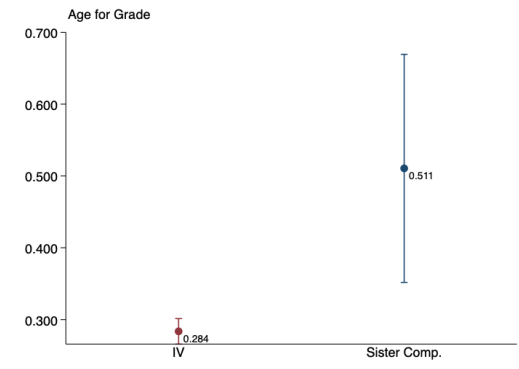
i=individual c=cohort h=household t=time

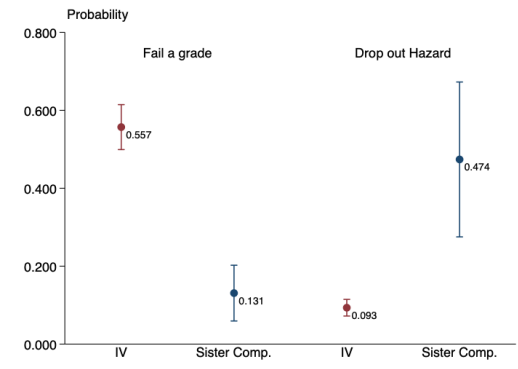
2. In the collapsed panel:

$$Outcome_{ich} = \varphi_1 + \varphi_2 Pregnant \leq 18_{ich} + \varphi_3 X_i + \psi_h + \varsigma_c + \upsilon_{ijh}$$

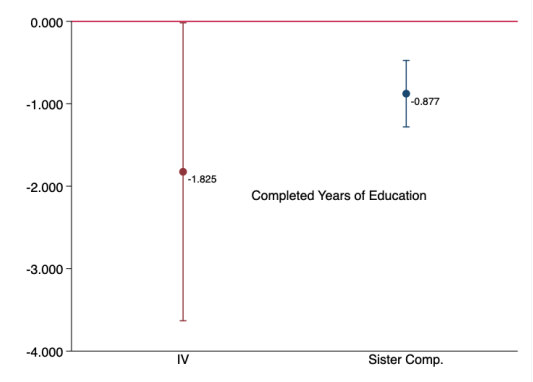
- ψ_h Household fixed effects
- φ_2 Coefficient of interest
- X_i is a set of individual level adult health controls

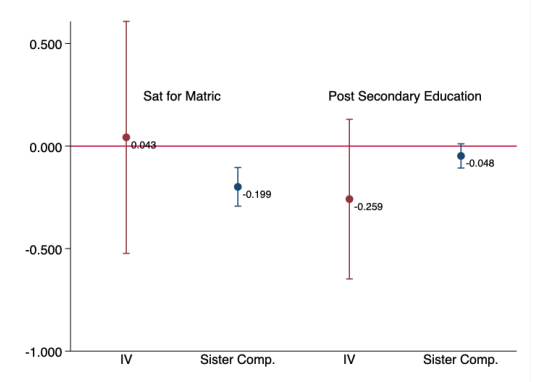
School Progression Results





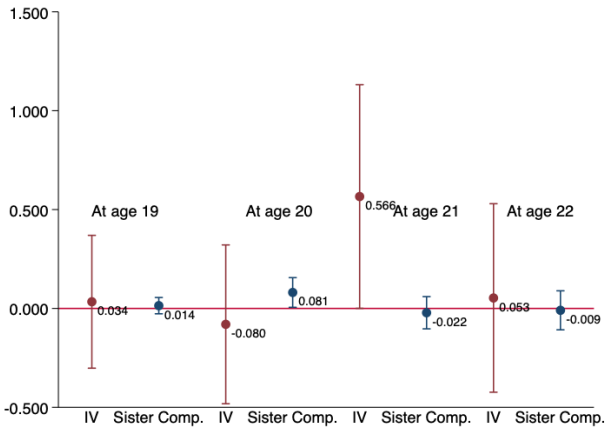
School Attainment Results





Labor Force Participation Results

Active in the labor force



Robustness Checks

1. Change the definition of teenage pregnancy Table
2. Check whether the instrument is sensitive to changes in the top value Table
3. Allow for non linearities in the instrument Table
4. Inverse Probability Weights Table
5. Limit the analysis to teenage births Table
6. Only black women Table
7. Consider child trauma and grandmother' height in main regressions
8. Change the age in the panel fro 20 to 24 Table
9. Do this approaches provide similar coefficients? Mostly Test

Conclusion

- Estimating the economic consequences of early pregnancy requires overcoming selection into motherhood.
- Two approaches: IV with teenage fertility and a Sibling Comparisons
- My findings suggest:
  - Teen Mothers lag behind in their education
  - Suggestive evidence of a degree of substitution between later education and labor force participation
- Grandmother and high failure school attendance mitigate the negative effects
- South Africa $\longrightarrow$ high motherhood penalty among the low income households
  - Policies that intended to address the issue should begin earlier

Thanks!

Teenage pregnancy in South Africa

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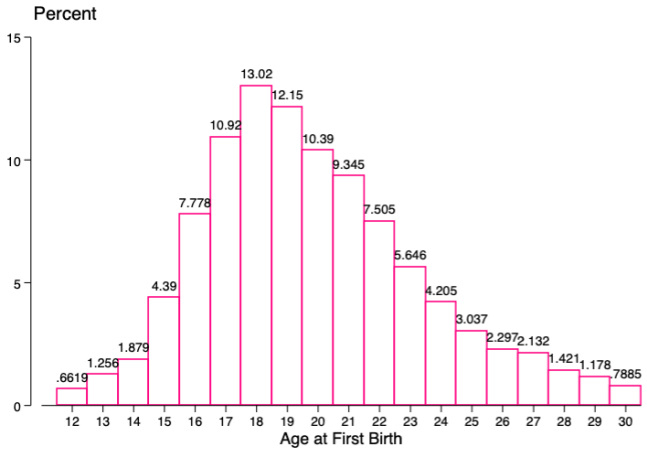

Figure: Age at First Birth, Women ages 25-49 Source: DHS, 1998

Prior Literature: in Developed countries

1. Instruments:
   - Miscarriages (Rindfuss, Bumpass, and St. John, 1980; Hotz, McElroy, and Sanders, 2005; Ashcraft and Lang, 2006a; Fletcher and Wolfe, 2009; and Ashcraft, Fernandez-Val, and Lang, 2013).
   - Abortion laws (Bitler and Zavodny, 2001)
   - Age at menarche (Klepinger et al., 1997 and Ribar, 1994)

   Results: modest estimates on education & labor outcomes
2. With-in family Fixed Effects (Geronimus and Korenman, 1993; Ribar, 1999; Duncan, Lee, Rosales-Rueda, and Kalil, 2018 and Heiland, Korenman, and Smith, 2019).

   Results: Effects $\approx$ 0-1 years less educated than their siblings
3. Propensity Score matching (Levine and Painter, 2003; Lee,2010 and Zito, 2018)

   Results: modest negative effects on schooling, less life satisfaction and no differing self-worth Back

	Country	Identification Strategy	Outcomes	Results
Heiland, et al. (2019)	US	HH FE	Yrs of education	≈ zero in outcomes
Zito (2018)	US	PSM	Attitudes & norms	↑ risk aversion. No self-worth or relationship effects
Duncan, Lee, Rosales-Rueda, Kalil (2018)	US	OLS, HH FE	Yrs of education & behavior problems	1 yr delay in birth ↑ 0.02 to 0.04 SD in school achievement & ↓ problems
Diaz & Fiel (2016)	US	Smoothing-diff. & IPW	Educational attainment and earnings	↓ college completion, early earnings
Yakusheva (2011)	US	PSM	Yrs of education	≈ 0 for high-risk teens & low effects for teens at low risk of TP
Ashcraft, Fernndez-Val & Lang (2006, 2013)	US	IV (miscarriages)	Yrs Education, GED Score, employment & marriage	GED ↓ by about 5 pp & ↓ 0.15 yrs educ. Employment: ↓ 5 pp. Marriage ↓ 3 pp.
Kane, Morgan, Harris, Guilkey (2013)	US	OLS, PSM & ML	Yrs Education	↓ 0.7 and 1.9 yrs. of education
Lee (2010)	US	PSM	Education, labor force	↓ early socioeconomic outcomes
Fletcher & Wolfe (2009)	US	OLS & IV (miscarriages)	Graduation, earnings	↓ 5-10 pp high school graduation, ↓ $1,000 to $2,400 annual income
Francesconi (2008)	UK	OLS, HH FE	Yrs education, bmi	↓ yrs education, employment. ↓ Child health in single parent
Hotz, McElroy & Sanders (2005)	US	IV (miscarriages)	Yrs of education, earnings	No education effects, ↑ earnings at older ages
Kaplan, Goodman, Walker (2004)	UK	OLS, PSM & IV (miscarriages)	Education attainment, employment	↓ large educ. attainment, no labour effects
Levine & Painter (2003)	US	PSM, HH FE	Yrs Education	↓ yrs education & bigger for teenagers at risk
Bitler (2001)	US	IV(Abortion laws)	Timinig of abortions	≈ zero in outcomes
Klepinger, Lundberg, Plotniek (1995, 1999)	US	IV (teenage fertility) & HH FE (1999)	Yrs of education & wages	↓ -2.14 yrs of education, ↓ 2 yrs work experience
Ribar (1994)	US	IV (age at menarche)	High school completion	↓ labor force participation, hours of work
Geronimus & Korenman (1992)	US	HH FE	High school completion	↓ small effects in school completion

Low and middle income countries - Literature

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	Country	Identification Strategy	Outcomes	Results
Branson & Byker (2019)	South Africa	Diff-in-Dif - Policy	Number of births, yrs. of education	↓ 6.3% birth rate , ⇑ 30% monthly earnings
Ranchhod, Lam, Leibbrandt, & Marteleto (2011)	South Africa	PSM	High school graduation	↓ 5.9 & 2.7 pp at ages 20-22. Later catch-up
Ardington, Menendez, Mutevedzi (2015)	Rural South Africa	OLS, PSM, HH FE	Yrs of education, child mortality	↓ 0.67 & 0.79 years. High mortality by 30
Branson, Ardington, Leibbrandt (2015)	South Africa	PS reweighting	Birth weight, height & stunting	6.5 pp low bw, 18.5 pp of stunting
Berthelon & Kruger (2017)	Chile	HH FE	Graduation, enrollment, employment	↓ high school grad. & higher educ., and ↓ 0.45 yrs. No labor effects
Urdinola & Ospino (2015)	Colombia	TM (1819) vs. older mothers (2021)	Job type & domestic violence	↓ 0.091 job quality, ↑ severe DV 0.051 pp, ↑ 1.2% child mort.
Arceo-Gomez & Campos-Vasquez (2014)	Mexico	PSM	Enrollment, yrs of education, employment	↓ 27-33 pp in enrollment, 1-1.2 yrs. educ., ↓ 13-15 employment
Azevedo, Lopez-Calva, Perova (2012)	Mexico	Miscarriages vs teen births	Yrs of education & income	↑ 0.34 yrs of education, ↑ 21 pp more likely to be employed, but ↑ assistance income by 36 %
Narita & Montoya Diaz (2016)	Brazil	PSM	High school completion, employment	↓ TP 1 SD explains ↑ 9.2% in high school comp. & ↑ 5.4% part.
Herrera, Almanza & Sahn (2018)	Madagascar	IV - access & exposure to condoms	Yrs of education & test scores	↑ drop out by 42 pp. ↓ 1.1-1.5 sd test scores in math & French

Notes: TM is short for Teenage Pregnancy, PSM for Propensity Score Matching, and FE Fixed effects

Data

Cape Area Panel Study:

- Young adults living in the Cape Town metropolitan area.
- 5 Rounds of data:
  - 2002, 2003, 2005, 2006 & 2009
- Stratified by race and household
- 2,612 Women aged 14−22 in 2002
- Retrospective information on living arrangements, enrollment and activities

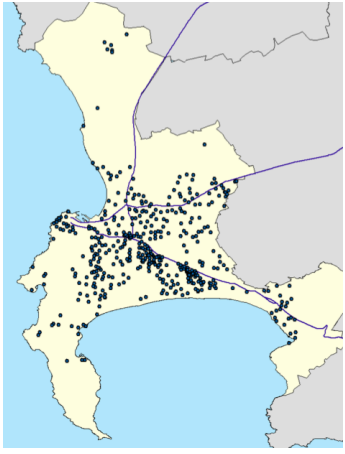

Figure: Source: CAPS Data - Wave 1

Summary Statistics

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	Full Sample (1)	Sibling Sample (2)	Difference (3)
% Coloured	0.461	0.409	-0.052*
	(0.499)	(0.492)	
% Black	0.486	0.565	0.070***
	(0.500)	(0.496)	
Adult Height-cm	157.979	158.006	0.027
	(8.133)	(8.945)	
Mother's Educ.	8.276	7.973	-0.303*
	(3.136)	(2.906)	
# Full Siblings	2.311	2.685	0.374***
	(1.760)	(1.596)	
ln(Hhold Inc.)	6.078	5.822	-0.256***
	(1.087)	(1.092)	
Observations	1,741	418	

Wording of 'Puberty' questions:

- GIRLS ONLY:
  As girls begin to mature into women, certain changes occur in their bodies, such as the start of menstrual periods. At what age did you have your first menstrual period or have you not had one yet? (Please look at the calendar, if that will help you remember.)

- BOYS ONLY:
  As boys begin to mature into men, certain changes occur in their bodies, for example their voices get deeper, they develop pubic hair, and sometimes they begin to have wet dreams. At what age did you first notice any of these changes happening in your body, or have none happened yet? (Please look at the calendar, if that will help you remember.)

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Variable Construction

	2002 Wave 1	2003-2004 Wave 2	2005 Wave 3	2006 Wave 4	2009-2010 Wave 5
Health, Fertility					
Age at Menarche	✓	-	✓ for those w/o data in wave 1	-	-
Pregnancy	Retr. yearly for 1979-2002	-	✓	✓	✓
Births	Retr. yearly for 1979-2002	-	✓	✓	✓
Marriage	Retr. yearly for 1979-2002	-	Retr. yearly for 2003-2005	✓	Retr. yearly for 2007-2009
Adult Height	-	-	-	✓	-
Education					
Literacy Exam	✓	-	-	-	-
Years of Education	Retr. yearly for 1979-2002	✓	✓	✓	Retr. yearly for 2007-2009
Grade Progress	Retros, yearly for 1979-2002	✓	✓	✓	Retr. yearly for 2007-2009
Matriculation	Retr. yearly for 1979-2002	✓	✓	✓	Retr. yearly for 2007-2009
Employment					
Employment	✓	✓	✓	✓	✓
Employment Charact.	✓	✓	✓	✓	✓
Control Variables					
Background	✓	-	-	-	-
Childhood Info	✓	-	-	-	-
Parents Dem.	✓	-	-	Health	-
Parents Death	Retr. yearly for 1979-2002	-	Retr. yearly for 2003-2005	✓	Retr. yearly for 2007-2009
Household Charac.	✓	-	-	-	-

Distribution of Schooling Attainment

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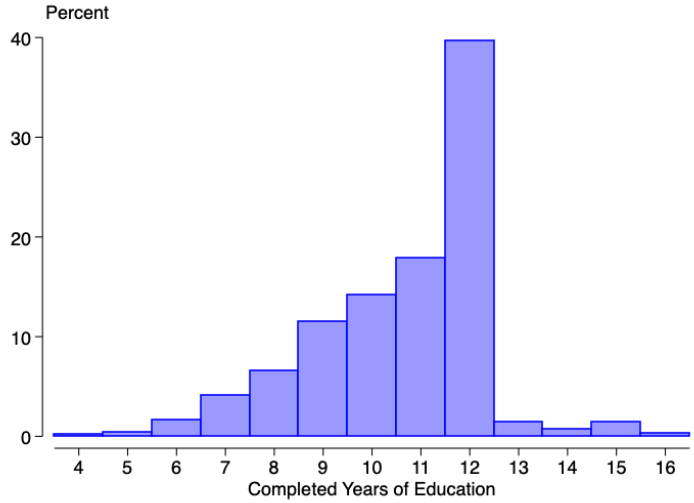

Teenage Pregnancy in the Full Sample

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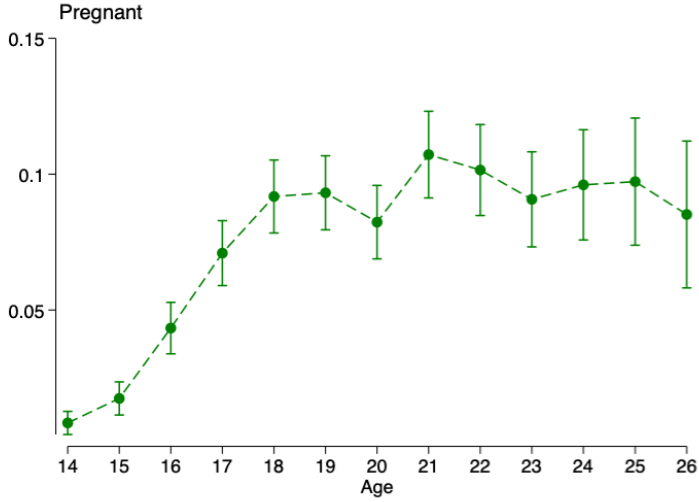

OLS Estimation - Panel

	Failed grade (1)	Age for Grade (2)	Hazard Drop Out (3)
Pregnant_{icst}	0.242***	0.687***	0.017***
	(0.031)	(0.051)	(0.001)
Comparison mean	0.113	1.091	0.359

OLS estimation - Static Model

Panel A: Schooling Attainment

	Years of Education (1)	Sat for Matric Exam (2)	Post Secondary Schooling (3)
Pregnancy ≤ 18	-1.034***	-0.233***	-0.043***
	(0.115)	(0.026)	(0.014)
Observations	1,741	1,741	1,741

Panel B: Labor Force Participation

	Active at age 19 (1)	age 20 (2)	age 21 (3)	age 22 (4)
Pregnancy ≤ 18	0.115***	0.059*	0.048	0.078***
	(0.030)	(0.033)	(0.033)	(0.029)
Observations	1,741	1,741	1,741	1,741

Birth Estimation - Static Model

	Years of Education (1)	Sat for Matric Exam (2)	Post Secondary Schooling (3)
Panel A: OLS Estimation			
Birth $\leq$ 18	-1.087***	-0.224***	-0.041***
	(0.117)	(0.027)	(0.014)
Observations	1,741	1,741	1,741
Panel B: IV Estimation			
Birth $\leq$ 18	-2.380**	0.056	-0.337
	(1.196)	(0.378)	(0.267)
Observations	1,741	1,741	1,741
First Stage F-stat	10.64	10.64	10.64
Mean Dep Var	10.94	0.524	0.147

First Stage Results

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	Panel Analysis		Collapsed Panel			
	Pregnant$_{it}$		Pregnancy $\leq$ 18			
	(1)	(2)	(3)	(4)	(5)	(6)
Fertile$_t$	0.023***	0.014***				
	(0.002)	(0.002)				
Num. Fertile years			0.016***	0.032***		
			(0.006)	(0.007)		
Menarche $\leq$ 14					0.048***	0.083***
					(0.018)	(0.022)
Observations	15,176	15,176	1,741	1,741	1,741	1,741
First-stage F	204.4	67.13	6.914	17.61	7.163	14.80
Sampling Location FE	No	Yes	No	Yes	No	Yes
Controls	No	Yes	No	Yes	No	Yes
Time FE	No	Yes				

Adult Height

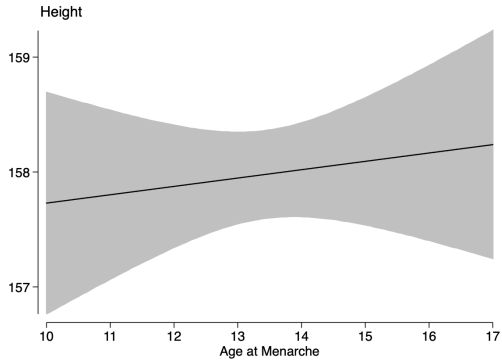

Figure: Adult Height and age at menarche Source: CAPS Round 4

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Summary statistics by Age at Menarche

	Menarche $\geq$ 14 (1)	Menarche <14 (2)	Difference (3)
Coloured	0.298	0.61	0.312***
	(0.458)	(0.488)	
Black	0.667	0.321	-0.346***
	(0.472)	(0.467)	
Height - cm	158.01	157.96	-0.052
	(8.80)	(7.48)	
Married ever	0.175	0.178	0.003
	(0.380)	(0.382)	
Hh Size	5.808	5.799	-0.009
	(2.734)	(2.442)	
Mother attended school	0.856	0.885	0.028*
	0.351	0.319	
	829	912	

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Mother's Height

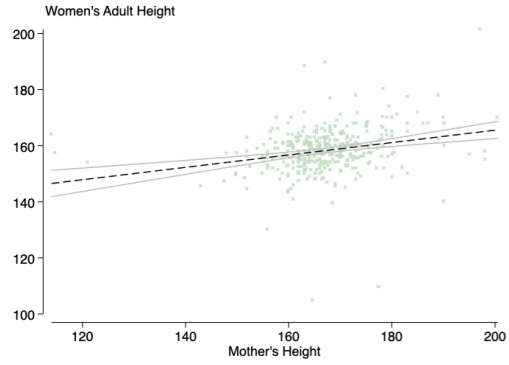

Figure: Mother's Height. Source: CAPS Round 4

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Recall Bias

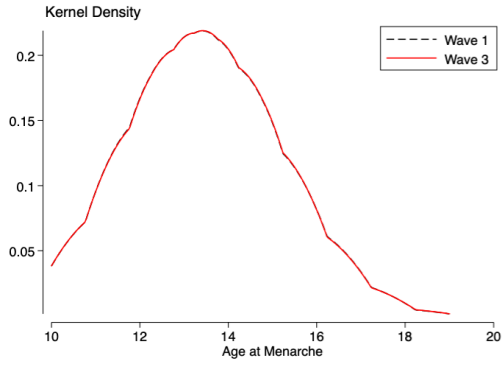

Figure: Age at Menarche - Self Report . Source: CAPS Rounds 1 and 3

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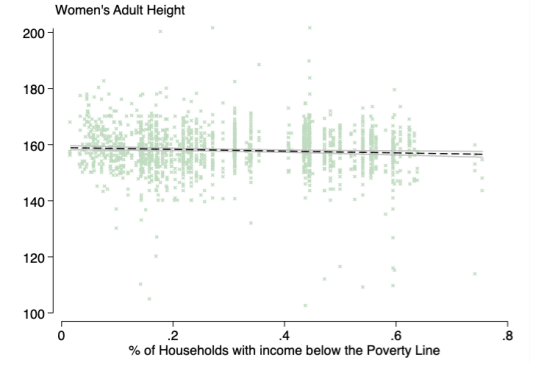
Environmental Factors



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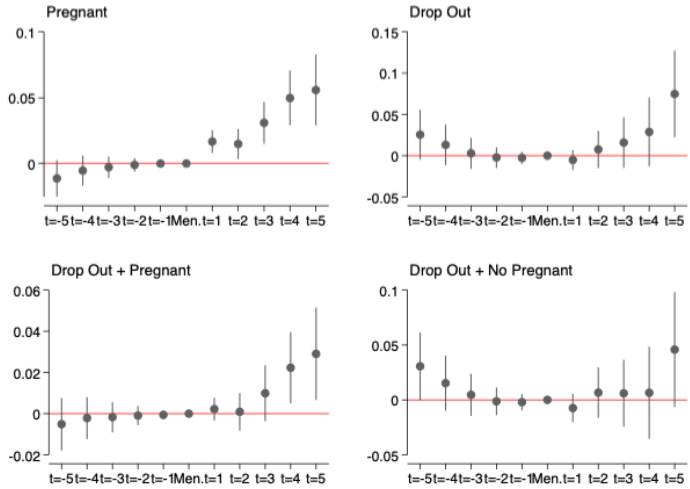
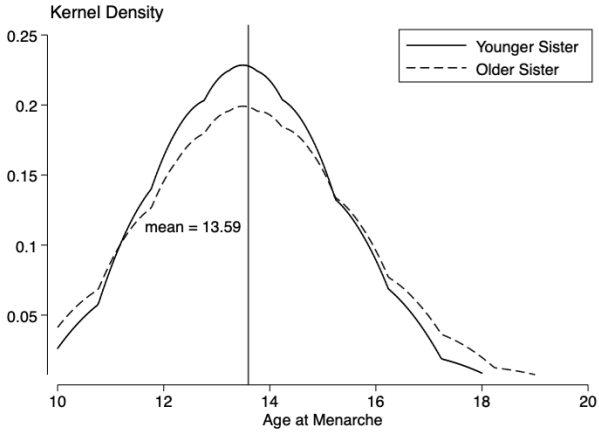
Event study analysis



Limitations of the Sibling Approach

1. Full sample vs Sibling Sample Table
2. Age at menarche between sisters (Corr. 0.724)



Extend the years accounted for by the instrument - First stage

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	Pregnancy≤18		
	(1)	(2)	(3)
Fertile years: 18- Age menarche	0.031***		
	(0.008)		
Fertile years: 19- Age menarche		0.031***	
		(0.008)	
Fertile years: 20- Age menarche			0.031***
			(0.008)
Observations	1,741	1,741	1,741
F-stat	17.57	17.57	17.57

Change in the teenage pregnancy threshold - First stage

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	Pregnancy≤16 (1)	Pregnancy≤17 (2)	Pregnancy≤18 (3)
Fertile Years	0.023***	0.031***	0.032***
	(0.005)	(0.006)	(0.008)
Observations	1,741	1,741	1,741
F-stat	20.67	25.53	17.61

Inverse Probability Weights

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Panel A: School Attainment

	Years Education (1)	Sat for Matric (2)	Post Secondary Educ. (3)
Pregnancy $\leq$18	-1.275**	-0.096	-0.122
	(0.629)	(0.168)	(0.106)
Observations	1,735	1,735	1,735
Comparison Mean	10.94	0.524	0.147
First Stage F-stat	22.85	22.85	22.85

Panel B: Not in Employment, Education or Training

	At age 19 (1)	At age 20 (2)	At age 21 (3)	At age 22
Pregnancy $\leq$18	0.176	0.314*	0.042	0.074
	(0.188)	(0.173)	(0.175)	(0.169)
Observations	1,735	1,735	1,735	1,735
First Stage F-stat	22.85	22.85	22.85	22.85
Comparison Mean	0.566	0.461	0.421	0.394

Test for systematic Comparisons in the differences

Back

	Sibling Comparisons (1)	Instrumental Var. (2)	Difference (3)	Pvalue (4)
Panel A: School Attainment				
Years Education	-1.078	-1.825	-0.747	0.042
Sat for Matric	0.044	-0.226	0.268	0.185
Post Secondary Educ.	-0.100	-0.259	0.158	0.898
Panel B: Labor Force Participation				
Active at age 19	0.014	-0.003	0.016	0.703
Active at age 20	-0.058	-0.093	0.035	0.349
Active at 21	-0.009	0.425	-0.434	0.004
Active 22	0.040	0.144	-0.105	0.554
Panel C: Not in Education, Employment or Training				
NEET at 19	0.185	0.606	-0.421	0.559
NEET at 20	0.117	0.456	-0.339	0.291
NEET at 21	0.125	0.020	0.106	0.025
NEET at 22	0.100	0.252	-0.152	0.217

Intensive Margin Outcomes in 2006 Back

	Earnings	Studying or working in 2006	Hours worked in 2006	Accept domestic worker position	Accept security guard position
	(1)	(2)	(3)	(4)	(5)
Panel A: OLS Estimation					
Pregnancy $\leq$ 18	-0.098***	-1.133***	-166.39*	0.048*	0.053*
	(85.604)	(0.033)	(0.379)	(0.027)	(0.031)
Observations	1,741	1,741	1,741	1,741	1,741
Panel B: IV Estimation					
Pregnancy $\leq$ 18	-0.010	3.370	1,348.10	0.158	0.196
	(0.302)	(3.967)	(1,238.91)	(0.25)	(0.265)
Observations	1,741	1,741	1,741	1,741	1,741
First stage F-stat	17.61	17.61	17.61	17.61	17.61
Comparison Mean	0.507	6.130	917.2	0.227	0.320

Schooling Progression - Until the age of 24

Back

	Failed grade (1)	Age for Grade (2)	Hazard Drop Out (3)
Panel A: IV Estimation			
Pregnant$_{icst}$	0.036	0.317***	0.095***
	(0.092)	(0.012)	(0.007)
Observations	15579	15579	15474
Panel B: Reduced Form Estimation			
Post Menarche$_{itcs}$	0.111***	0.315***	0.423*
	(0.033)	(0.009)	(0.201)
Observations	15,646	15579	15474
Comparison mean	0.113	1.091	0.359

Schooling Attainment- Only Black population

Back

	Years of Education	Sat for Matric	Post Secondary School
	(1)	(2)	(3)
Panel A: OLS Estimation			
Pregnancy ≤ 18	-2.261*	-0.171	-0.107
	(1.170)	(0.371)	(0.253)
Observations	841	841	841
First Stage F-stat	14.71	14.71	14.71
Fertile Years	-0.083*	-0.006	-0.004
	(0.045)	(0.014)	(0.010)
Observations	846	846	846
Comparison mean	10.82	0.466	0.118

Preview of the Results

1. Educational outcomes results:
   - Conditional on being enrolled, teen mothers are 14-22 55 pp more like to fail a grade, lag behind by 0.3 years
   - Increase in the drop out rate by 10 pp (23% increase) .
   - Decrease in years in education of 1-1.8 years

2. No labor force participation Comparisons
   - Positive but not statistically significant effects

3. Attenuation effects of teenage pregnancy:
   - The presence of the grandmother (0.5 years)
   - Attending a school with higher grade repetition rates (0.41 years)

Contributions & Prior Literature

1. Examine the effects of teenage pregnancy in a middle income setting
   - High income countries: **mixed and inconclusive** Literarure
   - Less in low and middle income countries: Almanza and Sahn (2018) in Madagascar & Ardington et al. (2014), and Branson and Byker (2018) Table
2. Provide evidence of the participation in the labor force
   - Branson and Byker (2018)
3. Understand which South African characteristics attenuate the effects of early pregnancy

Selection into Teenage Pregnancy

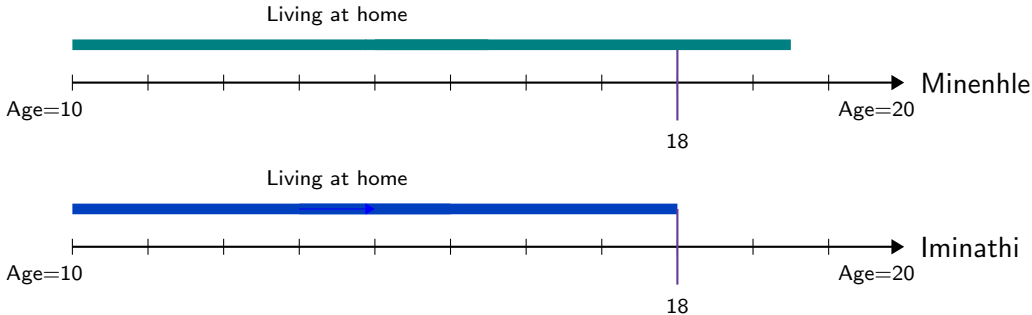
	No Pregnancy (1)	Pregnancy≤18 (2)	Difference (3)
% Coloured	0.438	0.555	0.117***
	(0.496)	(0.498)	
% Black	0.497	0.443	-0.055*
	(0.500)	(0.497)	
Adult Height (cm)	158.27	156.81	-1.463***
	(7.99)	(8.60)	
Mother attended School	0.880	0.839	-0.041*
	(0.009)	(0.020)	
Household Size	5.691	6.256	0.565***
	(2.528)	(2.755)	
ln(Hhold Inc.)	-0.078	-0.295	-0.255***
	(0.885)	(0.848)	
Observations	1394	348	

Educational Outcomes - Panel

	Failed grade (1)	Age for Grade (2)	Hazard Drop Out (3)
Panel A: OLS Estimation			
Pregnant$_{it}$	0.128***	0.501***	0.583***
	(0.043)	(0.122))	(0.091)
Observations	3,521	3,521	4,535
Panel B: Sibling Comparisons			
Pregnant$_{it}$	0.132***	0.521***	0.494**
	(0.037)	(0.080)	(0.103)
Observations	3,521	3,521	4,535
Comparison Mean	0.101	1.002	0.143

Sibling Comparisons Identification Strategy

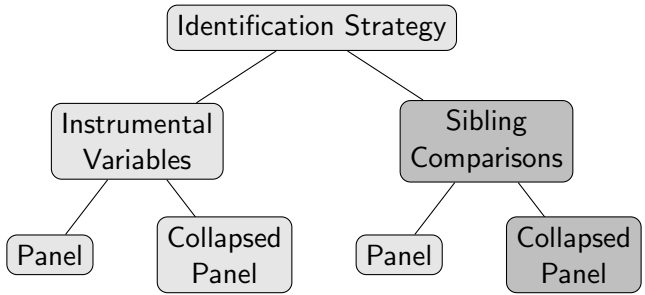
Iamgine that Minenhleand are sisters:



Sisters who live together share the same background

- One sibling experienced teenage pregnancy and at least one did not
- Variation is conditionally independent of unmeasured sibling differences that affect the outcomes

Results - Siblings Comparisons



$$Outcome_{ics} = \varphi_1 + \beta_2 \widehat{Pregnancy \leq 18_{ics}} + \beta_3 X_i + \vartheta_s + \lambda_c + \upsilon_{ics}$$

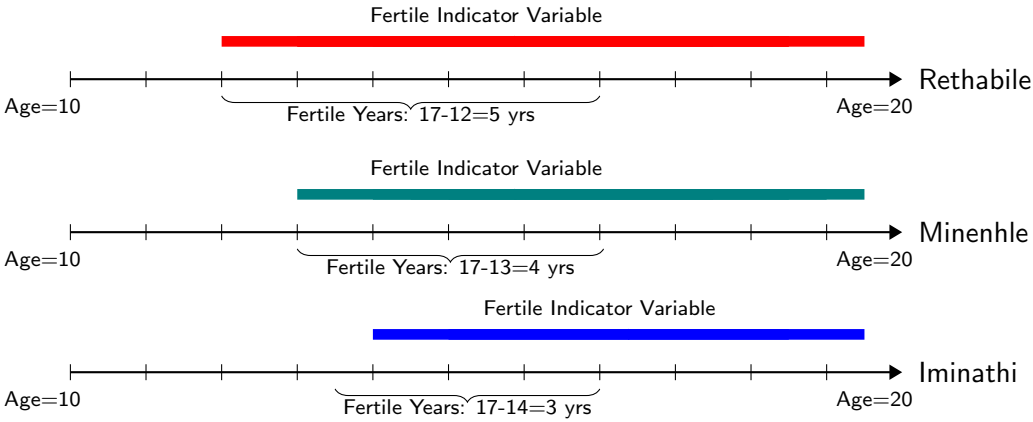
Educational Outcomes

	Years Education	Sat for Matric	Post Secondary School
	(1)	(2)	(3)
Panel A: OLS Estimation			
Pregnancy $\leq$ 18	-0.707***	-0.155***	-0.057**
	(0.194)	(0.042)	(0.024)
Observations	418	418	418
Panel B: Sibling Comparisons			
Pregnancy$\leq$ 18	-0.774***	-0.159***	-0.049**
	(0.170)	(0.040)	(0.024)
Observations	418	418	418
Comparison Mean	10.52	0.360	0.102

Labor Force Participation

	At age 19	At age 20	At age 21	At age 22
	(1)	(2)	(3)	(4)
Panel A: OLS Estimation				
Pregnancy $\leq$ 18	0.039	0.007	0.012	0.004
	(0.037)	(0.041)	(0.045)	(0.045)
Observations	418	418	418	418
Panel B: Sibling Comparisons				
Pregnancy$\leq$ 18	0.034	0.006	0.010	0.008
	(0.037)	(0.042)	(0.045)	(0.046)
Observations	418	418	418	418
Comparison Mean	0.197	0.282	0.328	0.363

Instrument: Women's Fertility



Grand mother alive-Teens

	Years Education (1)	Sat for Matric (2)	Post Secondary School (3)
Pregnancy $\leq$ 18	-2.138***	-0.059	-0.165
	(0.692)	(0.211)	(0.142)
Grand mother alive-Teens	0.285*	0.124**	0.023
	(0.157)	(0.057)	(0.028)
Pregnancy$\leq$18 x Grand mother alive	0.521*	0.017	-0.015
	(0.316)	(0.073)	(0.054)
Observations	1,741	1,741	1,741
R-squared	0.169	0.175	0.058
First Stage F-Statistic	17.67	17.67	17.67
Comparison Mean	10.94	0.524	0.147

High grade failure schools

	Yrs of Education (1)	Sat for Matric (2)	Post Sec. Education (3)
Pregnancy≤18	-1.749*	0.123	-0.255
	(0.946)	(0.333)	(0.216)
High Failure School	0.357**	0.110***	-0.004
	(0.139)	(0.040)	(0.029)
Pregnancy≤18 x High Failure School	0.410*	-0.006	-0.016
	(0.242)	(0.052)	(0.029)
Observations	1,741	1,741	1,741
First Stage F-Statistic	14.46	14.46	14.46
Comparison Mean	10.98	0.524	0.157

Schooling Progesion

	Failed grade (1)	Age for Grade (2)	Hazard Drop Out (3)
Panel A: IV Estimation			
Pregnant$_{icst}$	0.557***	0.284***	0.097***
	(0.028)	(0.010)	(0.009)
Observations	15,170	15,170	14,354
First stage-F-stat	171.2	171.2	171.2
Panel B: Reduced Form Estimation			
Post Menarche$_{itcs}$	0.617***	0.315***	0.423*
	(0.033)	(0.009)	(0.201)
Observations	15,170	15,170	14,354
Comparison mean	0.113	1.091	0.359

Schooling Attainment

OLS

	Years of Education	Sat for Matric	Post Secondary School
	(1)	(2)	(3)
Panel A: IV Estimation			
Pregnancy$\leq$ 18	-1.820**	0.044	-0.259
	(0.922)	(0.289)	(0.199)
Observations	1,741	1,741	1,741
First Stage F-stat	17.61	17.61	17.61
Panel B: Reduced Form Estimation			
Fertile Years	-0.057*	0.001	-0.008
	(0.030)	(0.009)	(0.006)
Observations	1,741	1,741	1,741
Comparison Mean	11.05	0.436	0.146

Labor Force Participation

	At age 19	At age 20	At age 21	At age 22
	(1)	(2)	(3)	(4)
Panel A: OLS Estimation				
Panel A: IV Estimation				
Pregnancy$\leq$ 18	0.192	0.338	0.229	-0.114
	(0.260)	(0.294)	(0.264)	(0.266)
Observations	1,741	1,741	1,741	1,741
First Stage F-stat	17.61	17.61	17.61	17.61
Panel B: Reduced Form Estimation				
Fertile Years	0.006	0.011	0.007	-0.004
	(0.008)	(0.009)	(0.008)	(0.009)
Observations	1,741	1,741	1,741	1,741
Comparison Mean	0.458	0.704	0.764	0.686

Main Outcomes:

- Educational outcomes:
  1. School progression
     - Grade failure
     - Measure of grade for age
     - Drop-out
  2. School attainment:
     - Number of years of completed years of schooling Distribution
     - Whether sampled women sat for the matriculation exam
     - Whether sampled women continued to higher education (formal education or training)
- Labor force participation