
Childhood mortality, childhood morbidity, and subsequent fertility decisions

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Motivation

What do we know about demographic transitions?

Past: Demographic Transition pattern in industrialized countries:

- Fertility rates followed the decrease in child mortality, with some lag.

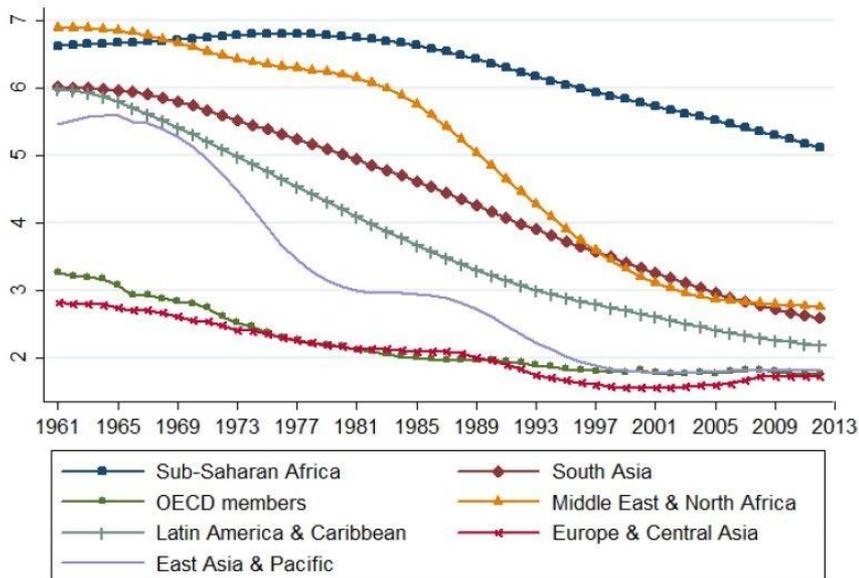
Present: sub-Saharan Africa current state of affairs:

- Has long been trapped in a Malthusian crisis.
- But mortality rates have fallen steadily from the 1960's.
- And fertility rates are remaining markedly high.
 - ➔ Rapid population growth and high demographic pressure.
- Why?

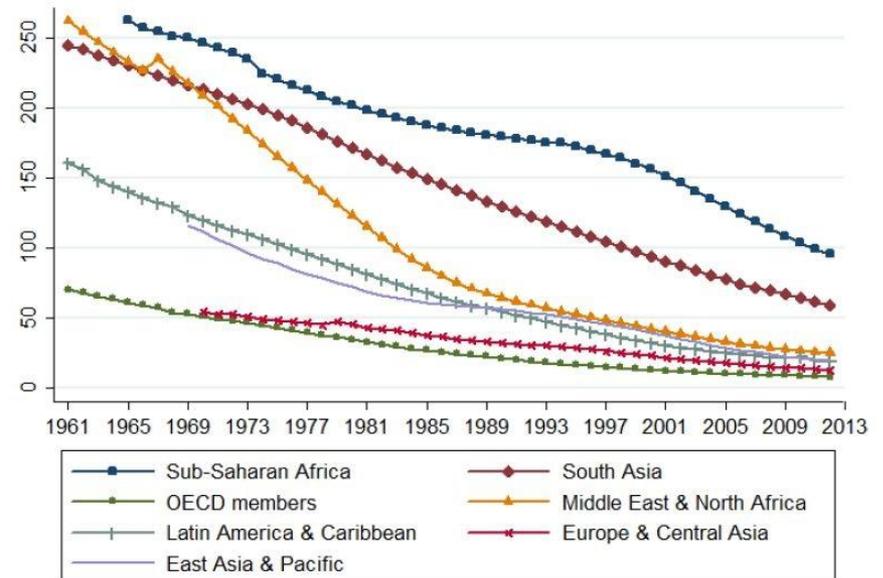
Motivation

Demographic transitions since 1960

(a) Total fertility rate



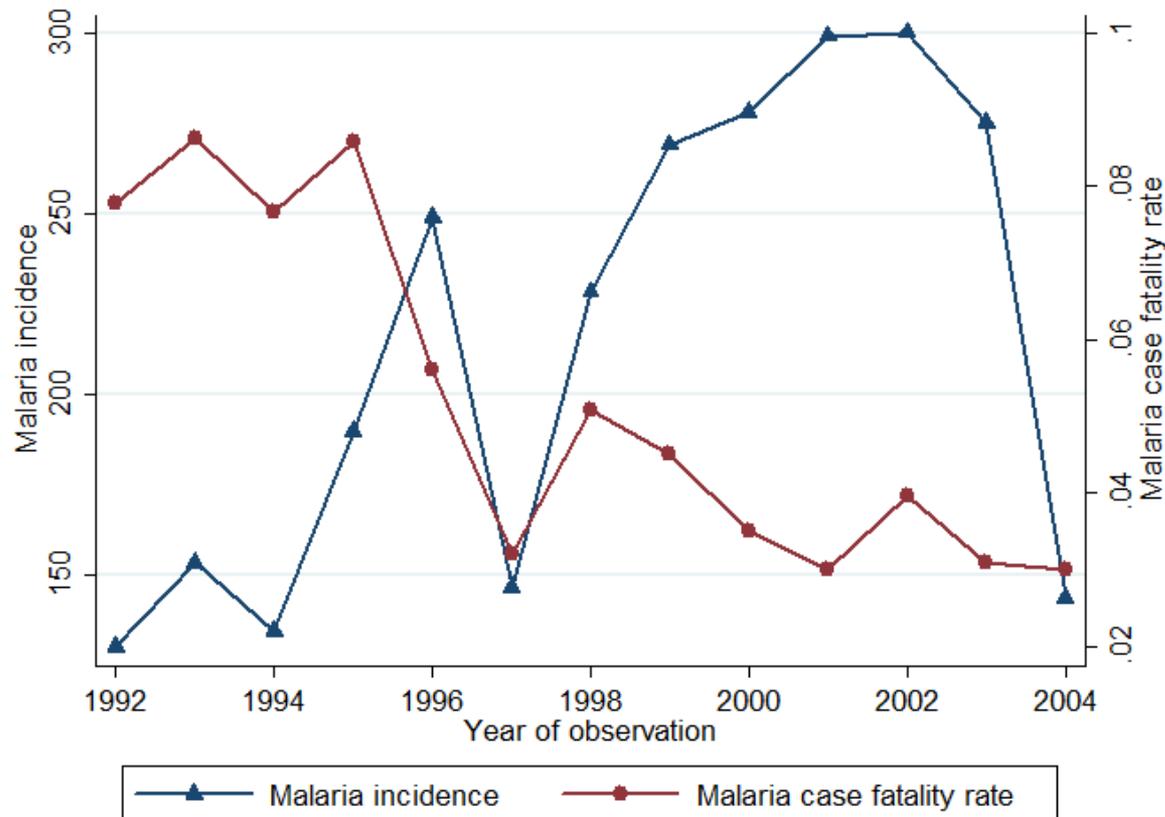
(b) Child mortality rate



Source: World Bank's World Development Indicators

Niakhar: Epidemiological profile

Malaria incidence and case fatality rates



The effect of child mortality on fertility

It can be twofold.

The replacement effect:

- when households have additional children to replace the ones that they lose → involves a sequential process.

The insurance effect (hoarding motive, child survival hypothesis):

- when households anticipate that not all children will survive to adulthood → additional children as an insurance against potential future losses.

Main objective

To analyze the effects of childhood mortality and morbidity on the fertility decision-making process.

- Estimate the magnitude of the replacement effect (using households' child mortality experiences).
- Identify the insurance effect (using community-level child mortality and morbidity).

Data: Niakhar HDSS

The rural community of Niakhar (Fatick, Senegal):

- 135 km east from Dakar
- Total area of 203 km², 30 villages
- Agriculture is the main source of livelihood

Sample selection:

- Annual data on 3435 women over the period 1984-2011
- Demographic data: birth and death histories
- Socio-economic data: index of deprivation in living standards
- Epidemiological data: malaria mortality and morbidity at the community level



Model

Nonlinear dynamic panel data model of fertility behavior

- allowing for **state dependence** (between past and present fertility status) and **unobserved heterogeneity**
- including the **determinants of fertility**



dynamic correlated random effects Probit model (Wooldridge, 2005):

$$\begin{aligned} P(\text{birth}_{it} = 1 | \text{birth}_{i,t-1}, \dots, \text{birth}_{i0}, z_i, c_i) \\ &= \Phi(z_{it}\gamma + \rho\text{birth}_{i,t-1} + c_i) \\ &= \Phi(\gamma_1\text{cm}_{it} + \gamma_2\text{cm}_{i,t-1} + \gamma_x x_{it} + \rho_1\text{birth}_{i,t-1} + c_i) \end{aligned}$$



allows to identify causal effects on subsequent fertility

Results

Identification of the replacement effect

	Model 1 (baseline model)		Model 1 (baseline model)	
	Coefficient estimates	Average partial effects	Coefficient estimates	Average partial effects
Child mortality				
This year	0.762*** (0.056)	0.1652 (0.077)		
Last year	0.877*** (0.060)	0.1902 (0.089)		
Temporary migration				
This year	-0.414*** (0.027)	-0.0897 (0.042)		
Last year	-0.007 (0.027)	-0.0015 (0.001)		
Formal education (ref. = none)				
Primary or religious school	-0.111*** (0.032)	-0.0240 (0.011)		
Higher	-0.294*** (0.081)	-0.0638 (0.030)		
Living Standards				
Extremely deprived	0.134* (0.067)	0.0290 (0.014)		
Religion (ref. = Islam)				
Christianity	-0.010 (0.028)	-0.0022 (0.001)		
Animism	-0.044 (0.115)	-0.0095 (0.004)		
Marital status in the household				
Married before 15 years of age	0.365*** (0.053)	0.0791 (0.037)		
Polygynous household	0.140*** (0.030)	0.0304 (0.014)		
Occupation (ref. = housewife)				
Active	-0.329** (0.101)	-0.0714 (0.033)		
Maid	-0.262*** (0.027)	-0.0569 (0.027)		
Student	-0.679*** (0.059)	-0.1472 (0.069)		
			Birth cohort (ref. = 1969-1974)	
			1975-1980	-0.007 (0.030) -0.0015 (0.001)
			1981-1986	0.046 (0.032) 0.0100 (0.005)
			Age	0.149*** (0.003) 0.0323 (0.015)
			State dependence	
			Fertility status last year	-1.291*** (0.031) -0.2799 (0.131)
			Initial conditions	
			Initial fertility status	0.132 (0.086)
			Constant	-3.817*** (0.076)
			$\hat{\sigma}_a$	0.405*** (0.015)
			<i>Rho</i>	0.141
			Log likelihood	-14198.938
			Wald test <i>p</i> -value	0.0000
			No. of individuals	3435
			No. of time periods per individual	10
			No. of observations	34350

NOTES: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Asymptotic standard errors in parentheses. Child mortality indicators (cm_t) are included but not shown in the table. The significance level of the average partial effects corresponds to the one of the coefficient estimates.

Results

Further analyses of the replacement effect

- larger in magnitude for the loss of a male rather than a female child
 - ➔ preference for sons through the replacement effect
- child mortality has a smaller impact on the subsequent fertility of women from more recent cohorts
 - ➔ downward trend in the size of the replacement effect

Results

Identification of the insurance effect

Include lagged annual measures of:

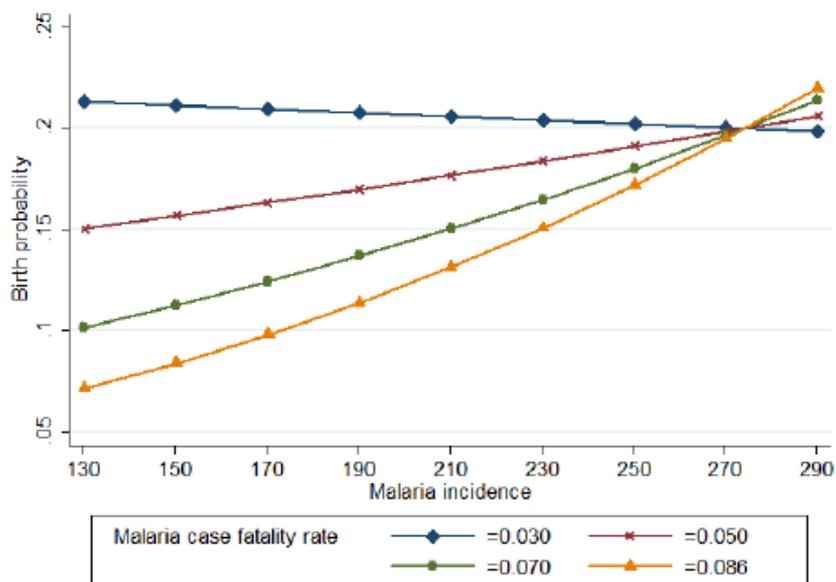
- malaria incidence
 - malaria case fatality
 - malaria mortality
- contextual child mortality and morbidity have a positive effect on households' fertility decisions
- the impact of past malaria incidence on the probability of birth varies depending on the severity of the disease

Results

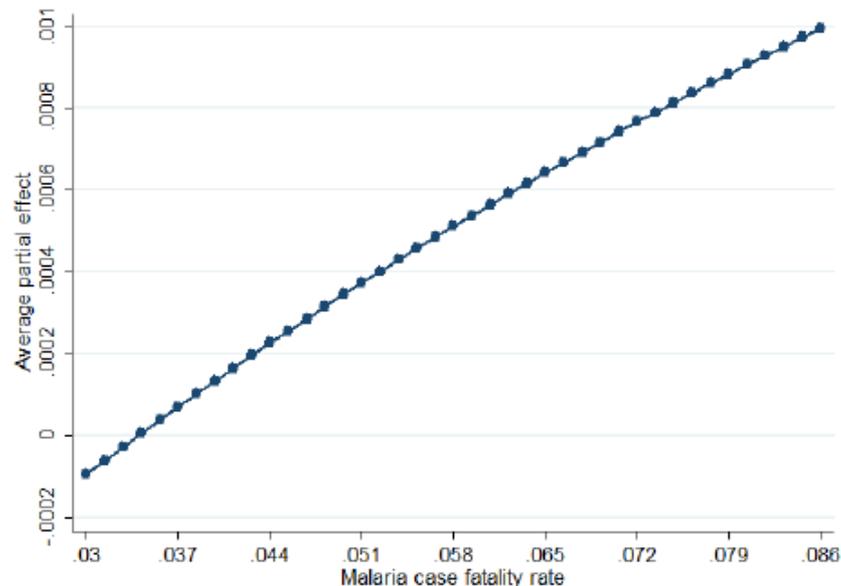
Identification of the insurance effect

Effect of community morbidity (malaria incidence rate) on fertility given malaria case fatality rate

(a) Predicted probabilities



(b) Average partial effect



Conclusion

- Malaria incidence among children has a positive effect on subsequent fertility choices
- This positive effect is stronger the higher the fatality of the disease.
 - ➔ First paper that identifies the causal effects of perceived child mortality and morbidity risks on fertility.

Policy implication :

Health policies aimed at reducing child mortality *and* morbidity will have indirect desirable effects on fertility behaviors