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# 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.

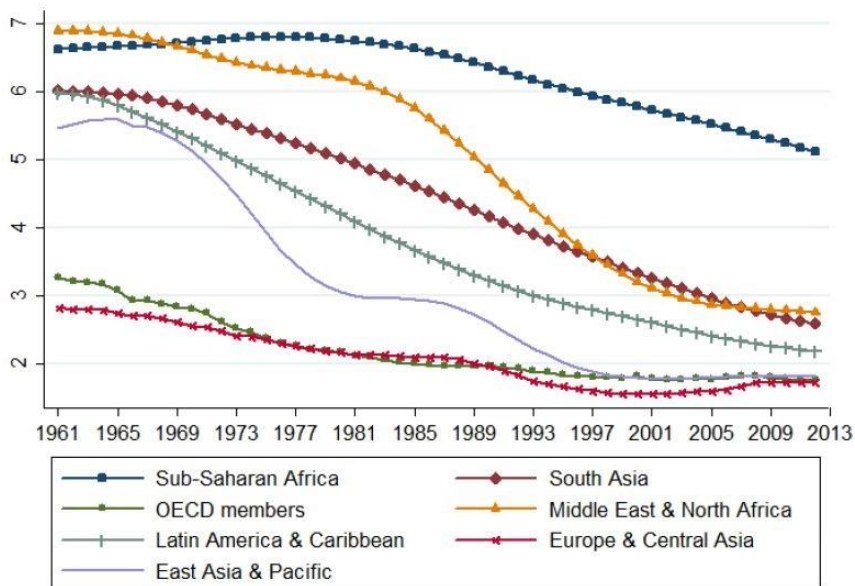
Present: sub-Saharan Africa current state of affairs:

- 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?

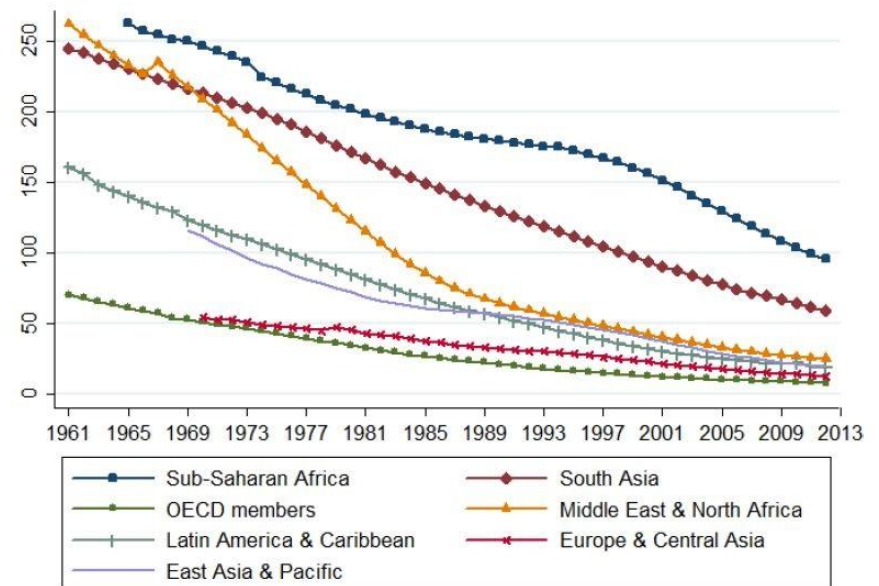
# Motivation

Demographic transitions since 1960

(a) Total fertility rate



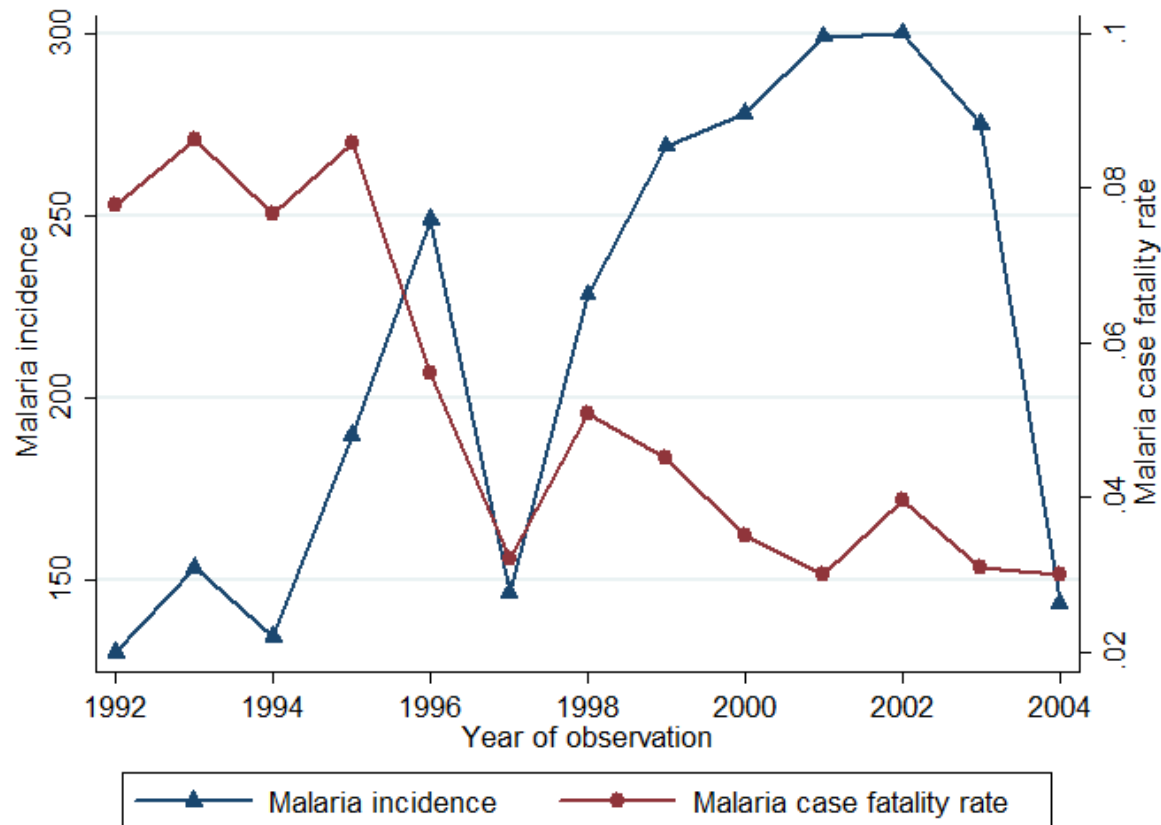
(b) Child mortality rate



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 km<sup>2</sup>, 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
<b>Child mortality</b>				
This year	0.762*** (0.056)	0.1652 (0.077)		
Last year	0.877*** (0.060)	0.1902 (0.089)		
<b>Temporary migration</b>				
This year	-0.414*** (0.027)	-0.0897 (0.042)		
Last year	-0.007 (0.027)	-0.0015 (0.001)		
<b>Formal education (ref. = none)</b>				
Primary or religious school	-0.111*** (0.032)	-0.0240 (0.011)		
Higher	-0.294*** (0.081)	-0.0638 (0.030)		
<b>Living Standards</b>				
Extremely deprived	0.134* (0.067)	0.0290 (0.014)		
<b>Religion (ref. = Islam)</b>				
Christianity	-0.010 (0.028)	-0.0022 (0.001)		
Animism	-0.044 (0.115)	-0.0095 (0.004)		
<b>Marital status in the household</b>				
Married before 15 years of age	0.365*** (0.053)	0.0791 (0.037)		
Polygynous household	0.140*** (0.030)	0.0304 (0.014)		
<b>Occupation (ref. = housewife)</b>				
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)		
			<b>Birth cohort (ref. = 1969-1974)</b>	
			1975-1980	-0.007 (0.030) -0.0015 (0.001)
			1981-1986	0.046 (0.032) 0.0100 (0.005)
			<b>Age</b>	0.149*** (0.003) 0.0323 (0.015)
			<b>State dependence</b>	
			Fertility status last year	-1.291*** (0.031) -0.2799 (0.131)
			<b>Initial conditions</b>	
			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 ( $cm_i$ ) 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:

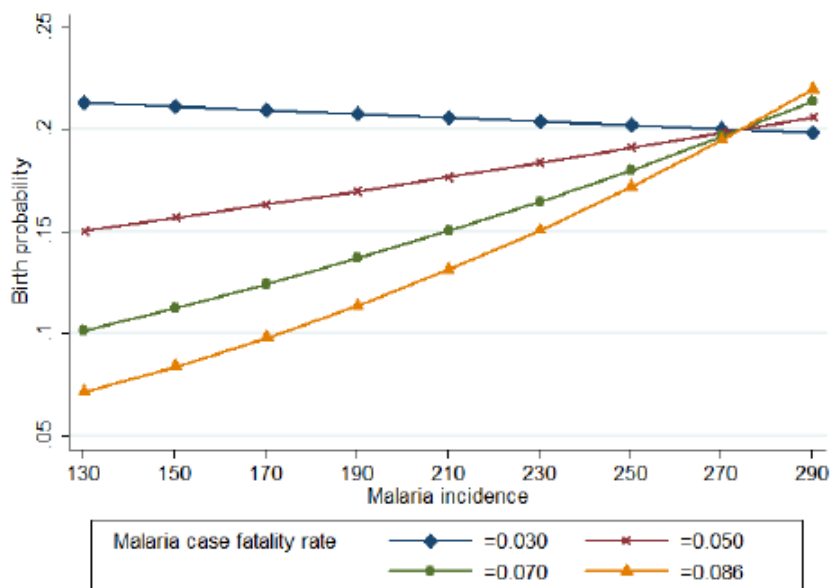
- malaria incidence
  - malaria case fatality
  - malaria mortality
- contextual child mortality and morbidity have a positive effect on households' fertility decisions
- the impact of past malaria incidence on the probability of birth varies depending on the severity of the disease

# Results

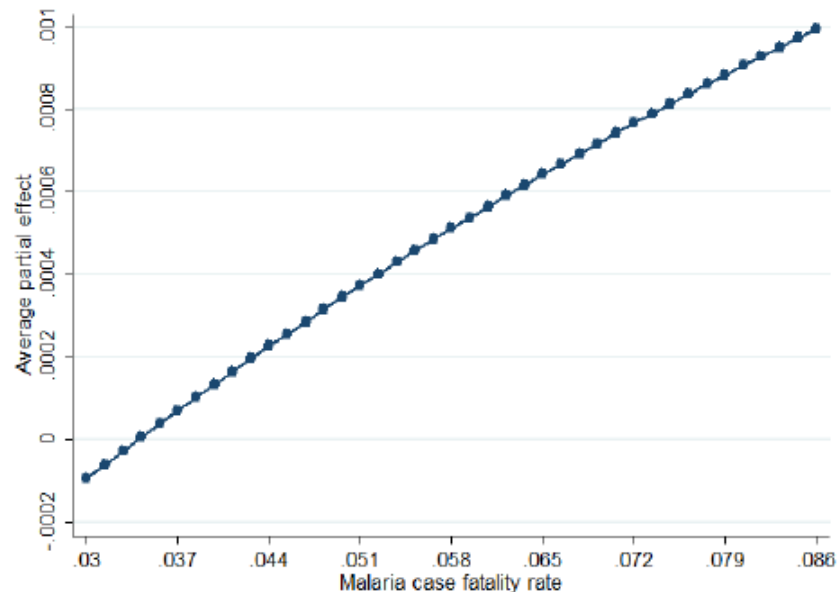
Identification of the insurance effect

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