From Awareness to Adverse Selection
Cardiovascular Disease Risk and Health Insurance Decisions

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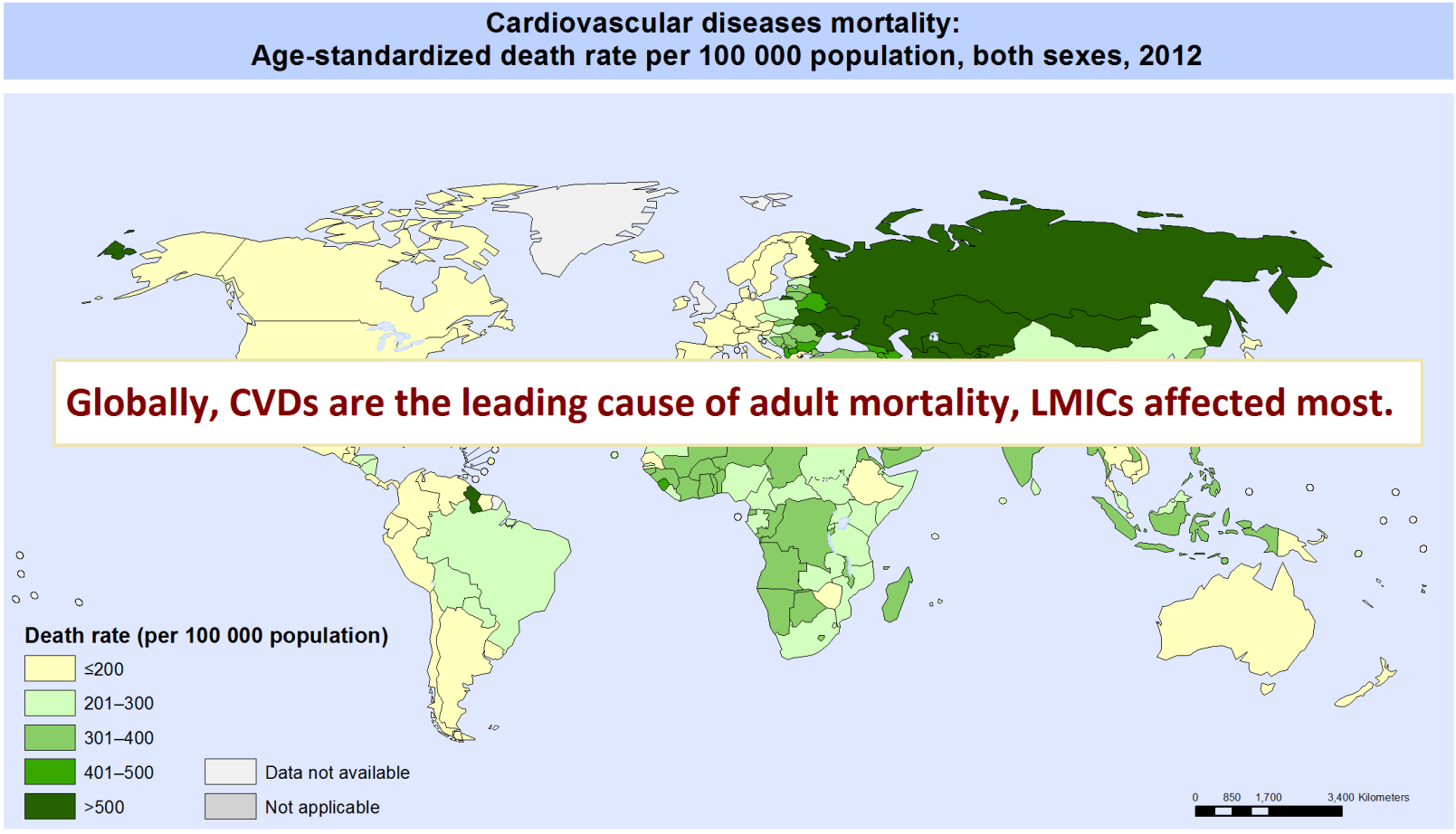
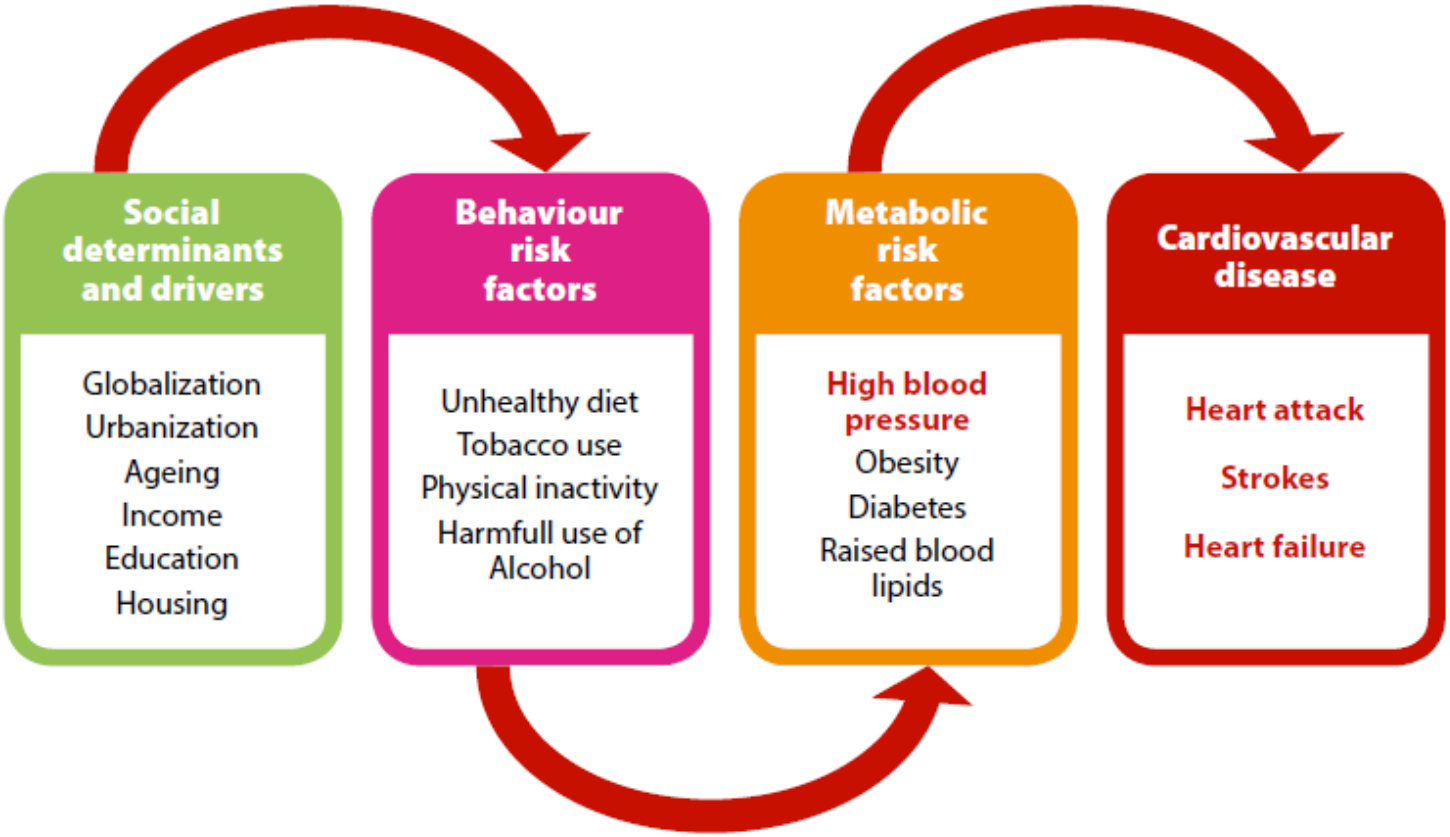
UNU-WIDER conference on human capital and growth
Helsinki, June 7, 2016



Source: World Health Organization, 2014.

Every year, 17.5 million people die from CVDs (31% of adult deaths); and more than 75% of all CVD deaths occur in LMICs.

Figure: Cardiovascular Diseases (CVDs) and their main drivers



Source: World Health Organization, 2014

Motivation

Health insurance to improve access to healthcare for CVD prevention?

Private health insurance providers often do not cover such treatment for fear of adverse selection (selective enrollment of high-risk populations)

Prior literature finds mixed results for selection on general health in developing countries (Wang et al., 2009; Zhang and Wang, 2008; Fonseca and Lewis, 2012; Parmar et al., 2012; Dalton et al., 2012)

Selection on CVD risk potentially stronger because of the chronic nature of CVDs. Alternatively, selection may be weaker:

- Lack of knowledge of own's CV health status (Addis et al., 2011; Zhao et al., 2013)
- Selection on other dimensions (e.g. risk aversion) associated with preventive behaviors (Finkelstein & McGarry, 2006; Barsky et al., 1997)

This paper: Adverse selection on CVD risk in health insurance?

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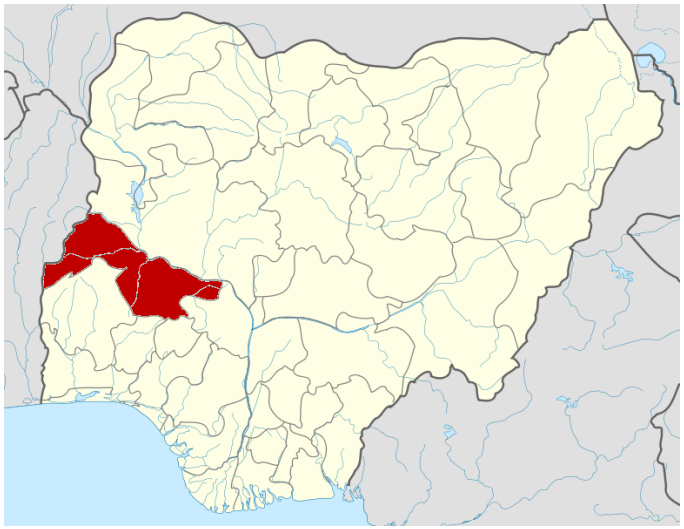
CONTEXT

Hygeia Community Health Care (HCHC) program



- Insurance scheme in Kwara State, Nigeria, launched in 2009
- Covers outpatient and inpatient health care in upgraded clinics
- Hypertension/diabetes treatment cost US $118 per patient per year
- Program reduced blood pressure (Hendriks *et al.* 2014, 2015)

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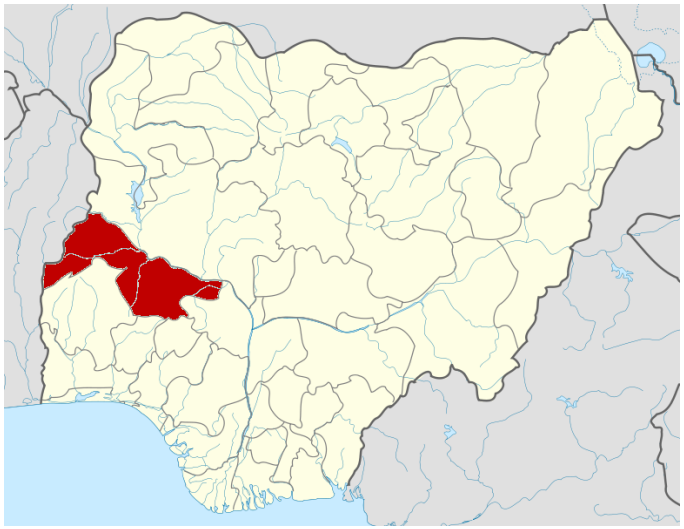

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- Households paid 300 Naira $\approx$ $ 2 per person per year (23.1 % of health expenditures, 2.5% of the package cost).
- Large subsidy may limit adverse selection, but many households decided to enroll some instead of all family members.
- We focus on these partially enrolling families. They are larger, have lower levels of education, and lower per capita consumption.

METHODS

Data

- Representative household surveys collected in '09, '11 and '13 for the program areas and a comparable control area.
- Each wave collected individual-level data on a.o. self-reported CV health, measured CVD risk factors and enrollment
- Focus on households in program area with ≥ 2 adult members
- Complete data on current CV health and subsequent enrollment
  - Baseline to midline: 605 HH (1,221 adults)
  - Midline to endline: 466 HH (1,166 adults)

Data

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- Focus on households in program area with ≥ 2 adult members
- Complete data on current CV health and subsequent enrollment
  - Baseline to midline: 505 HH (1,221 adults)
  - Midline to endline: 488 HH (1,186 adults)

Empirical strategy

Regress enrollment *future to current* round on *current* CVD risk; score from Framingham Heart Study (D'Agostino *et al.*, 2008)

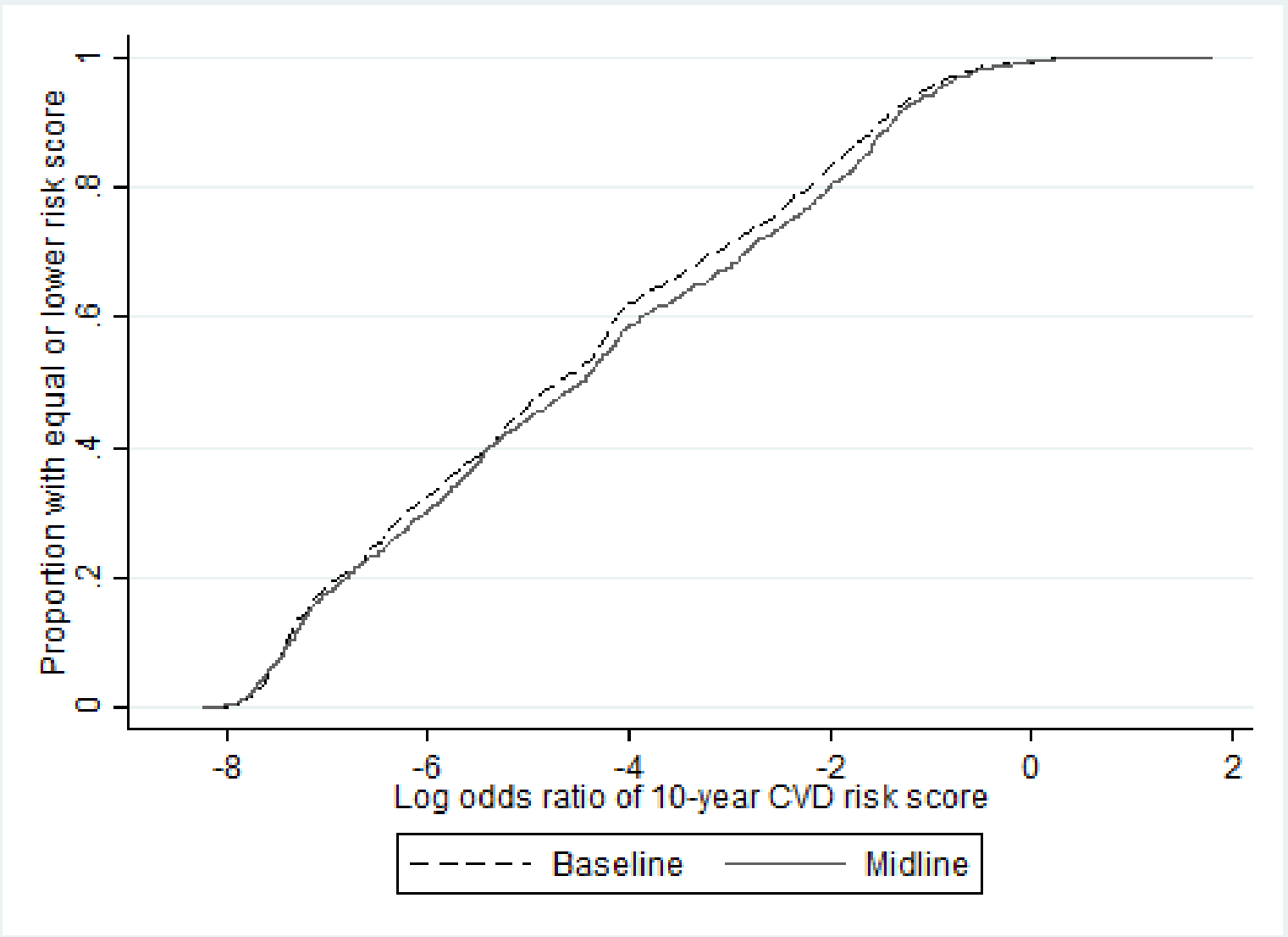
- 10-year risk based on age, gender, BMI, blood pressure, smoking status, and diabetes.
- We use the log odds ratio of this score, controlling for:
  - Age and gender (focus on asymmetric information)
  - Other healthcare needs (focus on CVDs)
  - Location effects (access to healthcare/program exposure)

Table: Description of individuals in the analysis sample

	From baseline to midline	From midline to endline	Difference over time
	(1)	(2)	(3)
Enrolls before follow-up	0.567	0.464	-0.103**
Reports CV health problem	0.025	0.093	0.069**
Framingham 10-year CVD risk	0.055	0.062	0.007**
Overweight or obese	0.225	0.229	0.004
High systolic BP	0.140	0.151	0.011
Reports diabetes/has high glucose	0.013	0.022	0.009†
Currently smokes	0.085	0.080	-0.005
Observations	1221	1186	

Notes: Sample includes all households with current health and subsequent enrollment observed for at least two adult family members. Means are weighted by the inverse number of observations in a household. Significance levels calculated after clustering standard errors by census area. † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Log odds for 10-year risk of developing any CVD



RESULTS

Figure: Coefficient on log odds 10-year CVD risk

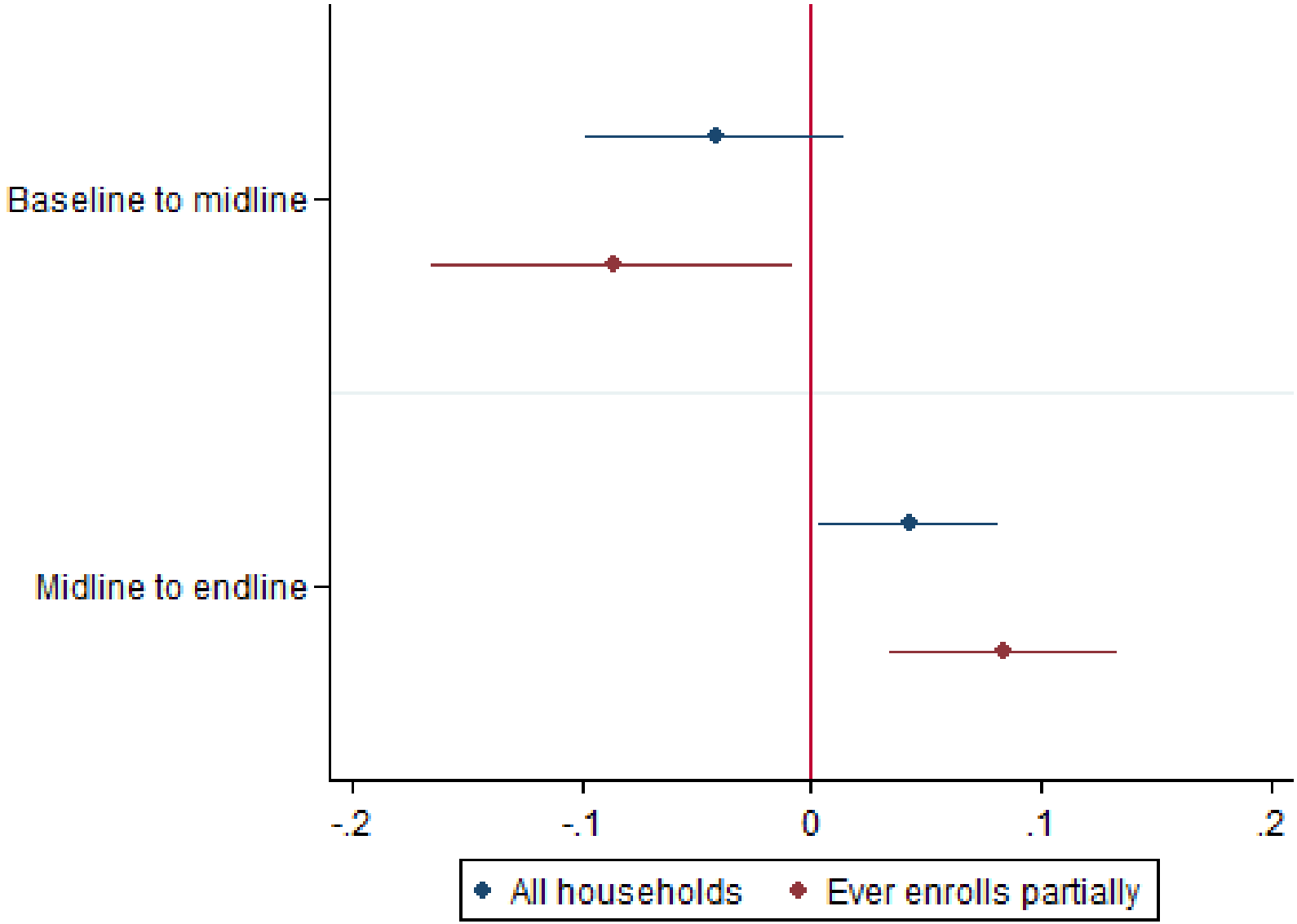


Table: Total CVD risk and subsequent enrollment in health insurance

	Baseline to midline		Midline to endline	
	All HH	Ever partially	All HH	Ever partially
Log odds CVD risk score	-0.042	-0.086*	0.042*	0.084**
	(0.028)	(0.039)	(0.019)	(0.025)
Log age	0.236**	0.474**	-0.130^{+}	-0.214*
	(0.083)	(0.121)	(0.076)	(0.090)
Female	-0.122	-0.231	0.160*	0.358**
	(0.100)	(0.142)	(0.066)	(0.091)
Had acute illness in past 12 months	0.061^{+}	0.060	0.115**	0.167**
	(0.035)	(0.040)	(0.032)	(0.045)
Gets pregnant before follow-up	0.138**	0.179*	0.208**	0.206*
	(0.047)	(0.072)	(0.049)	(0.082)
Past enrollment	No	No	Yes	Yes
Location effects	Yes	Yes	Yes	Yes
Observations	1221	591	1186	567
R-squared	0.090	0.069	0.169	0.101
Mean enrollment	0.567	0.563	0.464	0.498

Notes: Estimated using linear probability model, weighted by inverse number of adult family members in current survey. Standard errors in parentheses are clustered by census area. † $p < 0.1$, * $p < 0.05$, ** $p < 0.01$.

Why does selection increase over time?

1. **Increased awareness of one's CVD risk?**
   - Estimate selection separately for adults who *do* versus *do not* report CV health problems.
2. Changes in correlates of preventive behaviors?
   - Control for individual characteristics (education, income, savings, intra-household status risk aversion)
   - Control for household fixed effects (unobserved household behaviors)

Figure: Midline CVD risk interacted with knowledge of CVD status

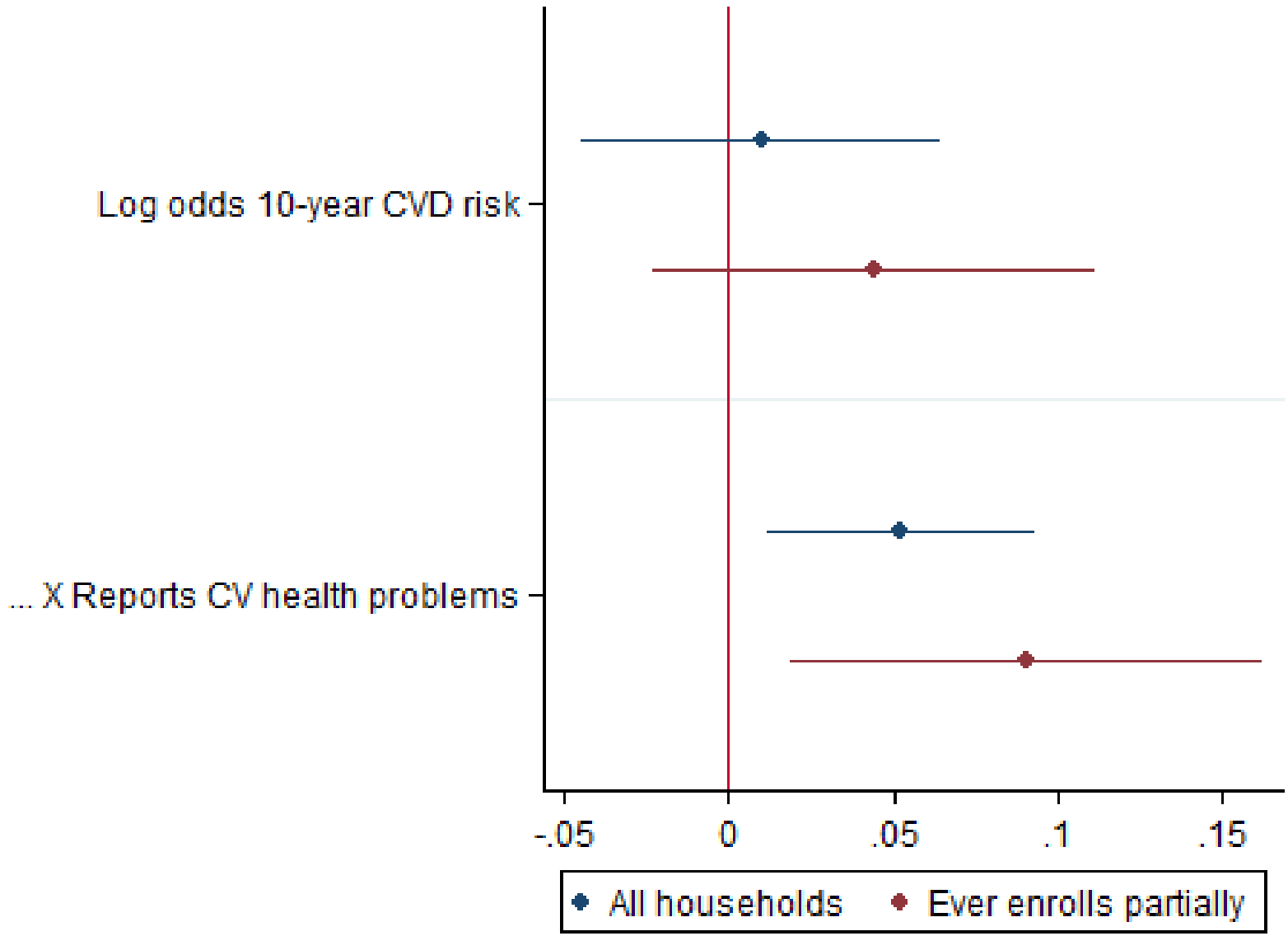


Table: Awareness of CVD risk and enrollment in health insurance

	Baseline to midline		Midline to endline	
	All HH	Ever partially	All HH	Ever partially
Log odds CVD risk score	-0.050	-0.086*	0.010	0.044
	(0.030)	(0.040)	(0.027)	(0.034)
Reports CV health problem	0.003	-0.134	0.119**	0.194**
	(0.079)	(0.149)	(0.040)	(0.072)
...*X* Log odds CVD risk score	0.015	0.006	0.052*	0.091*
	(0.039)	(0.063)	(0.020)	(0.036)
p-val. Log odds CVD risk score | Reports CV health problem	0.455	0.270	0.068	0.002
Past enrollment	No	No	Yes	Yes
Health controls	Yes	Yes	Yes	Yes
Location effects	Yes	Yes	Yes	Yes
Observations	1221	591	1186	567
R-squared	0.090	0.069	0.175	0.113
Mean enrollment	0.567	0.563	0.464	0.498

Notes: Estimated using linear probability model, weighted by inverse number of adult family members in current survey. Standard errors in parentheses are clustered by census area. † $p < 0.1$, * $p < 0.05$, ** $p < 0.01$.

Why does selection increase over time?

1. **Increased awareness of one's CVD risk.**
   - Selection mainly among adults who *do* report CV problems.
2. **Changes in correlates of preventive behaviors?**
   - Control for individual characteristics (education, income, savings, intra-household status risk aversion)
   - Control for household fixed effects (unobserved household behaviors)

Table: Controlling for potential confounds of adverse selection

	Baseline to midline		Midline to endline	
	All HH	Ever partially	All HH	Ever partially
	(1)	(2)	(3)	(4)
A. Controlling for individual characteristics				
Log odds CVD risk	-0.039	-0.071†	0.012	0.039
	(0.030)	(0.042)	(0.027)	(0.033)
Reports CV health problem	0.122	-0.005	0.249**	0.387**
	(0.170)	(0.309)	(0.077)	(0.133)
... *X* Log odds CVD risk	0.017	0.002	0.051*	0.090*
	(0.041)	(0.066)	(0.020)	(0.036)
B. Controlling for household fixed effects				
Log odds CVD risk	-0.020	-0.057	0.022	0.055
	(0.024)	(0.047)	(0.020)	(0.045)
Reports CV health problem	-0.194	-0.379	0.110	0.272
	(0.122)	(0.265)	(0.081)	(0.182)
... *X* Log odds CVD risk	-0.020	-0.047	0.031	0.076
	(0.030)	(0.085)	(0.019)	(0.050)
Health controls/location effects	Yes	Yes	Yes	Yes
Observations	1221	591	1186	567
Mean enrollment	0.567	0.563	0.464	0.498

Health: Female, log age, acute illness, pregnancy. Controls Panel A: Income, savings, willingness to take risks, rank within household, education level. Estimated using a linear probability model weighted by inverse adult family size in current survey. Standard errors in parentheses clustered by census area. † $p < 0.1$, * $p < 0.05$, ** $p < 0.01$.

Why does selection increase over time?

1. **Increased awareness of one's CVD risk.**
   - Selection mainly among adults who *do* report CV problems.
2. **Changes in correlates of preventive behaviors: No.**
   - Controlling for individual characteristics and household fixed effects does not substantially affect the estimated coefficients.

Conclusion

Private *voluntary* health insurance to expand treatment of CVD risk factors?

- Insurance providers prefer restricting choice (mandatory enrollment) for fear of adverse selection
- We observe adverse selection on privately observed CVD risk, but only once adults become aware of their CV health problems.

Over time, increased awareness will give rise to adverse selection

- Although competition creates incentives to provide insurance efficiently, it can also invoke adverse selection
- Restrict individual health insurance choice through family-based or group-level insurance (provided through e.g. MFIs or cooperatives)

Thank you!