Supplementary material

This online resource has been provided by the authors to give readers additional information about their work.

Supplement to: **Effects of the Senegalese free health insurance programme for the poor on health service utilisation and financial protection**

Contents:

Bousmah M-Q, *et al. BMJ Global Health* 2022; 7:e009977. doi: 10.1136/bmjgh-2022-009977

Appendix A1. Members of the UNISSAHEL Study Group

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Acronyms: AMSE (France): Aix-Marseille School of Economics, CEPED (France): Centre Population et Développement, CNRS (France): Centre National de la Recherche Scientifique, CRCF (Senegal): Centre Régional de Recherche et de Formation à la Prise en Charge Clinique de Fann, LASDEL (Niger): Laboratoire d'Etudes et de Recherche sur les Dynamiques Sociales et le Développement Local, LPED (France): Laboratoire Population Environnement Développement, SESSTIM (France): Sciences économiques et sociales de la santé et traitement de l'information médicale, UDEM (Canada): Université de Montréal, UGB (Sénégal): Université Gaston Berger de Saint Louis.

Appendix A2. The CMUtuelleS survey design and implementation

This description is partly taken from Bousmah M-Q, Boyer S, Lalou R, *et al.* Reassessing the demand for community-based health insurance in rural Senegal: Geographic distance and awareness. *SSM Popul Health* 2021;**16**:100974.

Due to the low health insurance enrolment rate in rural Senegal (Daff *et al.* Bull World Health Organ. 2020 Feb 1;98(2):100-108), in order to have sufficient statistical power, a stratified survey was preferred over a general population survey. We conducted a preliminary study to identify individuals enrolled in a CBHI, merging the individuals' identifiers from the CBHI registers into the Niakhar Health and Demographic Surveillance System (Delaunay *et al.* Int J Epidemiol. 2013 Aug;42(4):1002-11).

Households were then stratified into three groups: (A) households with at least one voluntary insured individual, (B) households with at least one individual insured through the BSF national program (and no voluntary insured individuals), and (C) households with neither voluntary nor subsidized insured individuals. Group (A) households were selected exhaustively due to their relatively small number (n=255), while households in the two other groups were randomly selected to have 300 households in each group (representing approximately 30% and 20% of the population in group (B) and (C), respectively).

A household-level questionnaire was administered to the head of the household, or to the most knowledgeable proxy respondent in the household if the head was missing. Then, an adult-level questionnaire was administered to up to two adults (≥ 15 years) in the household. In group (A) households, the main CBHI-enrolled member was selected (the other potential CBHI-enrolled members being beneficiaries) and, if in a union, her/his partner. In group (B), the main CBHI-enrolled adult was selected (*i.e*, the one designated to receive the BSF cash transfer) and, if in a union, her/his partner. In group (C), the household head was selected and, if in a union, her/his partner.

The household-level questionnaire gathered information on socioeconomic and demographic characteristics, detailed expenditures, and financial risk exposition and coping strategies. The adult-level questionnaire gathered self-reported information on socioeconomic and demographic characteristics, economic activity, health and quality of life, healthcare utilization, health insurance, individual preferences, and perceptions of healthcare quality. The recall periods were: ever in lifetime for the PNBSF receipt (the PNBSF programme was launched in 2013), the last two years for maternal health questions, and the last two months for questions about health service utilisation.

The survey was conducted between November 2019 and March 2020. All questionnaires were administered in Serer – the local language – by a team of eight interviewers and a field coordinator. Data were electronically recorded on tablets using Voxco software (Montreal, Canada).

The final sample included 1002 households and 1787 adults. More households have been randomly selected to meet the objective of 300 households in group (B) and (C), as the repartition of households in each group slightly changed between the preliminary study and the survey. The survey was then matched with the Niakhar Health and Demographic Surveillance System to benefit from additional data on households' and individuals' socio-demographic characteristics (*e.g.*, GPS coordinates).

Appendix A3. Reflexivity statement on our international partnership between high-income and low- and –middle-income countries

Written following Morton B, Vercueil A, Masekela R, *et al.* Consensus statement on measures to promote equitable authorship in the publication of research from international partnerships. *Anaesthesia* 2022;77:264–76. doi:10.1111/anae.15597.

1. How does this study address local research and policy priorities?
In low- and middle-income countries, improving poor households' access to health services and protecting them against the financial risk associated with health care are major priority issues. Our study was designed to evaluate the capacity of the Senegalese PNBSF programme to meet these objectives.

2. How were local researchers involved in study design?
Two local researchers involved in this study are junior researchers with previous experience of involvement in international research collaborations (GDT and PD). Other researchers involved are two high-income countries senior researchers with extensive experience of involvement in leading and conducting international research collaborations involving low- and middle-income countries (JYLH, and RL), and a high-income countries junior researcher with extensive experience of involvement in conducting international research collaborations involving low- and middle-income countries (MQB). The majority of the researchers involved (three out of five) have diverse cultural heritages originating from low- and middle-income countries (GDT, MQB, and PD).

3. How has funding been used to support the local research team?
The two researchers based in Senegal (GDT and PD) were hired with funding from the Unissahel research project.

4. How are research staff who conducted data collection acknowledged?
Three authors participated in collecting the CMUtuelleS survey data for the present study (JYLH, MQB, and RL). The authors' contributions are described in the CRediT author statement. The staff at the Niakhar Health and Demographic Surveillance System, who collect the routine data that we matched with the CMUtuelleS survey data, are thanked in the acknowledgements.

5. Do all members of the research partnership have access to study data?
All members of the research partnership have access to study data.

6. How was data used to develop analytical skills within the partnership?
Weekly meetings with all study authors were held for one working year. These meetings, and the multidisciplinary nature of the team, made it possible to collectively develop analytical skills.

7. How have research partners collaborated in interpreting study data?
Study data were interpreted by all authors during the weekly meetings. Preliminary results were also presented by three of the study authors (JYLH, MQB, and RL) to the Unissahel study group (listed in Appendix A1) during seminars and yearly workshops.

8. How were research partners supported to develop writing skills?
Two researchers (GDT and PD) wrote technical reports related to their work in the Unissahel research project, with the help of their supervisors (including JYLH, MQB, and RL). A researcher (MQB) wrote the first draft of the manuscript. All authors commented and participated in editing the manuscript before submission.

9. How will research products be shared to address local needs?
The present study will be published as open access. The study in its pre-publication form was published as an open-access working paper in French, the official language in Senegal. We also planned to communicate the study results to the relevant local authorities (including the Senegalese Agence de la Couverture Maladie Universelle, ANACMU).

10. How is the leadership, contribution and ownership of this work by LMIC researchers recognised within the authorship?
The two local junior researchers (GDT and PD) were involved in data analysis, writing technical reports, and commenting/editing the manuscript. Hence, they do not appear as first or last authors. We also acknowledge that the authorship team is predominantly based in high-income countries (three out of five authors).

11. How have early career researchers across the partnership been included within the authorship team?
Three out of five authors within the authorship team are early career researchers (GDT, MQB, and PD), two of which are local researchers (GDT and PD).

12. How has gender balance been addressed within the authorship?
We acknowledge that there is no gender diversity in the authorship team, as all five authors are male.

13. How has the project contributed to training of LMIC researchers?
Research funding leveraged in the Unissahel research project supported the employment of the two local researchers (GDT and PD). They benefited from scientific witting training from their supervisors (including JYLH, MQB, and RL) and econometric training from MQB.

14. How has the project contributed to improvements in local infrastructure?
Part of the funding leveraged in the Unissahel research project has been disbursed to the local research centre, which manages the Niakhar Population Observatory where the study data were collected.

15. What safeguarding procedures were used to protect local study participants and researchers?
Data on study participants were pseudonymised, placed on a secured server, and analysed anonymously. See also our ethical statement in the manuscript. We were concerned about implementing a research project that fitted with local sociocultural norms/priorities. The issue of safeguarding was also considered within the manuscript, especially concerning local researchers, who were hired within the Unissahel research project and offered an equal opportunity for participation in research implementation.

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Appendix A4. Definitions of all variables used

Population	Variable	Type	Definition	Percentage of population or sub-population
All individuals (N=1787)	Health insurance status	Polytomous	Not enrolled in a CBHI (=reference category); Enrolled (voluntarily); Enrolled (PNBSF-subsidised)	87.38; 4.11; 8.51
	Knowledge of CBHI	Binary	Did not know about the existence of CBHI before the survey (=reference category); Knew about the existence of CBHI before the survey	64.86; 35.14
	Age	Continuous	Age (in years)	
	Sex	Binary	Male (=reference category); Female	45.89; 54.11
	Was in a union	Binary	In a union (=reference category); Not in a union	9.78; 90.22
	Had primary education or higher	Binary	None (=reference category); Primary education or higher	83.77; 16.23
	Had poorer self-rated health	Binary	Excellent/Very good health (=reference category); Good/Fair/Poor health	41.52; 58.48
	Distance to the nearest CBHI (in km)	Continuous	Shortest geographical distance (in km) between the household and the nearest CBHI (based on GPS coordinates)	
	Distance to the nearest health facility (in km)	Continuous	Shortest geographical distance (in km) between the household and the nearest health facility (based on GPS coordinates)	
	Wealth quartile	Ordinal	Wealth quartile calculated based on the distribution of the household's equivalized total monthly consumption expenditure	25.89; 25.50; 25.73; 22.88
	Number of adult equivalents in the household	Continuous	Number of adult equivalents in the household, calculated using the Food and Agriculture Organization (FAO)'s Adult Male Equivalent (AME) method	
	Had a lower perception of healthcare quality	Binary	Was very satisfied with the healthcare system (=reference category); Was less satisfied. Constructed based on nine dimensions about the health facility the most frequently visited by the respondent (the premises, the medical material and equipment, the waiting time, the physician's listening skills, the physical examination, the medical care provided, the medical staff guidance, the reliability of the diagnosis, and the availability of drugs)	28.98; 71.02
Individuals who had a health problem in the last 2 months (N=418)	Consulted in a health facility following a health problem	Binary	Did not consult in a health facility in case of health problem that occurred in the last 2 months (=reference category); Consulted	67.38; 32.62
	Duration of the health problem	Binary	[1;2] days (=reference category); [3;59] days. Only for individuals who reported a health problem that occurred in the last 2 months	30.17; 69.83
	Severity of the health problem	Binary	None/Mild/Moderate (=reference category); Severe. Only for individuals who reported a health problem that occurred in the last 2 months	82.86; 17.14
Women who had a live birth in the last 2 years (N=197)	Number of prenatal consultations	Discrete	Number of prenatal consultations	
	Gave birth in a health facility	Binary	Delivered at home (=reference category); Delivered in a health facility	45.81; 54.19

All households (N=1001)	Beneficiary of the PNBSF cash transfer programme	Binary	The household did not receive any cash transfer from the PNBSF (=reference category); The household received a cash transfer from the PNBSF at least once, including all generations of beneficiaries	44.72; 55.28
	Health insurance status	Polytomous	The household did not have any CBHI member (=reference category); Had at least one member who voluntarily enrolled in a CBHI; Had at least one member who benefited from the subsidised CBHI enrolment through the PNBSF	82.24; 6.54; 11.23
	Forgone medical consultation	Binary	The household did not have to forgo medical consultation in the last 12 months due to financial hardship (=reference category); The household has forgone medical consultation	64.39; 35.61
	Forgone medical treatment	Binary	The household did not have to forgo medical treatment in the last 12 months due to financial hardship (=reference category); The household has forgone medical treatment	75.99; 24.01
	Had catastrophic health expenditures, 40% threshold	Binary	The household's out-of-pocket health expenditure in the past 4 weeks did not exceed 40% of its capacity to pay (=reference category); The household's out-of-pocket health expenditure exceeded 40% of its capacity to pay	93.82; 6.18
	Had catastrophic health expenditures, 30% threshold	Binary	The household's out-of-pocket health expenditure in the past 4 weeks did not exceed 30% of its capacity to pay (=reference category); The household's out-of-pocket health expenditure exceeded 30% of its capacity to pay	89.40; 10.60
	Had catastrophic health expenditures, 20% threshold	Binary	The household's out-of-pocket health expenditure in the past 4 weeks did not exceed 20% of its capacity to pay (=reference category); The household's out-of-pocket health expenditure exceeded 20% of its capacity to pay	83.17; 16.83
	Age of the household head	Continuous	Age (in years)	
	Sex of the household head	Binary	Male (=reference category); Female	92.72; 7.28
	Household head was in a union	Binary	In a union (=reference category); Not in a union	84.85; 15.15
	Formal education level of the household head	Categorical	None (=reference category); Primary; Middle school or higher	79.80; 15.69; 4.52
	Number of adults in the household	Discrete	Number of adults in the household	
	Number of children under the respondents' responsibility	Discrete	Number of children under the respondents' responsibility (i.e., excluding other children in the household who were not under the respondents' responsibility)	

Notes: Data were weighted using sampling weights to account for choice-based stratified samples. Missing covariate data were imputed using predictive mean matching.
Abbreviations: N=number of observations, CBHI=community-based health insurance, PNBSF=*Programme National de Bourses de Sécurité Familiale*.

Appendix A5. Summary statistics by health insurance status

Population	Variable	Type	Not enrolled in a CBHI				Enrolled (voluntarily)				Enrolled (PNBSF-subsidised)			
			Mean or proportion	SD	Min	Max	Mean or proportion	SD	Min	Max	Mean or proportion	SD	Min	Max
All individuals (N=1787)	Knew about the existence of CBHI	Binary	0.30	0.46	0.00	1.00	0.95	0.22	0.00	1.00	0.54	0.50	0.00	1.00
	Age	Continuous	53.22	13.77	14.00	94.00	45.27	16.40	15.00	92.00	52.80	12.15	21.00	92.00
	Sex (female)	Binary	0.53	0.50	0.00	1.00	0.58	0.49	0.00	1.00	0.63	0.48	0.00	1.00
	Was in a union	Binary	0.91	0.28	0.00	1.00	0.89	0.31	0.00	1.00	0.79	0.41	0.00	1.00
	Had primary education or higher	Binary	0.15	0.36	0.00	1.00	0.42	0.49	0.00	1.00	0.13	0.34	0.00	1.00
	Had poorer self-rated health	Binary	0.59	0.49	0.00	1.00	0.57	0.50	0.00	1.00	0.55	0.50	0.00	1.00
	Distance to the nearest CBHI (in km)	Continuous	5.61	2.83	0.06	12.82	3.74	2.68	0.06	11.43	4.79	2.75	0.05	11.08
	Distance to the nearest health facility (in km)	Continuous	3.17	2.21	0.01	9.40	2.54	1.95	0.01	8.01	3.25	2.05	0.15	7.46
	Number of adult equivalents in the household	Continuous	11.72	6.04	0.79	41.90	11.90	5.76	2.50	41.90	9.31	4.39	1.56	22.74
	Had a lower perception of healthcare quality	Binary	0.71	0.45	0.00	1.00	0.70	0.46	0.00	1.00	0.73	0.45	0.00	1.00
Individuals who had a health problem in the last 2 months (N=418)	Consulted in a health facility following a health problem	Binary	0.32	0.47	0.00	1.00	0.50	0.50	0.00	1.00	0.32	0.47	0.00	1.00
	Duration of the health problem	Binary	0.70	0.46	0.00	1.00	0.68	0.47	0.00	1.00	0.68	0.47	0.00	1.00
	Severity of the health problem	Binary	0.17	0.38	0.00	1.00	0.23	0.42	0.00	1.00	0.16	0.38	0.00	1.00
Women who had a live birth in the last 2 years (N=197)	Number of prenatal consultations	Discrete	3.33	1.25	0.00	6.00	3.74	0.99	0.00	6.00	2.55	1.51	0.00	4.00
	Gave birth in a health facility	Binary	0.50	0.50	0.00	1.00	0.86	0.35	0.00	1.00	0.55	0.52	0.00	1.00
All households (N=1001)	Beneficiary of the PNBSF cash transfer programme	Binary	0.51	0.50	0.00	1.00	0.39	0.49	0.00	1.00	0.98	0.12	0.00	1.00
	Forgone medical consultation	Binary	0.36	0.48	0.00	1.00	0.27	0.44	0.00	1.00	0.40	0.49	0.00	1.00
	Forgone medical treatment	Binary	0.25	0.44	0.00	1.00	0.13	0.33	0.00	1.00	0.18	0.39	0.00	1.00
	Had catastrophic health expenditures, 40% threshold	Binary	0.06	0.24	0.00	1.00	0.08	0.28	0.00	1.00	0.04	0.21	0.00	1.00
	Had catastrophic health expenditures, 30% threshold	Binary	0.11	0.31	0.00	1.00	0.15	0.36	0.00	1.00	0.06	0.24	0.00	1.00
	Had catastrophic health expenditures, 20% threshold	Binary	0.17	0.37	0.00	1.00	0.21	0.41	0.00	1.00	0.14	0.35	0.00	1.00
	Age of the household head	Continuous	57.59	13.55	20.00	94.00	56.53	14.48	22.00	95.00	53.59	14.09	25.00	92.00
	Sex of the household head (female)	Binary	0.07	0.25	0.00	1.00	0.05	0.22	0.00	1.00	0.13	0.33	0.00	1.00
	Household head was in a union	Binary	0.85	0.36	0.00	1.00	0.89	0.31	0.00	1.00	0.79	0.41	0.00	1.00

	Number of adults in the household	Discrete	8.21	4.29	1.00	26.00	8.88	4.55	2.00	31.00	6.63	3.08	2.00	17.00
	Number of children under the respondents' responsibility	Discrete	3.17	3.03	0.00	18.00	3.19	3.17	0.00	15.00	3.31	2.66	0.00	11.00

Notes: Means were computed for continuous and discrete variables, and proportions were computed for binary variables. Data were weighted using sampling weights to account for choice-based stratified samples. The stratification was based on the individual health insurance status variable for all individual-level variables, and on the household health insurance status for all household-level variables.
Abbreviations: CBHI=community-based health insurance, SD=standard deviation, N=number of observations, PNBSF=*Programme National de Bourses de Sécurité Familiale*.

Appendix A6. Knowledge of CBHI by health insurance status and by whether the individual's household was a beneficiary of the PNBSF cash transfer programme

Variable	Type	Not enrolled in a CBHI		Enrolled (voluntarily)		Enrolled (PNBSF-subsidised)	
		Not beneficiary of the PNBSF cash transfer programme	Beneficiary of the PNBSF cash transfer programme	Not beneficiary of the PNBSF cash transfer programme	Beneficiary of the PNBSF cash transfer programme	Not beneficiary of the PNBSF cash transfer programme	Beneficiary of the PNBSF cash transfer programme
Knew about the existence of CBHI	Binary	29.55	31.32	96.57	92.45	.	53.96
Heard about the existence of CBHI through:							
- An information campaign	Binary	41.09	46.82	65.68	65.31	.	75.12
- A relative	Binary	40.66	45.14	39.05	41.84	.	20.02
- A CBHI member	Binary	24.72	19.43	29.59	27.55	.	14.75
- The media	Binary	28.12	17.26	14.20	16.33	.	13.70

Notes: Results are reported as percentages of sample (N=1787 individuals) or sub-sample (N=808 individuals who heard about the existence of CBHI). Data were weighted using sampling weights to account for choice-based stratified samples.
Abbreviations: CBHI=community-based health insurance, N=number of observations, PNBSF=*Programme National de Bourses de Sécurité Familiale*.

Appendix A7. STROBE statement – checklist of items that should be included in reports of observational studies

Written following von Elm E, Altman DG, Egger M, *et al.* Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *BMJ* 2007;335:806–8. doi:10.1136/bmj.39335.541782.AD.

	Item No	Recommendation	Section/ Paragraph No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Abstract/¶2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	Abstract/¶3
Introduction			
Background/ rationale	2	Explain the scientific background and rationale for the investigation being reported	§Introduction/¶5
Objectives	3	State specific objectives, including any prespecified hypotheses	§Introduction/¶6
Methods			
Study design	4	Present key elements of study design early in the paper	§Introduction/¶6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	§Methods/The CMUtuelleS survey/¶1 and Appendix A2
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	§Methods/The CMUtuelleS survey/¶2 and Appendix A2
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	§Methods/The CMUtuelleS survey/¶2 and Appendix A2
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	§Methods/Data and descriptive analysis/¶1-4 and Appendix A4
Data sources/ measurement	8	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	§Methods/Data and descriptive analysis/¶1-4 and Appendix A4
Bias	9	Describe any efforts to address potential sources of bias	§Methods/ Econometric analysis/¶1
Study size	10	Explain how the study size was arrived at	Appendix A2
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	§Methods/Data and descriptive analysis/¶1-4 and Appendix A4
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	§Methods/ Econometric analysis/¶1

		(*b*) Describe any methods used to examine subgroups and interactions	N/A
		(*c*) Explain how missing data were addressed	Appendix A4
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	§Methods/ Econometric analysis/¶1 and 5
		(*e*) Describe any sensitivity analyses	N/A
Results			
Participants	13	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	§Results/Summary statistics/¶6-8
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	§Results/Summary statistics/¶1-8 and Table 1 and Appendices A4-A6
		(b) Indicate number of participants with missing data for each variable of interest	Appendix A4
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	N/A
Outcome data	15	*Cohort study*—Report numbers of outcome events or summary measures over time	N/A
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	Appendix A4
		Cross-sectional study—Report numbers of outcome events or summary measures	Table 1 and Appendix A4
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Table 2 and Appendices A8-A19
		(*b*) Report category boundaries when continuous variables were categorized	N/A
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	§Discussion/¶1
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	§Discussion/Study strengths and limitations/¶2-4
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	§Discussion
Generalisability	21	Discuss the generalisability (external validity) of the study results	§Discussion/Study strengths and limitations/¶3
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	§Declarations/ Funding

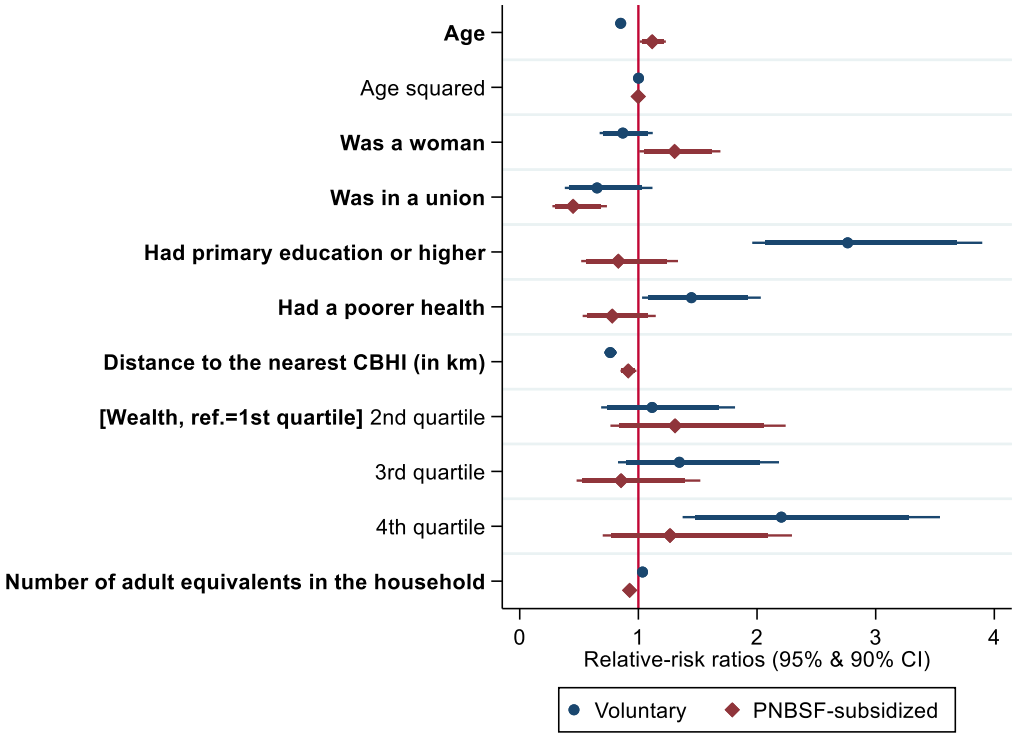
Appendix A8. Multinomial logit model of health insurance enrolment at the individual level

Appendix A8.1 Regression results

	Enrolled in a CBHI (voluntarily)		**Enrolled in a CBHI (PNBSF-subsidised)**	
	Relative risk ratios	**Marginal effects on the predicted probability of voluntary CBHI enrolment**	**Relative risk ratios**	**Marginal effects on the predicted probability of PNBSF-subsidised enrolment**
Age	0.851***	-0.002***	1.116**	0.000
	(0.02)	(0.00)	(0.06)	(0.00)
Age squared	1.001***		0.999**	
	(0.00)		(0.00)	
Female	0.869	-0.006	1.306**	0.020**
	(0.11)	(0.00)	(0.17)	(0.01)
Was in a union	0.652	-0.014	0.450***	-0.073***
	(0.18)	(0.01)	(0.11)	(0.03)
Had primary education or higher	2.764***	0.047***	0.831	-0.017
	(0.48)	(0.01)	(0.20)	(0.02)
Had poorer self-rated health	1.447**	0.014**	0.780	-0.020
	(0.25)	(0.01)	(0.15)	(0.02)
Distance to the nearest CBHI (in km)	0.763***	-0.009***	0.914**	-0.006**
	(0.03)	(0.00)	(0.03)	(0.00)
Wealth (ref.=1st quartile)				
2nd quartile	1.116	0.002	1.309	0.021
	(0.28)	(0.01)	(0.36)	(0.02)
3rd quartile	1.345	0.010	0.854	-0.011
	(0.33)	(0.01)	(0.25)	(0.02)
4th quartile	2.205***	0.030***	1.267	0.015
	(0.53)	(0.01)	(0.38)	(0.02)
Number of adult equivalents in the household	1.035***	0.001***	0.927***	-0.006***
	(0.01)	(0.00)	(0.02)	(0.00)
Constant	8.048***		0.041**	
	(6.27)		(0.05)	

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. N=1787. The base outcome was not being enrolled in a CBHI. Regressions were weighted using sampling weights to account for choice-based stratified samples. Standard errors in parentheses (clustered at the household level to account for intra-household correlation).
Abbreviations: CBHI=community-based health insurance, PNBSF=*Programme National de Bourses de Sécurité Familiale*, N=number of observations.

Appendix A8.2 Graphical representation of the regressions results



Appendix A9. Inverse probability of treatment weighting, individual-level models: covariate balance table

Covariate	Standardized differences		Variance ratio	
	Raw	Weighted	Raw	Weighted
Voluntary				
Age	-0.5797281	0.1429035	1.602909	0.9977584
Age squared	-0.4980496	0.1469589	1.208668	0.9498274
Female	0.1479137	-0.3307215	0.9173906	1.062038
Was in a union	-0.062286	-0.0447006	1.152503	1.079797
Had primary education or higher	0.5518133	0.1260056	1.849546	1.202641
Had poorer self-rated health	-0.1130705	-0.0769216	1.145235	1.076258
Distance to the nearest CBHI (in km)	-0.649895	-0.0213646	0.7508671	0.888533
Wealth quartile	0.1404107	-0.1581938	0.985317	0.9697626
Number of adult equivalents in the household	-0.1881384	-0.1373132	0.5232414	0.5573209
Subsidised				
Age	0.0821518	-0.0005644	1.200122	0.9613523
Age squared	0.0988964	-0.0049434	1.387961	1.082771
Female	0.4051663	0.2170264	0.6913384	0.8347389
Was in a union	-0.3537773	-0.103394	1.796774	1.21303
Had primary education or higher	0.0639475	-0.0162005	1.144552	0.9673123
Had poorer self-rated health	-0.0240577	-0.004043	1.04993	1.001151
Distance to the nearest CBHI (in km)	-0.5464248	-0.1469359	0.6678143	0.8389619
Wealth quartile	-0.0903086	-0.0854095	0.7351771	0.6774592
Number of adult equivalents in the household	-0.2628046	-0.085063	0.5736998	0.6245368

The table reports the model-adjusted differences in means and ratio of variances between the treated (both voluntary and PNBSF-subsidised groups) and untreated for each covariate. As can be seen, differences in weighted means are negligible, and variance ratios are near unity, indicating good balancing properties across treatment and control groups.

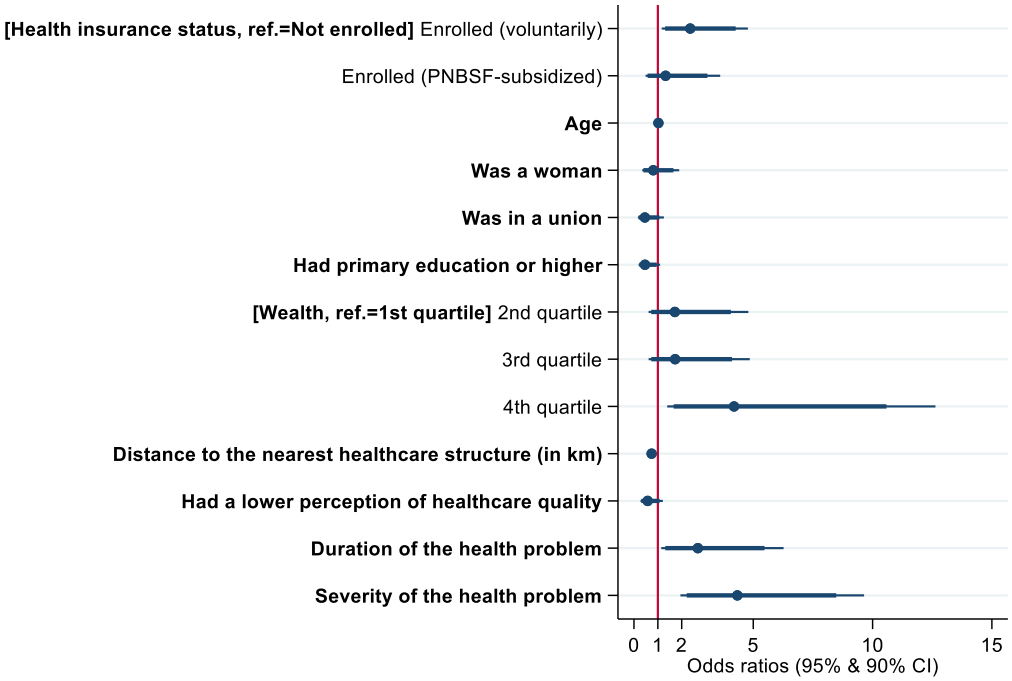
Appendix A10. IPW logit model of consulting in a health facility, following a health problem that occurred in the last 2 months (Model 1)

Appendix A10.1 Regression results

Model 1	**Odds ratios**	**Average marginal effects on the predicted probability of consulting in a health facility following a health problem**
Health insurance status (ref.=Not enrolled in a CBHI)		
Enrolled (voluntarily)	2.357**	0.144**
	(0.85)	(0.06)
Enrolled (PNBSF-subsidised)	1.326	0.045
	(0.68)	(0.08)
Age	1.024*	0.004*
	(0.01)	(0.00)
Female	0.810	-0.035
	(0.35)	(0.07)
Was in a union	0.457	-0.135
	(0.24)	(0.09)
Had primary education or higher	0.462*	-0.126*
	(0.20)	(0.07)
Wealth (ref.=1st quartile)		
2nd quartile	1.714	0.087
	(0.90)	(0.08)
3rd quartile	1.726	0.088
	(0.91)	(0.09)
4th quartile	4.196**	0.247**
	(2.36)	(0.10)
Distance to the nearest health facility (in km)	0.741***	-0.050***
	(0.08)	(0.02)
Had a lower perception of healthcare quality	0.575	-0.094
	(0.22)	(0.06)
Duration of the health problem	2.678**	0.166**
	(1.16)	(0.07)
Severity of the health problem	4.332***	0.265***
	(1.77)	(0.07)
Constant	0.210	
	(0.25)	

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. N=418. Regressions were weighted by both (i) the inverse probability of treatment obtained in the first-step multinomial logit model of health insurance enrolment at the individual level, and (ii) the sampling weights to account for choice-based stratified samples. Standard errors in parentheses (clustered at the household level to account for intra-household correlation).
Abbreviations: CBHI=community-based health insurance, PNBSF=*Programme National de Bourses de Sécurité Familiale*, N=number of observations.

Appendix A10.2 Graphical representation of the regressions results



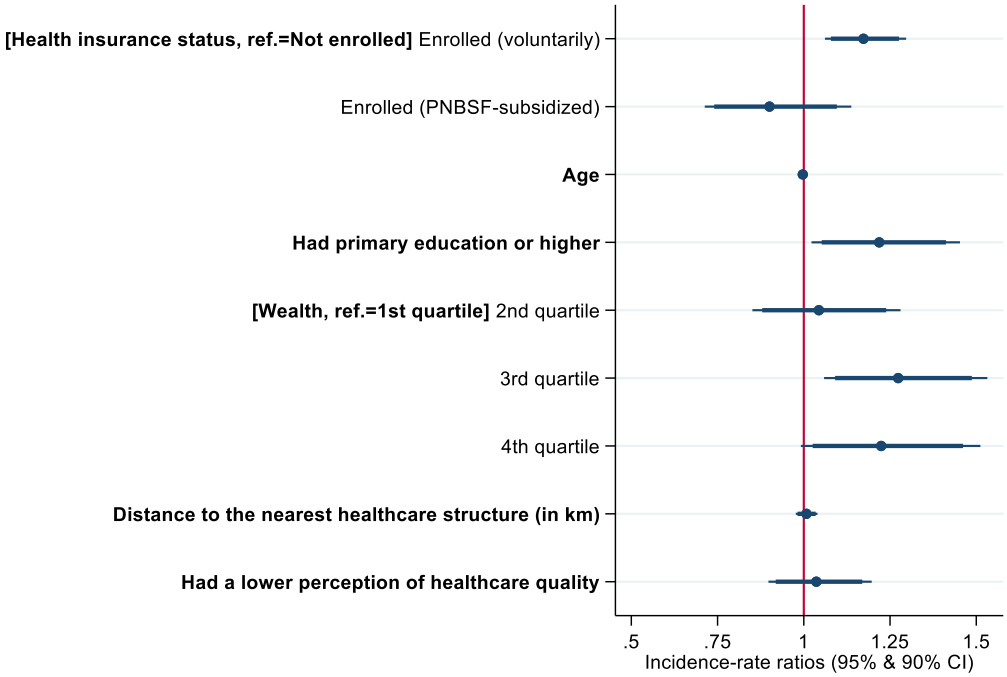
Appendix A11. IPW Poisson model of the number of prenatal consultations, for women who had a live birth in the last 2 years (Model 2)

Appendix A11.1 Regression results

Model 2	Incidence rate ratios	Average marginal effects on the predicted number of prenatal consultations
Health insurance status (ref.=Not enrolled in a CBHI)		
Enrolled (voluntarily)	1.173***	0.565***
	(0.06)	(0.18)
Enrolled (PNBSF-subsidised)	0.901	-0.325
	(0.11)	(0.36)
Age	0.997	-0.010
	(0.00)	(0.02)
Had primary education or higher	1.219**	0.703**
	(0.11)	(0.33)
Wealth (ref.=1st quartile)		
2nd quartile	1.044	0.132
	(0.11)	(0.32)
3rd quartile	1.274**	0.828***
	(0.12)	(0.30)
4th quartile	1.224*	0.679*
	(0.13)	(0.35)
Distance to the nearest health facility (in km)	1.008	0.026
	(0.02)	(0.05)
Had a lower perception of healthcare quality	1.036	0.120
	(0.08)	(0.25)
Constant	2.889***	
	(0.62)	

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. N=197. Regressions were weighted by both (i) the inverse probability of treatment obtained in the first-step multinomial logit model of health insurance enrolment at the individual level, and (ii) the sampling weights to account for choice-based stratified samples. Standard errors in parentheses (clustered at the household level to account for intra-household correlation).
Abbreviations: CBHI=community-based health insurance, PNBSF=*Programme National de Bourses de Sécurité Familiale*, N=number of observations.

Appendix A11.2 Graphical representation of the regressions results



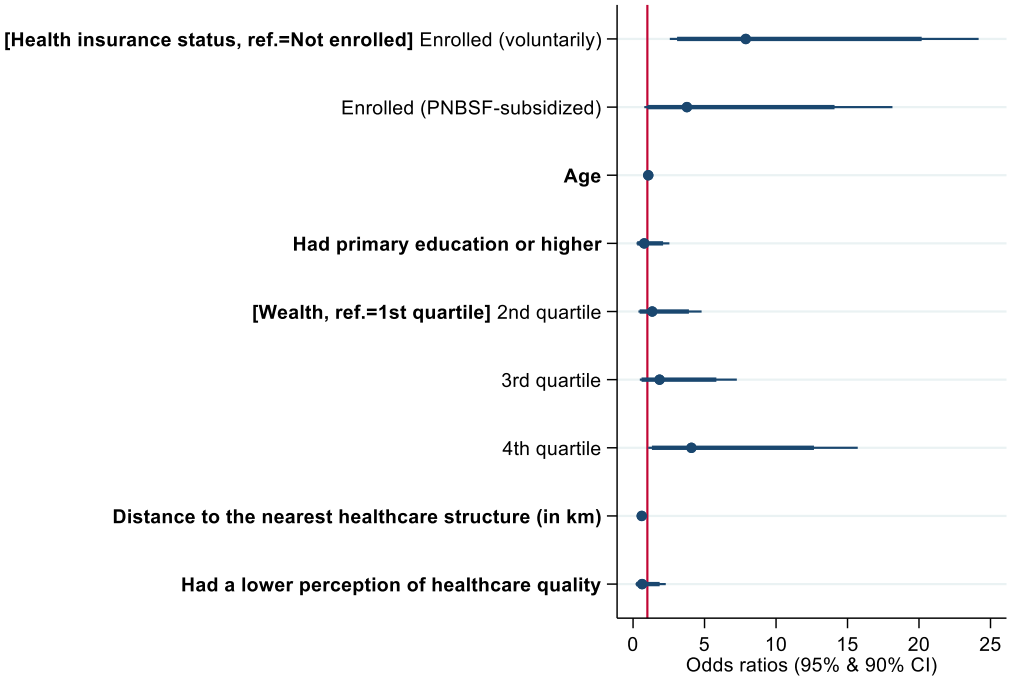
Appendix A12. IPW logit model of giving birth in a health facility, for women who had a live birth in the last 2 years (Model 3)

Appendix A12.1 Regression results

Model 3	Odds ratios	Average marginal effects on the predicted probability of giving birth in a health facility
Health insurance status (ref.=Not enrolled in a CBHI)		
Enrolled (voluntarily)	7.883***	0.349***
	(4.51)	(0.08)
Enrolled (PNBSF-subsidised)	3.767*	0.238*
	(3.02)	(0.12)
Age	1.062	0.010
	(0.05)	(0.01)
Had primary education or higher	0.780	-0.040
	(0.47)	(0.10)
Wealth (ref.=1st quartile)		
2nd quartile	1.339	0.051
	(0.87)	(0.11)
3rd quartile	1.856	0.104
	(1.29)	(0.12)
4th quartile	4.082**	0.216**
	(2.81)	(0.10)
Distance to the nearest health facility (in km)	0.608***	-0.079***
	(0.09)	(0.02)
Had a lower perception of healthcare quality	0.634	-0.072
	(0.42)	(0.10)
Constant	0.557	
	(1.15)	

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. N=197. Regressions were weighted by both (i) the inverse probability of treatment obtained in the first-step multinomial logit model of health insurance enrolment at the individual level, and (ii) the sampling weights to account for choice-based stratified samples. Standard errors in parentheses (clustered at the household level to account for intra-household correlation).
Abbreviations: CBHI=community-based health insurance, PNBSF=*Programme National de Bourses de Sécurité Familiale*, N=number of observations.

Appendix A12.2 Graphical representation of the regressions results



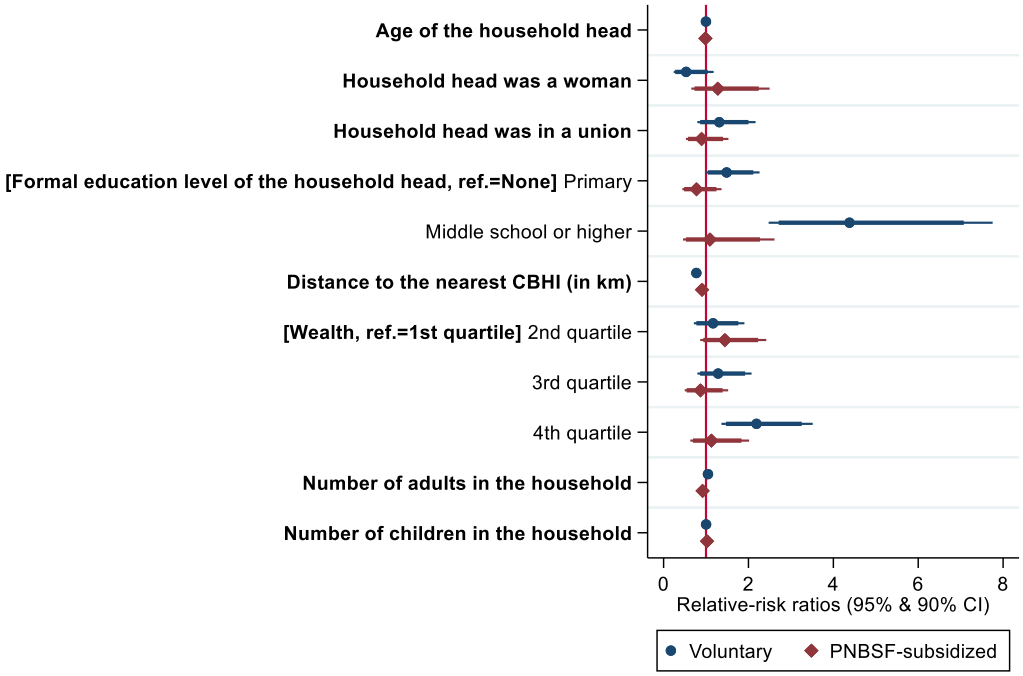
Appendix A13. Multinomial logit model of health insurance enrolment at the household level

Appendix A13.1 Regression results

	Household enrolled in a CBHI (voluntarily)		**Household enrolled in a CBHI (PNBSF-subsidised)**	
	Relative risk ratios	**Marginal effects on the predicted probability of voluntary CBHI enrolment**	**Relative risk ratios**	**Marginal effects on the predicted probability of PNBSF-subsidised enrolment**
Age of the household head	0.998 (0.01)	0.000 (0.00)	0.985* (0.01)	-0.001* (0.00)
Female household head	0.532 (0.22)	-0.031** (0.01)	1.277 (0.44)	0.030 (0.04)
Household head was in a union	1.312 (0.34)	0.015 (0.01)	0.897 (0.24)	-0.013 (0.03)
Formal education level of the household head (ref.=None)				
Primary	1.486* (0.32)	0.026* (0.01)	0.776 (0.22)	-0.026 (0.02)
Middle school or higher	4.381*** (1.28)	0.134*** (0.04)	1.092 (0.49)	-0.009 (0.04)
Distance to the nearest CBHI (in km)	0.773*** (0.03)	-0.014*** (0.00)	0.907*** (0.03)	-0.008** (0.00)
Wealth (ref.=1st quartile)				
2nd quartile	1.166 (0.29)	0.005 (0.01)	1.445 (0.38)	0.038 (0.03)
3rd quartile	1.285 (0.31)	0.014 (0.01)	0.870 (0.25)	-0.014 (0.02)
4th quartile	2.189*** (0.53)	0.048*** (0.01)	1.127 (0.33)	0.005 (0.03)
Number of adults in the household	1.046** (0.02)	0.003*** (0.00)	0.920*** (0.03)	-0.008*** (0.00)
Number of children under the respondents' responsibility	1.002 (0.03)	-0.000 (0.00)	1.024 (0.03)	0.002 (0.00)
Constant	0.099*** (0.05)		0.889 (0.49)	

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. N=1001. The base outcome was not being enrolled in a CBHI. Regressions were weighted using sampling weights to account for choice-based stratified samples. Robust standard errors in parentheses.
Abbreviations: CBHI=community-based health insurance, PNBSF=*Programme National de Bourses de Sécurité Familiale*, N=number of observations.

Appendix A13.2 Graphical representation of the regressions results



Appendix A14. Inverse probability of treatment weighting, household-level models: covariate balance table

Covariate	Standardized differences		Variance ratio	
	Raw	Weighted	Raw	Weighted
Voluntary				
Age of the household head	-0.0561883	0.0319971	1.05571	0.9799462
Female household head	-0.1573077	-0.0508809	0.5240265	0.8311219
Household head was in a union	0.057345	0.0030147	0.8879776	0.9874824
Formal education level of the household head	0.394763	-0.0803681	2.042448	0.8894083
Distance to the nearest CBHI (in km)	-0.628948	0.1083766	0.9080854	1.049232
Wealth quartile	0.281656	-0.0920272	1.037762	1.017249
Number of adults in the household	0.1615772	-0.0834744	1.10097	0.8144204
Number of children under the respondents' responsibility	0.0852888	0.035124	1.095247	1.11451
Subsidised				
Age of the household head	-0.2889666	0.0012989	1.050044	1.007606
Female household head	0.1225834	-0.0070108	1.442361	0.9740941
Household head was in a union	-0.1316781	-0.036676	1.267231	1.068254
Formal education level of the household head	0.0242624	-0.0619803	1.159274	0.9698089
Distance to the nearest CBHI (in km)	-0.3081	0.0455937	0.9735489	1.072137
Wealth quartile	-0.0814968	0.0040871	0.9703965	0.9469951
Number of adults in the household	-0.4234303	-0.1071588	0.4741226	0.6053008
Number of children under the respondents' responsibility	0.0922454	0.0441797	0.7793216	0.8269859

The table reports the model-adjusted differences in means and ratio of variances between the treated (both voluntary and PNBSF-subsidised groups) and untreated for each covariate. As can be seen, differences in weighted means are negligible, and variance ratios are near unity, indicating good balancing properties across treatment and control groups.

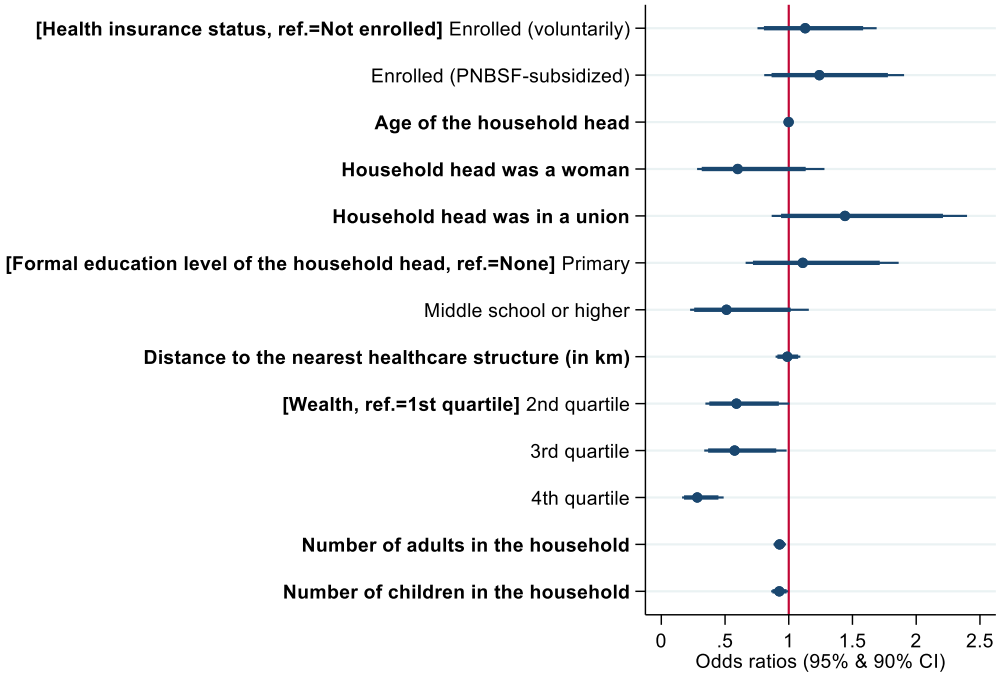
Appendix A15. IPW logit model of forgoing medical consultation (at the household level) (Model 4)

Appendix A15.1 Regression results

Model 4	Odds ratios	Average marginal effects on the predicted probability of forgoing medical consultation
Health insurance status (ref.=Not enrolled in a CBHI)		
Enrolled (voluntarily)	1.129	0.026
	(0.23)	(0.04)
Enrolled (PNBSF-subsidised)	1.240	0.047
	(0.27)	(0.05)
Age of the household head	0.999	-0.000
	(0.01)	(0.00)
Female household head	0.599	-0.105
	(0.23)	(0.07)
Household head was in a union	1.441	0.077
	(0.37)	(0.05)
Formal education level of the household head (ref.=None)		
Primary	1.110	0.023
	(0.29)	(0.06)
Middle school or higher	0.511	-0.133*
	(0.21)	(0.07)
Distance to the nearest health facility (in km)	0.989	-0.002
	(0.05)	(0.01)
Wealth (ref.=1st quartile)	0.589*	-0.125*
2nd quartile		
	(0.16)	(0.06)
3rd quartile	0.575**	-0.130**
	(0.16)	(0.06)
4th quartile	0.282***	-0.273***
	(0.08)	(0.06)
Number of adults in the household	0.928***	-0.016***
	(0.03)	(0.01)
Number of children under the respondents' responsibility	0.926**	-0.017**
	(0.03)	(0.01)
Constant	1.782	0.023
	(0.93)	(0.06)

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. N=1001. Regressions were weighted by both (i) the inverse probability of treatment obtained in the first-step multinomial logit model of health insurance enrolment at the household level, and (ii) the sampling weights to account for choice-based stratified samples. Robust standard errors in parentheses.
Abbreviations: CBHI=community-based health insurance, PNBSF=*Programme National de Bourses de Sécurité Familiale*, N=number of observations.

Appendix A15.2 Graphical representation of the regression results



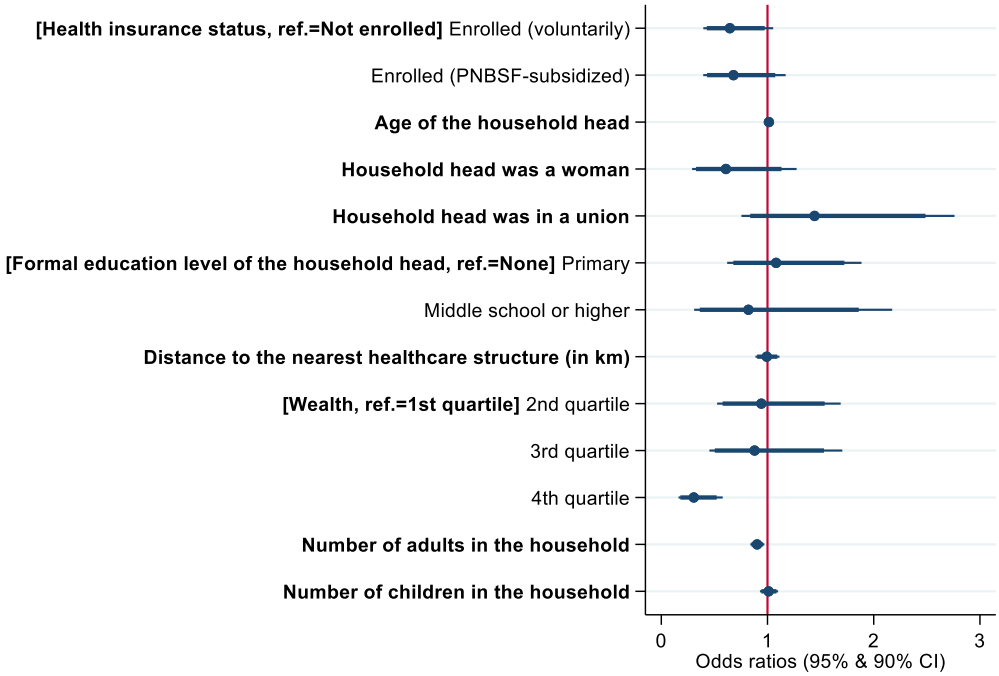
Appendix A16. IPW logit model of forgoing medical treatment (at the household level) (Model 5)

Appendix A16.1 Regression results

Model 5	Odds ratios	Average marginal effects on the predicted probability of forgoing medical treatment
Health insurance status (ref.=Not enrolled in a CBHI)		
Enrolled (voluntarily)	0.646*	-0.072*
	(0.16)	(0.04)
Enrolled (PNBSF-subsidised)	0.680	-0.065
	(0.19)	(0.04)
Age of the household head	1.013	0.002
	(0.01)	(0.00)
Female household head	0.608	-0.071
	(0.23)	(0.05)
Household head was in a union	1.443	0.055
	(0.48)	(0.05)
Formal education level of the household head (ref.=None)		
Primary	1.081	0.013
	(0.31)	(0.05)
Middle school or higher	0.820	-0.030
	(0.41)	(0.07)
Distance to the nearest health facility (in km)	0.993	-0.001
	(0.06)	(0.01)
Wealth (ref.=1st quartile)		
2nd quartile	0.942	-0.011
	(0.28)	(0.05)
3rd quartile	0.878	-0.023
	(0.30)	(0.06)
4th quartile	0.306***	-0.159***
	(0.10)	(0.04)
Number of adults in the household	0.902***	-0.017***
	(0.03)	(0.01)
Number of children under the respondents' responsibility	1.010	0.002
	(0.04)	(0.01)
Constant	0.344	
	(0.22)	

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. N=1001. Regressions were weighted by both (i) the inverse probability of treatment obtained in the first-step multinomial logit model of health insurance enrolment at the household level, and (ii) the sampling weights to account for choice-based stratified samples. Robust standard errors in parentheses.
Abbreviations: CBHI=community-based health insurance, PNBSF=*Programme National de Bourses de Sécurité Familiale*, N=number of observations.

Appendix A16.2 Graphical representation of the regression results



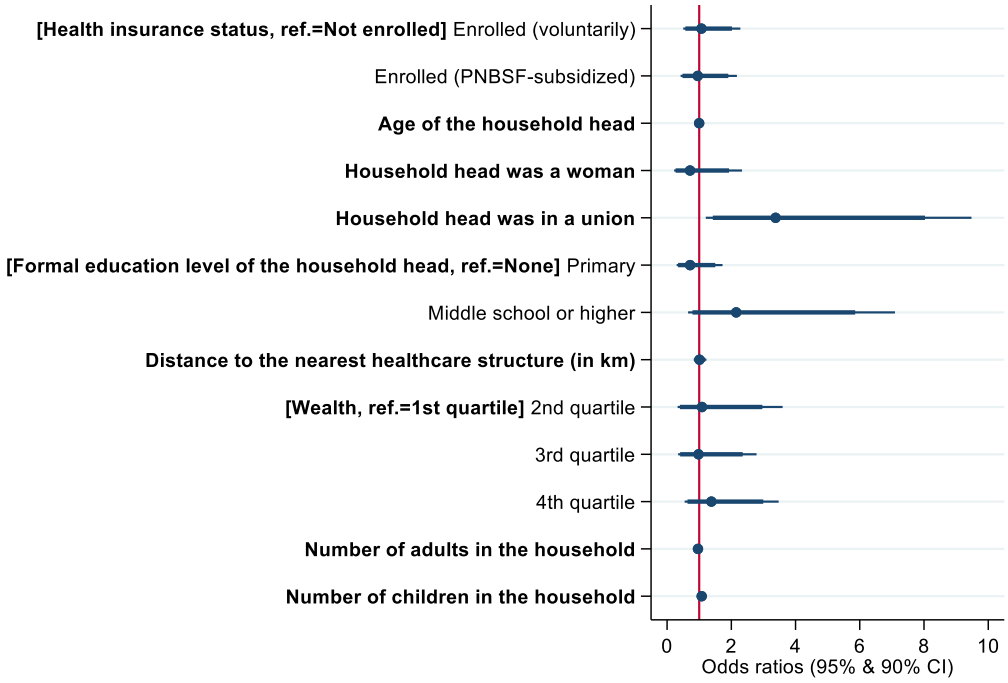
Appendix A17. IPW logit model of having catastrophic health expenditures, at the 40% threshold (at the household level) (Model 6)

Appendix A17.1 Regression results

Model 6	Odds ratios	Average marginal effects on the predicted probability of having catastrophic health expenditures
Health insurance status (ref.=Not enrolled in a CBHI)		
Enrolled (voluntarily)	1.070	0.004
	(0.41)	(0.02)
Enrolled (PNBSF-subsidised)	0.956	-0.002
	(0.40)	(0.02)
Age of the household head	0.998	-0.000
	(0.01)	(0.00)
Female household head	0.714	-0.017
	(0.43)	(0.03)
Household head was in a union	3.379**	0.047***
	(1.78)	(0.02)
Formal education level of the household head (ref.=None)		
Primary	0.717	-0.016
	(0.32)	(0.02)
Middle school or higher	2.151	0.060
	(1.31)	(0.06)
Distance to the nearest health facility (in km)	1.008	0.000
	(0.10)	(0.01)
Wealth (ref.=1st quartile)		
2nd quartile	1.086	0.004
	(0.66)	(0.03)
3rd quartile	0.978	-0.001
	(0.52)	(0.03)
4th quartile	1.379	0.019
	(0.65)	(0.03)
Number of adults in the household	0.962	-0.002
	(0.04)	(0.00)
Number of children under the respondents' responsibility	1.078*	0.004*
	(0.05)	(0.00)
Constant	0.022***	
	(0.02)	

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. N=1001. Regressions were weighted by both (i) the inverse probability of treatment obtained in the first-step multinomial logit model of health insurance enrolment at the household level, and (ii) the sampling weights to account for choice-based stratified samples. Robust standard errors in parentheses.
Abbreviations: CBHI=community-based health insurance, PNBSF=*Programme National de Bourses de Sécurité Familiale*, N=number of observations.

Appendix A17.2 Graphical representation of the regression results



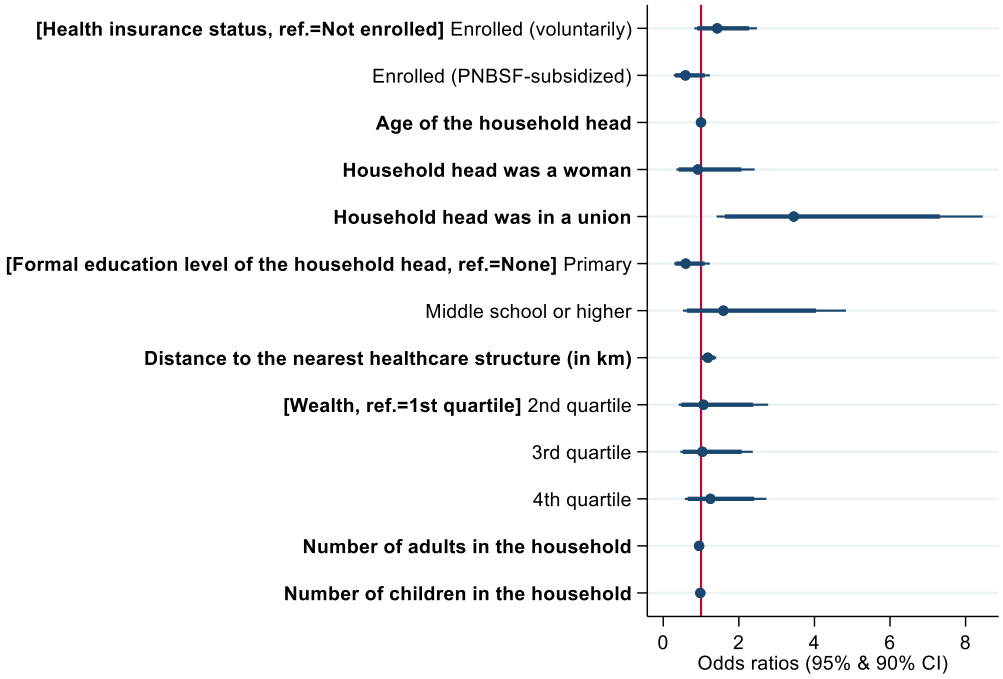
Appendix A18. IPW logit model of having catastrophic health expenditures, at the 30% threshold (at the household level) (Model 7)

Appendix A18.1 Regression results

Model 7	Odds ratios	Average marginal effects on the predicted probability of having catastrophic health expenditures
Health insurance status (ref.=Not enrolled in a CBHI)		
Enrolled (voluntarily)	1.428	0.038
	(0.40)	(0.03)
Enrolled (PNBSF-subsidised)	0.587	-0.042
	(0.22)	(0.03)
Age of the household head	0.999	-0.000
	(0.01)	(0.00)
Female household head	0.915	-0.008
	(0.45)	(0.04)
Household head was in a union	3.454***	0.083***
	(1.58)	(0.02)
Formal education level of the household head (ref.=None)		
Primary	0.595	-0.042
	(0.22)	(0.03)
Middle school or higher	1.590	0.053
	(0.90)	(0.07)
Distance to the nearest health facility (in km)	1.180*	0.016*
	(0.10)	(0.01)
Wealth (ref.=1st quartile)		
2nd quartile	1.066	0.006
	(0.52)	(0.04)
3rd quartile	1.035	0.003
	(0.44)	(0.04)
4th quartile	1.249	0.021
	(0.50)	(0.04)
Number of adults in the household	0.948	-0.005
	(0.03)	(0.00)
Number of children under the respondents' responsibility	0.980	-0.002
	(0.05)	(0.00)
Constant	0.036***	
	(0.03)	

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. N=1001. Regressions were weighted by both (i) the inverse probability of treatment obtained in the first-step multinomial logit model of health insurance enrolment at the household level, and (ii) the sampling weights to account for choice-based stratified samples. Robust standard errors in parentheses.
Abbreviations: CBHI=community-based health insurance, PNBSF=*Programme National de Bourses de Sécurité Familiale*, N=number of observations.

Appendix A18.2 Graphical representation of the regression results



Appendix A19. IPW logit model of having catastrophic health expenditures, at the 20% threshold (at the household level) (Model 8)

Appendix A19.1 Regression results

Model 8	Odds ratios	Average marginal effects on the predicted probability of having catastrophic health expenditures
Health insurance status (ref.=Not enrolled in a CBHI)		
Enrolled (voluntarily)	1.456	0.057
	(0.36)	(0.04)
Enrolled (PNBSF-subsidised)	1.174	0.023
	(0.34)	(0.04)
Age of the household head	1.014	0.002
	(0.01)	(0.00)
Female household head	0.754	-0.040
	(0.35)	(0.06)
Household head was in a union	0.879	-0.020
	(0.33)	(0.06)
Formal education level of the household head (ref.=None)		
Primary	1.111	0.016
	(0.37)	(0.05)
Middle school or higher	1.248	0.035
	(0.60)	(0.08)
Distance to the nearest health facility (in km)	1.204***	0.028***
	(0.08)	(0.01)
Wealth (ref.=1st quartile)		
2nd quartile	0.615	-0.079
	(0.21)	(0.06)
3rd quartile	0.635	-0.074
	(0.23)	(0.06)
4th quartile	0.568*	-0.090*
	(0.19)	(0.05)
Number of adults in the household	1.005	0.001
	(0.03)	(0.00)
Number of children under the respondents' responsibility	0.990	-0.001
	(0.04)	(0.01)
Constant	0.075***	
	(0.05)	

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. N=1001. Regressions were weighted by both (i) the inverse probability of treatment obtained in the first-step multinomial logit model of health insurance enrolment at the household level, and (ii) the sampling weights to account for choice-based stratified samples. Robust standard errors in parentheses.
Abbreviations: CBHI=community-based health insurance, PNBSF=*Programme National de Bourses de Sécurité Familiale*, N=number of observations.

Appendix A19.2 Graphical representation of the regression results