Behavioral Economics and Health Behaviors:

Insights from Cancer Screening Programs

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Behavioral Economics and Health Behaviors: Insights from Cancer Screening Programs

- The Good Outcomes of Bad News. A Field Experiment on Formatting Breast Cancer Screening Invitation Letters

- Cervical Cancer Screening Invitations in Low- and Middle- Income Countries: Evidence from Armenia

The Good Outcomes of Bad News. A Field Experiment on Formatting Breast Cancer Screening Invitation Letters

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Scheme of the presentation

- Motivation

- Related literature

- Institutional context

- Experimental design

- Results

- Conclusion

Motivation (1)

- Among women, breast cancer is the most common neoplastic disease worldwide and the second most common cause of cancer mortality in developed countries (IARC 2012)

    ○ 1.7 million new cases in 2012, accounting for 25% of all new cancer cases in women. Estimated number of 521,900 deaths in 2012

    ○ Breast cancer is associated with an overall cost of about 0.5-0.6% of the total health care expenditure of developed countries (OECD 2009)

Motivation (2)

- A mammography every two years lowers the risk of dying through breast cancer by up to 40%, namely 8 deaths prevented per 1,000 screened women (Lauby-Secretan et al. 2015).

- This measure is also highly cost-effective (Cutler 2008, Moore et al. 2009)

- As of March 2014, screening programs based on EU indications were active in almost all the EU28 member states.

- Unfortunately, take-up rates were still below the EU target rate (75%) in many states (Altobelli and Lattanzi 2014)

This paper

- We run a randomized field experiment in the province of Messina (Sicily) to study how the take-up rate responds to costless manipulations of the invitation letters

- Manipulations along two dimensions: framing (either negative or positive) and enhancing or not information

- In comparison to the baseline, when combining the loss frame with enhanced information on the negative consequences of not taking the mammography, the take-up rate increases by 25% (2.5 pp). No effect for the other manipulations.

- The effect is larger among subjects with lower baseline take-ups: those living farther away from the screening site, residing in municipalities with low education, or with no recent screening experience

- Mechanism: perceived importance and urgency of the screening. Women exposed to the letter combining the loss frame with enhanced information on the negative consequences of not taking the mammography are less luckily to reschedule/post-pone the screening visit

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Related literature – the framework

- Nudge (Thaler and Sunstein 2008): *any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives*

- "Information disclosure" as a form of nudging: providing individuals with more information about the consequences of their choices (Sunstein 2014) may affect their behavior and promote good practices.

- "Gain-loss framing" (Tversky and Kahneman 1981) in health persuasion. Rothman and Salovey (1997) distinguish between:
    1. Prevention behaviors: non-risky and help in maintaining good health (a gain);
    2. Detection behaviors: risky and serve to identify illnesses (a loss)

- Gain-framed messages are more effective at promoting prevention behaviors and loss-framed messages at promoting detection ones

Related literature – relevant examples and our contributions

- Meyerowitz and Chaiken (1987): loss-framed messages are more effective than gain-framed messages in motivating college students to perform breast self-examinations

- Banks et al. (1995): loss-framed videos are more effective than gain-framed videos in enhancing women aged 40+ to self-report mammography utilization

- Bourmand et al (2016): providing a 12-page information leaflet does not increase take-up rate for breast cancer screening.

- Goldzahl, Hollard and Jusot (2017): (i) a new logo on the envelope; (ii) patient-approved clarity in the letter's content; (iii) a combination of the two previous treatments; (iv) information on the number of women receiving mammograms in the recipient's area of residence do not affect take-up rate for breast cancer screening

→ Our contributions:
  → **combine information & framing - *wholly new and effective* form of nudging,**
  → field experiment built within the actual LHA's screening program,
  → administrative data on actual take-up rate,
  → assess heterogeneous effects.

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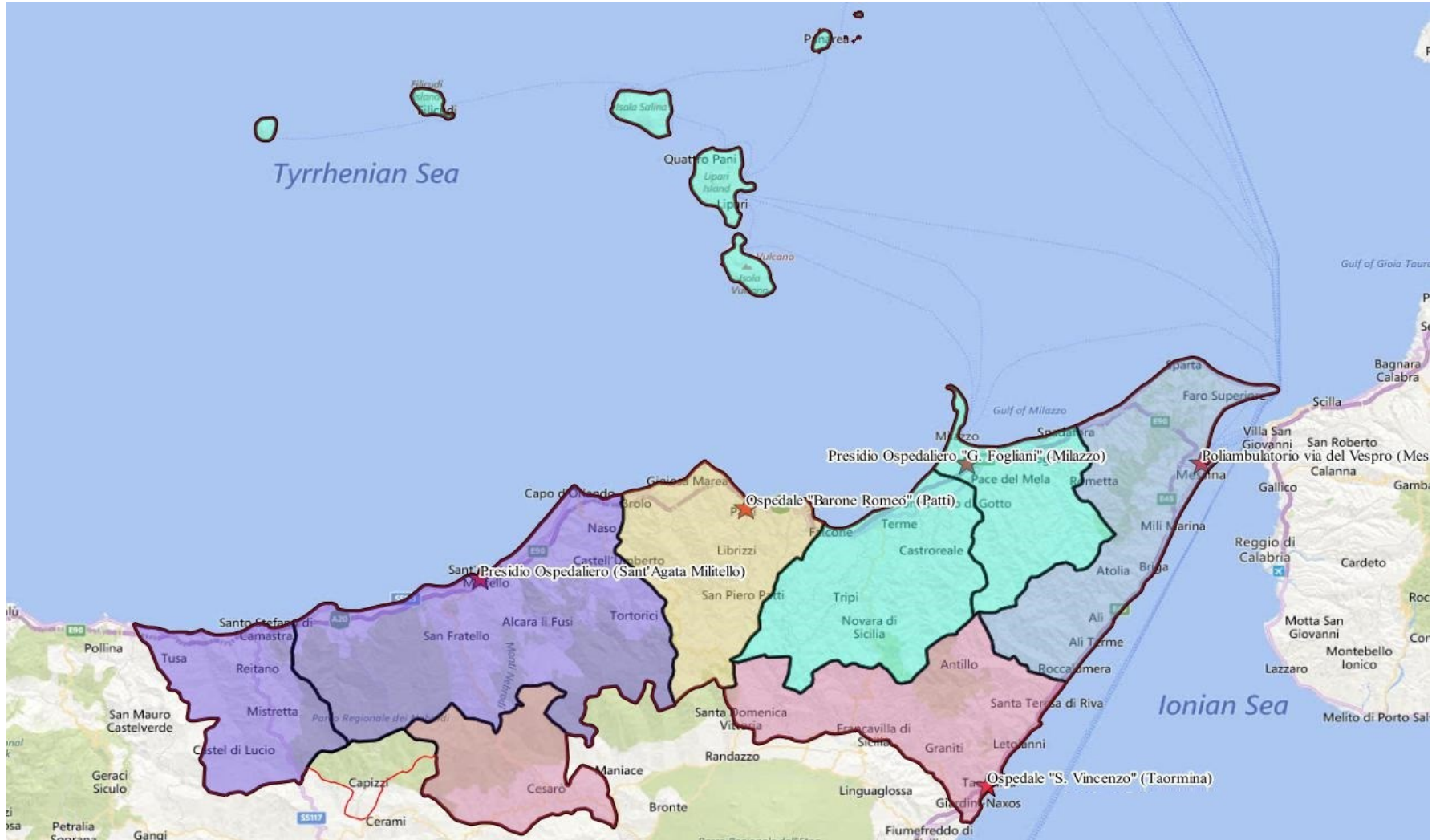- Experimental design

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Institutional context (1)

- EU recommendations (European Parliament, 2003, 2006):

  i.   women aged 50-69 should take a mammography every two years;
  ii. the invitation letter must provide information about the screening program;
  iii. qualified radiologists and modern dedicated X-ray equipment/image receptors;
  iv. double reading procedure

- ITALY: national breast cancer screening program included in the Basic Healthcare Parameters (Livelli Essenziali di Assistenza) since 2001

- LHAs responsible for the implementation of the screening program

- Take-up rates are still relatively low and exhibit a strong North-South gap

Institutional context (2)

- The Province of MESSINA:

  (i) 92,048 women aged 50-69 targeted by the screening program;

  (ii) 8 districts: Messina, Taormina, Milazzo, Lipari, Barcellona Pozzo di Gotto, Patti, Mistretta, Sant'Agata Militello;

  (iii) 5 health care centers: the Ospedale "San Vincenzo" in Taormina, the Poliambulatorio in Messina, the Ospedale "Barone Romeo" in Patti, the Presidio Ospedaliero in Sant'Agata Militello (Sant'Agata Militello and Mistretta), the Presidio Ospedaliero "G. Fogliani" in Milazzo (Milazzo, Barcellona Pozzo di Gotto and Lipari)

- Starting with a pilot study in 2014 and reaching population-level coverage in 2015, the Messina LHA has implemented the national breast cancer screening program by inviting all women aged 50-69 to take a free mammography every two years

- Very low take-up rate, below 15% in both 2015 and 2016. Pressing need to intervene.

Institutional context (3)

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Experimental design: the manipulations

	INFORMATION INCLUDED	INFORMATION EXCLUDED
GAIN FRAME	**"Enhanced - Gain"** "Scientific studies demonstrate that participating in breast cancer screening programs can have relevant positive effects on the treatment of an early diagnosed disease: it reduces the mortality rate, allows for less extensive surgeries, more effective treatments, with higher chances of recovery."	**"Restricted - Gain"** "Scientific studies demonstrate that participating in breast cancer screening programs can have relevant positive effects on the treatment of an early diagnosed disease."
LOSS FRAME	**"Enhanced – Loss"** "Scientific studies demonstrate that not participating in breast cancer screening programs can have relevant negative effects on the treatment of a lately diagnosed disease: it increases the mortality rate, implies more extensive surgeries, less effective treatments, with lower chances of recovery."	**"Restricted – Loss"** "Scientific studies demonstrate that not participating in breast cancer screening programs can have relevant negative effects on the treatment of a lately diagnosed disease."

Azienda Sanitaria Provinciale
Prevention Department

Address: XXXX
Tel. XXXX

LOCAL RADIOLOGY UNIT

Director: Dr. XXXX

Senology unit: Dr. XXXX

Address: XXXX

Dear Madam,

this Azienda Sanitaria Provinciale (ASP), in collaboration with your general practitioner, is promoting a breast cancer prevention campaign, inviting all women between 50 and 69 to have a mammography.

Scientific studies demonstrate that not participating in breast cancer screening programs can have relevant negative effects on the treatment of a lately diagnosed disease: it increases the mortality rate, implies more extensive surgeries, less effective treatments, with lower chances of recovery.

For this reason, we have booked an appointment for you to have the mammography at the following address and date:

Address: XXXX

Date and Time: XXXX

The mammography is free and you do not need a medical prescription. You only need to show your tax code, your identity card and the present letter to the radiologist.

Please, call the following telephone number XXXX from Monday to Friday, from 09.00 to 13.00 if:

- you have already had a mammography in the last 12 months;
- you want to modify date and/or time of the appointment;
- you had a breast surgery.

In case you previously had a mammography, please bring the results with you.

Please read carefully the information reported in the back of the present letter, under the law dated 28th of March, 2001, n.145.

Sincerely yours,

Your General Practitioner,
Dr. XXXX

The Direction of the Local Radiology Unit
Dr. XXXX

In industrialized western countries, due to its incidence, breast cancer represents a concerning social disease. Italian estimates show that every year more than 31,000 women are diagnosed with breast cancer (data from the Italian Association for Cancer Registries).

Scientific evidence demonstrates that a late diagnosis of this cancer can have relevant negative effects on the treatment of the disease. In particular, it has been documented that a late diagnosis of this cancer increases the mortality rate, implies more extensive surgeries, less effective treatments, with lower chances of recovery.

For this reason, in the last 20 years, great attention has been paid to early diagnosis through the promotion of high quality national screening programs by targeting all women between 50 and 69(who represent the age category with higher risk of breast cancer).

The early diagnosis activities involve an integrated approach of different services in senology and will be implemented in collaboration with a network of oncological and epidemiological institutions. This collaboration guarantees monitoring and valuable assistance in case of breast cancer diagnosis.

DO NOT MISS THIS OPPORTUNITY!!!

The responsible of the Breast Cancer Screening Program

Dr. XXXX

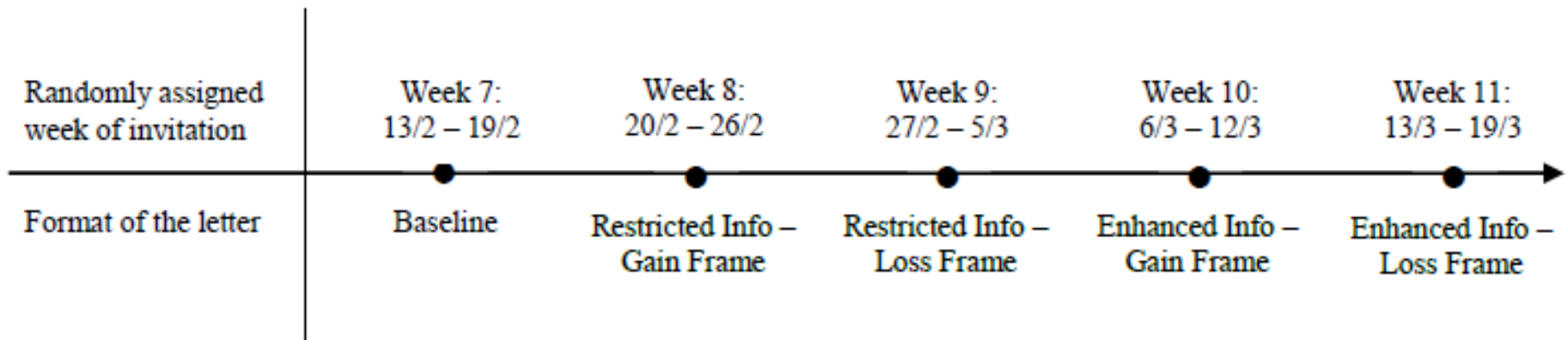CONSENT TO THE PROCESSING OF PERSONAL DATA (Legislative Decree 196/03)

In accordance with the Legislative Decree 196/03, ASP, responsible of the processing of personal data, informs you that your personal and sensitive data will be exclusively used for conducting the screening activities, for research purposes and for ordinary administration, and will be processed by authorized staff, under the limitations of the current law and in accordance with minimal security requirements. At any time, you can contact the secretary of the screening unit to obtain information on how your personal data will be processed as well as on the adopted security procedures adopted by ASP.

DATE_____

SIGNATURE_____

Experimental design: procedures

- Screening centers provide a yearly stock of slots – enough to satisfy the needs of the target population – evenly distributed throughout the year

- Women randomly allocated to screening slots by LHA computer system

- Our manipulations affected women invited for screening during Feb 13 – Mar 19 2017

- We sent a different letter to women invited in each week

Randomly assigned week of invitation	Week 7: 13/2 – 19/2	Week 8: 20/2 – 26/2	Week 9: 27/2 – 5/3	Week 10: 6/3 – 12/3	Week 11: 13/3 – 19/3
Format of the letter	Baseline	Restricted Info – Gain Frame	Restricted Info – Loss Frame	Enhanced Info – Gain Frame	Enhanced Info – Loss Frame

- Letters sent 3 weeks before the mammography by a professional private mail company – no information available on actual letter delivery

Data

- Administrative archives of Messina's Local Health Authority
  - Screening take-up
  - Hospital providing the screening
  - Demographic information
  - Previous screening experience (invitation and take-up)

- Administrative archive of the mail company managing the delivery of the invitation letters
  - Date of invitation treatment status
  - Home address home-hospital travel time (STATA georoute module)

- Total: 6,194 subjects

 The experiment interests <10% of the target population, each letter received by <2% of it spillover effects are unlikely

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Results - descriptive statistics

Treatment Group	(1) Observations	(2) Percent
Baseline	1,237	19.97%
Restricted - Gain	1,238	19.99%
Restricted - Loss	1,245	20.10%
Enhanced - Gain	1,238	19.99%
Enhanced - Loss	1,236	19.95%
Total	6,194	100%

Variable	(1) Mean	(2) Std. dev.
Outcome:		
Screened	0.104	0.305
Covariates:		
Screened Jan14 - Jun16	0.136	0.343
Invited to screen in previous years	0.922	0.268
Year of birth	1958.1	6.232
Express mail	0.848	0.359
Home-hospital travel time (minutes)	27.76	28.66
Health care center 2	0.309	0.462
Health care center 3	0.120	0.325
Health care center 4	0.132	0.338
Health care center 5	0.345	0.476

Results - descriptive statistics

Home-hospital travel time

kernel = epanechnikov, bandwidth = 2.3642
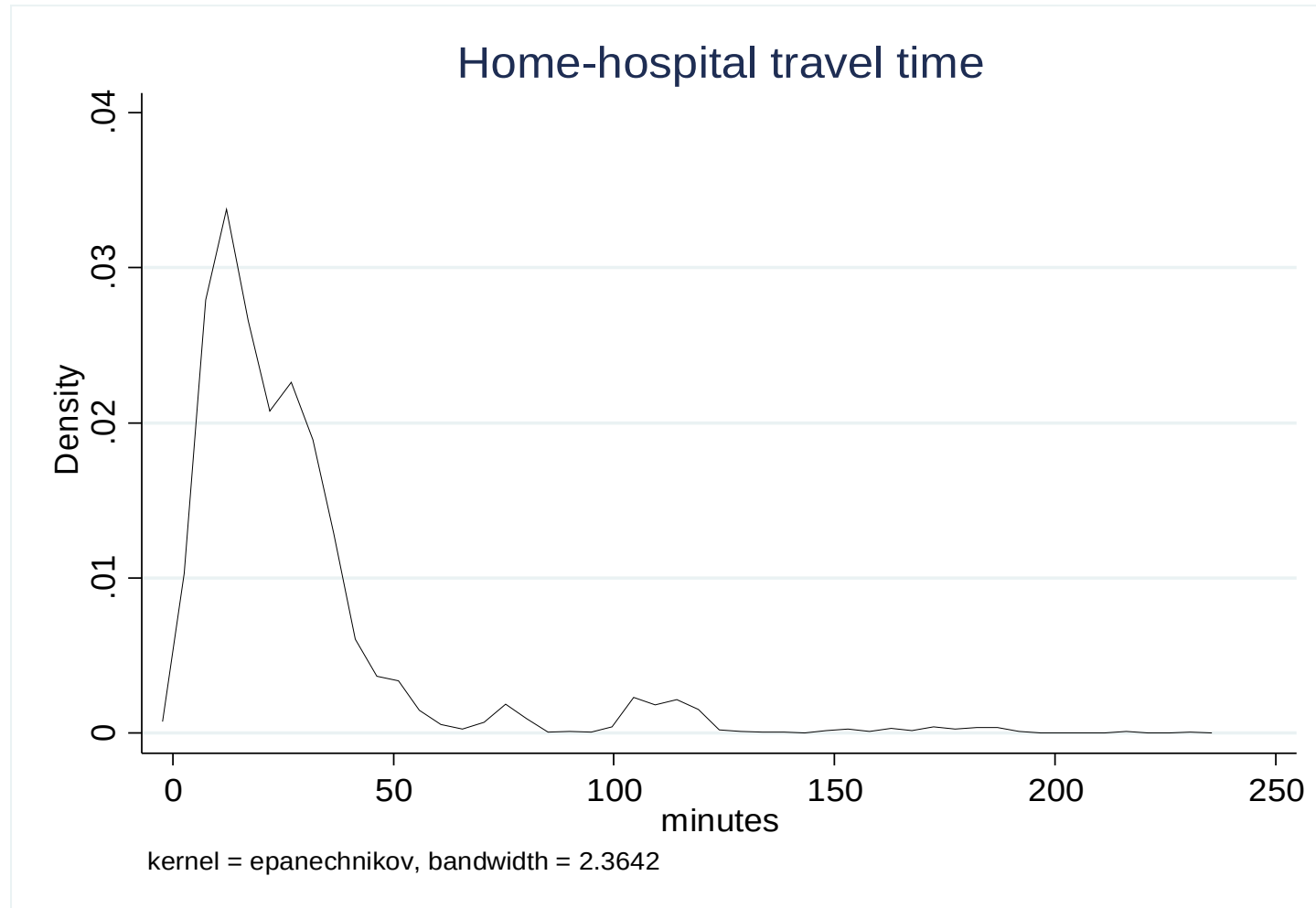
Results - balancing

	(1) Baseline	(2) Restricted Gain	(3) Restricted Loss	(4) Enhanced Gain	(5) Enhanced Loss	(6) Joint equality (p-value)
Screened Jan14 - Jun16	0.131	0.128	0.137	0.143	0.142	0.71
Invited to screen in previous years	0.928	0.922	0.925	0.921	0.916	0.86
Year of birth	1958.3	1958.2	1957.9	1958.0	1958.2	0.48
Express mail	0.866	0.855	0.841	0.836	0.844	0.58
Home-hospital travel time (median)	19.95	19.64	21.38	20.80	20.63	0.38
Health care center 2	0.301	0.307	0.311	0.317	0.309	0.96
Health care center 3	0.122	0.120	0.120	0.118	0.121	0.99
Health care center 4	0.133	0.133	0.128	0.131	0.133	0.98
Health care center 5	0.347	0.347	0.349	0.342	0.341	0.97

Main results

$$Screened_i = \alpha + \beta_1 RestrictedGain_i + \beta_2 RestrictedLoss_i +$$

$$+\beta_3 EnhancedGain_i + \beta_4 EnhancedLoss_i + \gamma X_i + \varepsilon_i$$

	(1)	(2)	(3) Linear Probability Model	(4) Linear Probability Model
	Logit	Logit		
Restricted - Gain	-0.009	-0.009	-0.008	-0.007
	(0.013)	(0.012)	(0.012)	(0.011)
Restricted - Loss	-0.001	-0.001	-0.001	-0.002
	(0.012)	(0.012)	(0.012)	(0.012)
Enhanced - Gain	0.004	0.001	0.004	0.001
	(0.012)	(0.012)	(0.012)	(0.012)
Enhanced- Loss	0.026**	0.023**	0.028**	0.025**
	(0.012)	(0.011)	(0.013)	(0.012)
Covariates	No	Yes	No	Yes
Mean outcome – Baseline group	0.099	0.099	0.099	0.099

Main results

Enhanced - Loss vs. …	(1) Logit	(2) Logit	(3) Linear Probability Model	(4) Linear Probability Model
Restricted - Gain	0.034 [0.005]	0.032 [0.006]	0.036 [0.004]	0.032 [0.007]
Restricted - Loss	0.026 [0.027]	0.024 [0.037]	0.028 [0.026]	0.026 [0.031]
Enhanced- Gain	0.022 [0.066]	0.022 [0.054]	0.024 [0.066]	0.024 [0.053]
Covariates	No	Yes	No	Yes

Robustness tests (1)

- Only one week per treatment: seasonality?
- Redo the analysis on data for same screening weeks in previous years, when all subjects received the same letter

	(1) 2015	(2) 2016	(3) 2017
Year Week 8 / Restricted - Gain	-0.028	0.002	-0.009
	(0.021)	(0.014)	(0.013)
Year Week 9 / Restricted - Loss	-0.003	0.015	-0.001
	(0.027)	(0.013)	(0.012)
Year Week 10 / Enhanced - Gain	-0.028	-0.005	0.004
	(0.022)	(0.014)	(0.012)
Year Week 11 / Enhanced - Loss	0.004	0.002	0.026**
	(0.021)	(0.013)	(0.012)
Observations	3,484	6,094	6,194

Notes: the table reports the average marginal effects on screening rates by week in 2015, 2016 and 2017. The baseline is Year Week 7. Logit models without covariates. Standard errors robust to the presence of heteroscedasticity reported in parenthesis. ***: $p<.01$; **: $p<.05$; *: $p<.1$.
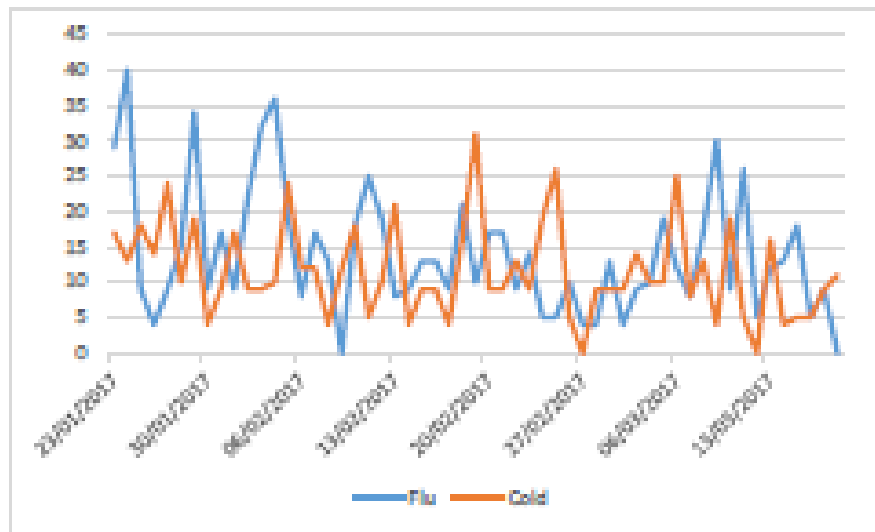
Robustness tests (2)

- Remaining identification concern are **group-specific time effects**
  - ○ Example: "Breast cancer awareness month" takes place in October every year. It could have raised take-up rates independently of the experiment, had the latter taken place in October
- *Special festivities or public holidays:* not in our experimental weeks
- *Concurring campaigns on breast cancer*: indirect evidence - Google Trends data
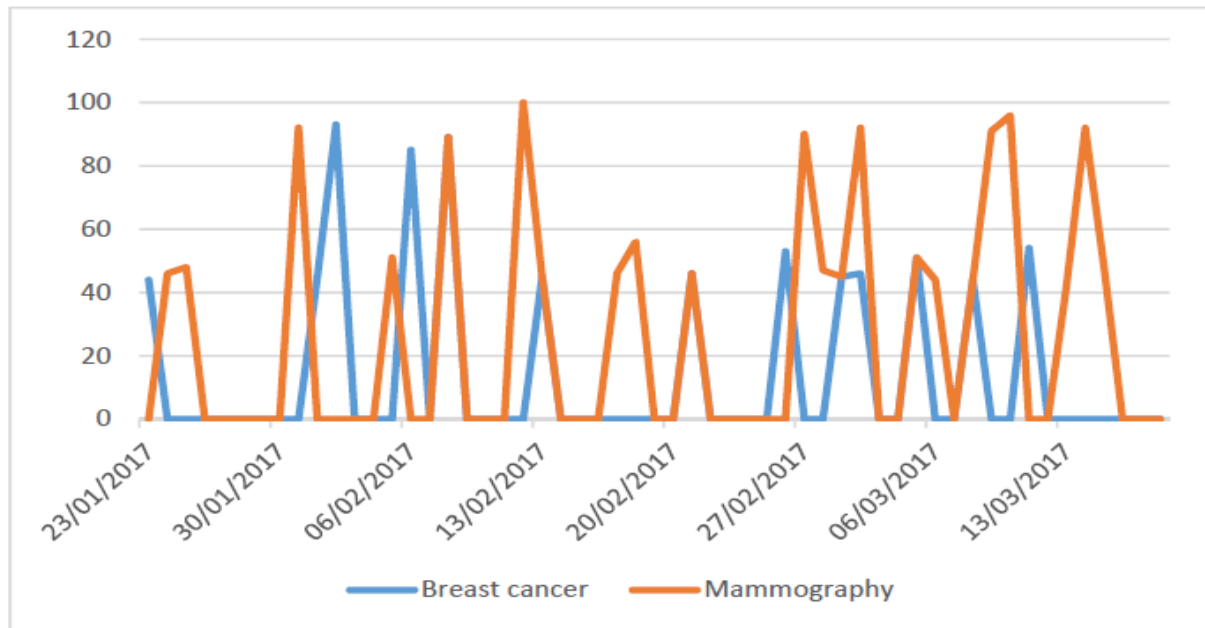
Notes: Numbers represent search interest relative to the highest point on the chart. A value of 100 is the peak popularity for the term. A value of 50 means that the term is half as popular. Likewise a score of 0 means the term was less than 1% as popular as the peak.

Robustness tests (2)

Panel A

Panel B
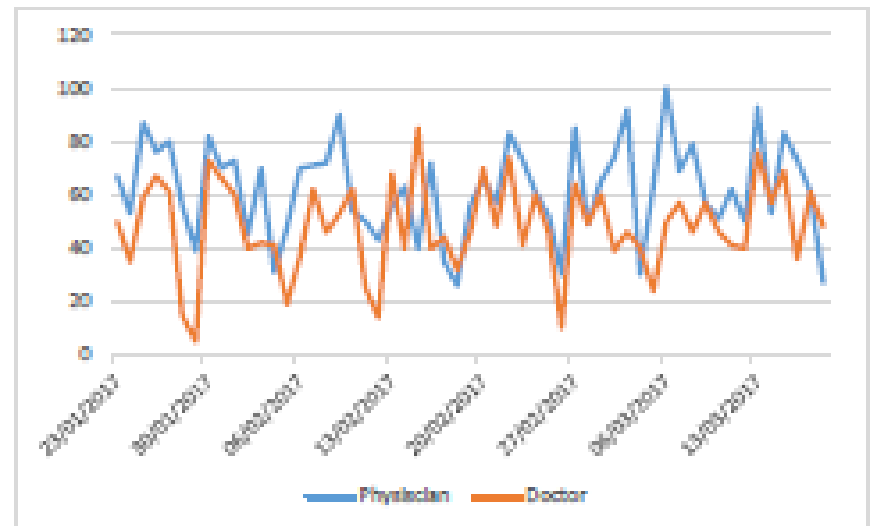
Robustness tests (3)

Slight imbalance in E-G week
Yet, 5mm/day cannot cause disarray

	(1) Baseline	(2) Restricted Gain	(3) Restricted Loss	(4) Enhanced Gain	(5) Enhanced Loss	(6) Joint equality (p-value)
Rainfall (mm/day)	0.000	0.397***	0.213***	5.283***	0.133***	0.000
Average daily temperature (Celsius Degrees)	12.764	12.895*	14.135***	13.532***	12.923*	0.000

	(1) Logit	(2) Linear Probability Model
Restricted – Gain	-0.009 (0.012)	-0.008 (0.011)
Restricted – Loss	-0.003 (0.013)	-0.003 (0.012)
Enhanced –Gain	0.001 (0.014)	0.000 (0.013)
Enhanced- Loss	0.023** (0.011)	0.024** (0.012)
Rainfall (mm/day)	-0.000 (0.001)	0.000 (0.001)
Average Daily Temperature (Celsius Degrees)	0.001 (0.003)	0.001 (0.003)
Other covariates	Yes	Yes
Mean outcome – Baseline group	0.099	0.099

- Ambiguous effects on take-up
  - Increases travel time
  - Decreases opp. cost of leisure

- Empirically, random rain unrelated to take-up

- As expected, effects unchanged by its inclusion as a control

Robustness tests (4)

- *8th March General Strike* took place during the "enhanced-gain" manipulation

  ◦ Modest participation (<25% interested workforce, mostly concentrated in school sector)
  ◦ No significant heterogeneity in daily take-up rate within the strike week

	(1) Monday 6-3-2017	(2) Tuesday 7-3-2017	(3) Wednesday 8-3-2017	(4) Thursday 9-3-2017	(5) Friday 10-3-2017	(6) Saturday 10-3-2017	(7) Joint equality (p-value)
Take-up	0.083	0.115	0.074	0.118	0.123	0.088	0.36
N. Obs.	192	296	230	272	203	45	

  ◦ If we assumed take-up rate for the 8th of March was as high as the highest take-up rate during the week (11.7% for Thu 9), weekly take-up rate would be 11.1%, and difference with baseline would be 1.2 pp, below Minimum Detectable Effect

Robustness tests (5)

- Statistical Inference: a problem of multiple testing?

- We are simultaneously testing the effects of four manipulations against a baseline

    - If a single test is performed at the 5% level of confidence and the null hypothesis being tested is true, we expect a 5% chance of incorrectly rejecting it
    - If N=4 independent tests are simultaneously carried out and all corresponding null hypotheses are true, the probability of at least one incorrect rejection is equal to 18.5%

- List, Shaikh and Xu (2016): resampling-based method for testing multiple null hypotheses simultaneously in experimental settings with multiple treatments
- "Enhanced-loss" effect still significant with $p = 0.082$
- Standard Bonferroni-Holm procedure (more conservative) gives $p = 0.096$

Heterogeneous effects

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. By home-hospital travel time	Above median	Below median	Above median	Below median	Above median	Below median
Enhanced- Loss	0.035**	0.018	0.035**	0.008	0.033**	0.006
	(0.018)	(0.016)	(0.017)	(0.015)	(0.017)	(0.016)
Observations	3,094	3,100	3,094	3,100	3,094	3,100
Mean outcome – Baseline group	0.088	0.110	0.088	0.110	0.088	0.110
Panel B. By % with at least high school by municipality	Above median	Below median	Above median	Below median	Above median	Below median
Enhanced- Loss	-0.001	0.044***	-0.001	0.037**	-0.001	0.037**
	(0.017)	(0.017)	(0.017)	(0.016)	(0.017)	(0.016)
Observations	2,705	3,489	2,705	3,489	2,705	3,489
Mean outcome – Baseline group	0.098	0.100	0.098	0.100	0.098	0.100
Panel C. By screening experience in the Jan 14-Jun 16 period	Screened	Not Screened	Screened	Not Screened	Screened	Not Screened
Enhanced- Loss	0.001	0.027**	0.007	0.028**	-0.004	0.026**
	(0.049)	(0.011)	(0.049)	(0.011)	(0.050)	(0.011)
Observations	843	5,351	842	5,351	842	5,351
Mean outcome – Baseline group	0.370	0.05	0.370	0.059	0.370	0.0590
Covariates	No	No	Individual	Individual	Individual and municipality	Individual and municipality

Mechanisms: perceived importance and urgency of the screening

Postponement conditional on participation

	(1) LPM	(2) LPM
Enhanced - Loss	-0.323***	-0.319***
	(0.068)	(0.068)
Observations	6,194	6,194
Covariates	No	Yes

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Conclusion

- Loss frame and enhanced information increase the take-up rate by 25% (2.5pp) relative to the baseline. Other treatments are instead ineffective.

- The effect is stronger for subjects living farther away from the health care centers: letter formatting can overcome the cost to take the mammography

- "Enhanced – Loss" letter increases the perceived importance and urgency of participating in the screening program (psychological "unpacking" effect, see Van Boven and Epley 2003 and Angelini et al. 2017)

- Back of the envelope calculations. Screening saves 8 out of 1,000 screened women (Lauby-Secretan et al. 2015). Extending our results on the overall target population in Messina (90,000 women): 18 lives saved AT ZERO COST

- *Concerns about over-diagnosis: "breast cancers that would never have been diagnosed or never caused harm if women had not been screened"*… BUT over-diagnosis in Italy is low - between 1 and 4.6% (Puliti *et al*. 2012)

Implications for policy makers

- European guidelines for quality assurance in breast cancer screening and diagnosis: invitations to the screening program should be *positively framed* (e.g. 9 out of 10 recalled women are found to be normal rather than 1 out of 10 recalled women will have cancer)

- Our experimental findings *do not lend empirical support to this advice*, and would call for an update of the guidelines to ensure that the highest possible take-up rate is achieved, at least for areas comparable to Messina

- Future research: re-do the experiment in areas with higher baseline take-up rate (but very hard to convince LHAs to participate)

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Cervical Cancer Screening Invitations in Low- and Middle- Income Countries: Evidence from Armenia

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Marco BERTONI
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The project in a nutshell

- Collaboration between Armenia National SDG Innovation Lab (joint initiative of UN and the Government of the Republic of Armenia, supported by the UNDP) and the Ministry of Health of the Republic of Armenia

- The study is aimed at increasing the uptake of a cervical cancer screening program that runs in the Republic of Armenia

- To the best of our knowledge, the first RCT in the developing world that studies the impact of invitation letters and reminders on (cervical) cancer screening uptake

Cervical cancer (CC)

- CC is the fourth most frequent cancer among women in the world, with roughly 570,000 new cases in 2018 (9.3% of all female cancers) (GLOBOCAN, 2018)

- Yearly, around 90% of deaths occur in low- and middle-income countries (LMIC):

    - Absence of organized screening programs or low participation if a program is present (e.g., Gakidou et al., 2008; O'Donovan et al., 2019; Sankaranarayanan, 2001)

    - In the last 40 years Sharp decline of cervical cancer incidence in high-income countries due to organized screening programs

Estimated age-standardized incidence rates (World) in 2018, cervix uteri, all ages
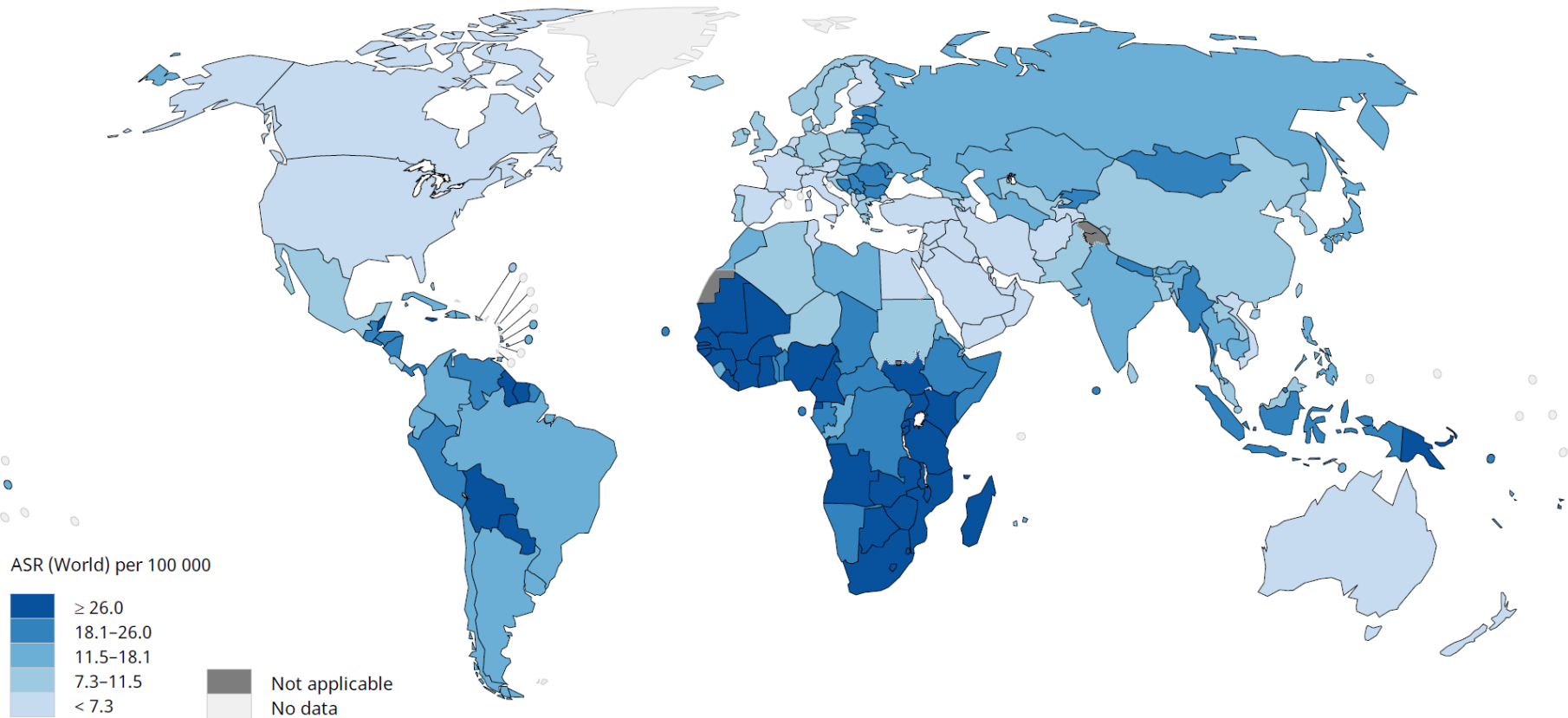
ASR (World) per 100 000

- ≥ 26.0
- 18.1–26.0
- 11.5–18.1
- 7.3–11.5
- < 7.3

Not applicable
No data

World Health Organization

CC screening

- Luckily, CC is one of the most preventable among the relevant human cancers.
  - Mono-causal genesis: infection of the uterine cervix with human papillomavirus (HPV) needs to persist for many years to generate cancer.

- Main prevention devices (European Commission, 2015):
  - Population-based HPV vaccination of girls aged 12+
  - Population-based Pap-test screening of women aged 25-64, every 3 years
  - This has been recently substituted by the introduction of HPV testing every 5 years for women above 30

CC screening programs in LMICs

- Despite large benefits, lack of infrastructures and scarce health care resources limit the possibility to implement adequate screening activities in LMICs (Lazcano-Ponce et al, 1999; Rao 2012)

- When in place, low participation in these programs (WHO, 2002) due to:
  - Information gaps, cultural and socio-economic barriers

- In HICs, invitation letters and reminders stimulate participation in CC screening programs (Decker et al., 2013; Eaker et al., 2011; Radde et al., 2016; Tavasoli et al., 2016)

- Some evidence that framing of letters also matters (Bertoni et al., 2020)

- Lack of research on how these results extend to LMICs

Why invitation letters and reminders may not work in LMICs?

- Absence of insurance and low income
  - patients frightened to detect any illness as they would it impossible to get treated if cancer is detected - which in turn may deter attendance

- Traditional cultural values (even about medical exams)

- Distrust toward the medical system (corruption and low quality)

- Response to screening programs and various invitation strategies can be different between HIC and LMIC

What do we do?

- We worked with the Health Ministry of Armenia and Armenia SDG Innovation Lab to evaluate the effects of invitation letters and reminders aimed at enhancing screening participation

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- Institutional context

- Experimental design
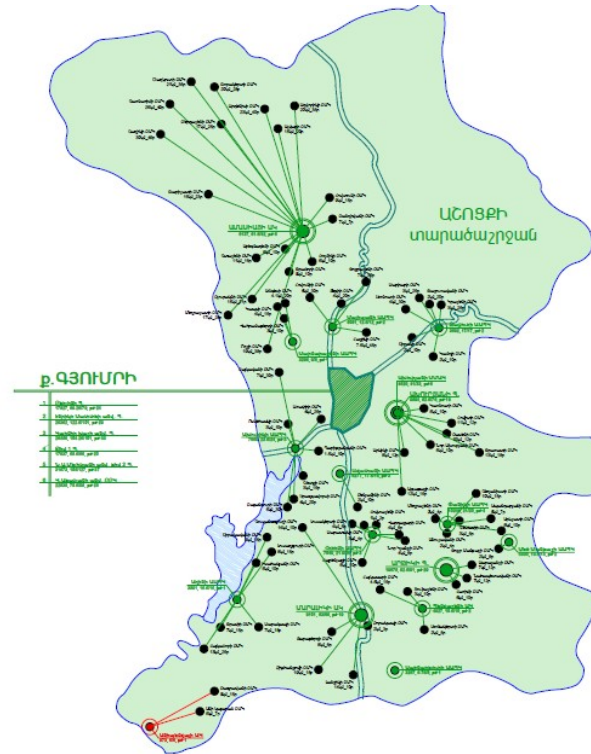
- Results

- Conclusion

Armenia

- Post-communist, middle income country in transition

- Population: about 3,000,000

- GDP per capita: 4,000 USD (2017)

- Poverty: 25.7% (2017)

- CC Incidence:
Armenia= 8.4, Europe=11.2

- CC Mortality:
Armenia= 5.6, Europe=3.8

CC screening and treatment in Armenia

- Screening

  ◦ Up to 2014: opportunistic screening not through PAP testing (pay out of pocket if you want to do it)

  ◦ Since 2015: "Disease Prevention and Control Project in Armenia" project funded by the World Bank (2015-2020)

  ◦ One free screening slot for each woman aged 30-60 every three years

  ◦ No invitation system. Mostly advertised using classical advocacy tools as TV and radio programs, leaflets in supermarkets

  ◦ As of Feb 19, participation was not satisfactory for the Government

The region of interest

Shirak Region

- 44% of the population below the poverty line (the highest poverty rate in Armenia)

- Population 251,941 (2011 Census)

- Urban: 146,908 (58.3%)

- Rural: 105,033 (41.7%)

Scheme of the presentation

- Motivation

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Experimental design

- We manipulate

  - Presence of a letter

  - Presence of a reminder on top of the letter (Altmann & Traxler, 2017, Calzolari & Nardotto, 2016)

  - The frame of the invitation letters and reminders (Positive framing; Negative Framing; Concerned for others framing) (Rothman and Salovey, 1997; Bertoni et al 2019; Du, Li, Lu & Lu, 2019)

- 8 treatments (different invitations) + 1 control (no invitation)

The letter frames

- **Neutral (slightly positive invitation):**

  Please note that scientific studies demonstrate that participating in cervical cancer screening programs can have relevant positive effects on the treatment of an early diagnosed disease.
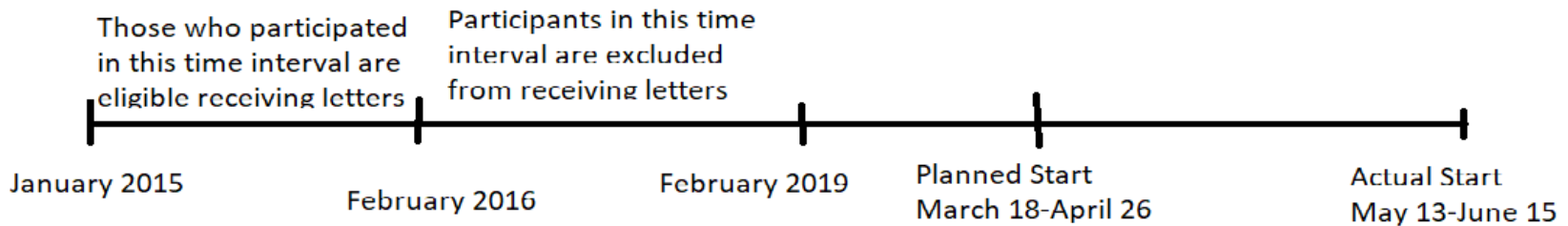
- **Negative Framing:**

  Please note that scientific studies demonstrate that not participating in cervical cancer screening programs can have relevant negative effects on the treatment of a lately diagnosed disease: it increases the mortality rate, implies more extensive surgeries, less effective treatments, with lower chances of recovery.

- **Concern for Others:**

  Your family members, relatives and friends expect you to live a long and healthy life with them. Detecting and curing a potential cancer at early stages can help you fulfil their expectations. Go to the screening for your loved ones!

Assignment to treatments

- Shirak target population: about 36,000 eligible women aged 30-60 who have not attended the program as of Feb 2019 (or attended in 2015/2016)

Those who participated in this time interval are eligible receiving letters

Participants in this time interval are excluded from receiving letters

January 2015

February 2016

February 2019

Planned Start
March 18-April 26

Actual Start
May 13-June 15

- 20,800 people receiving letters
  - Letters received 3 weeks before the scheduled week
  - Reminders received 1 week before the scheduled week

- Those individuals who did not receive letters are kept as the «control group»

Randomization

- We opted for individual-level randomization, stratified by GP

- Select a share of patients per GP in letter sample equal to share of patient per GP in the population

- Each letter type was equally represented within GP

- Day of letter delivery also independently and individually randomized

Sample allocation and treatments
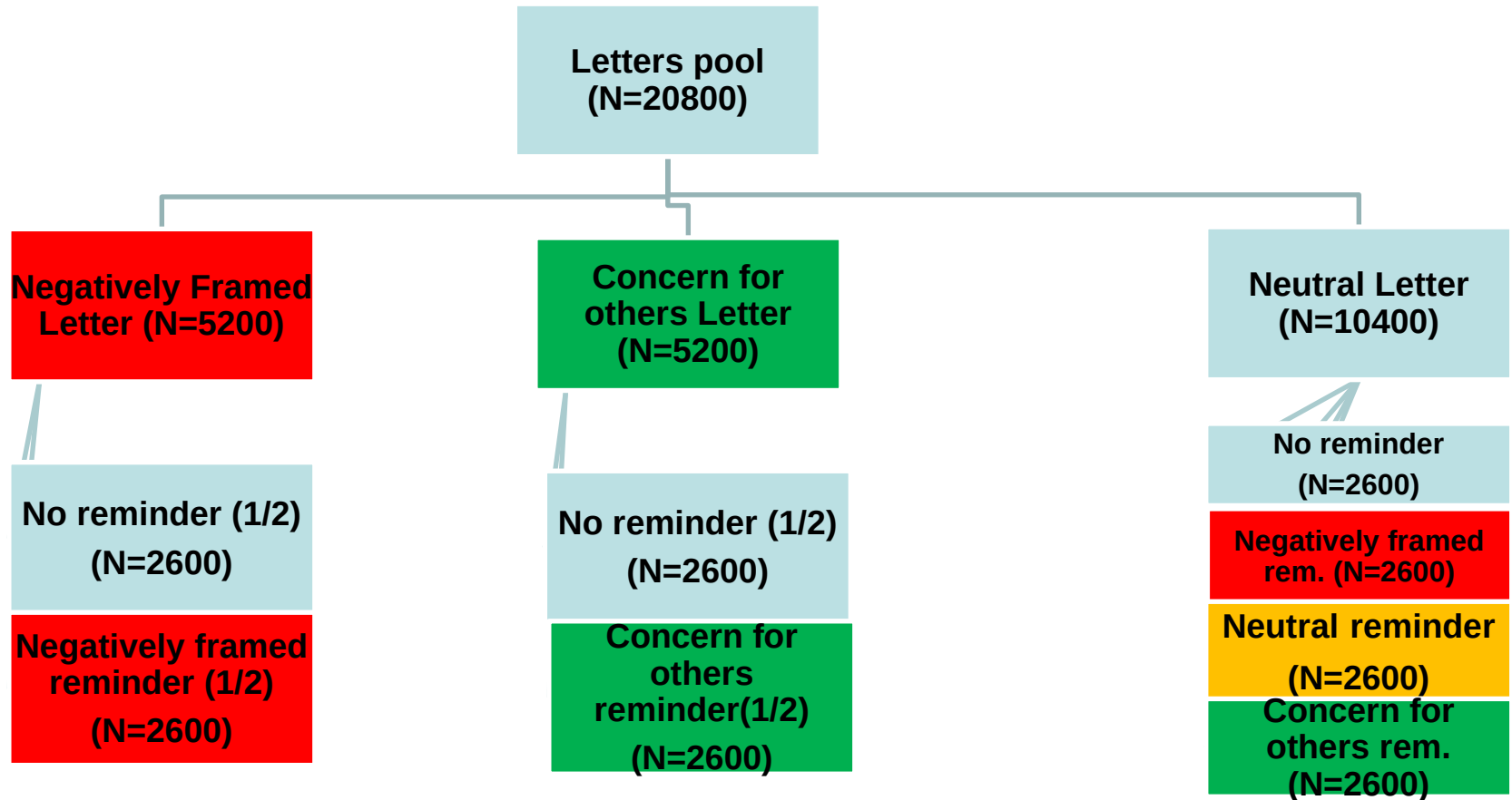
The RCT was implemented in Shirak province between May-July, 2019
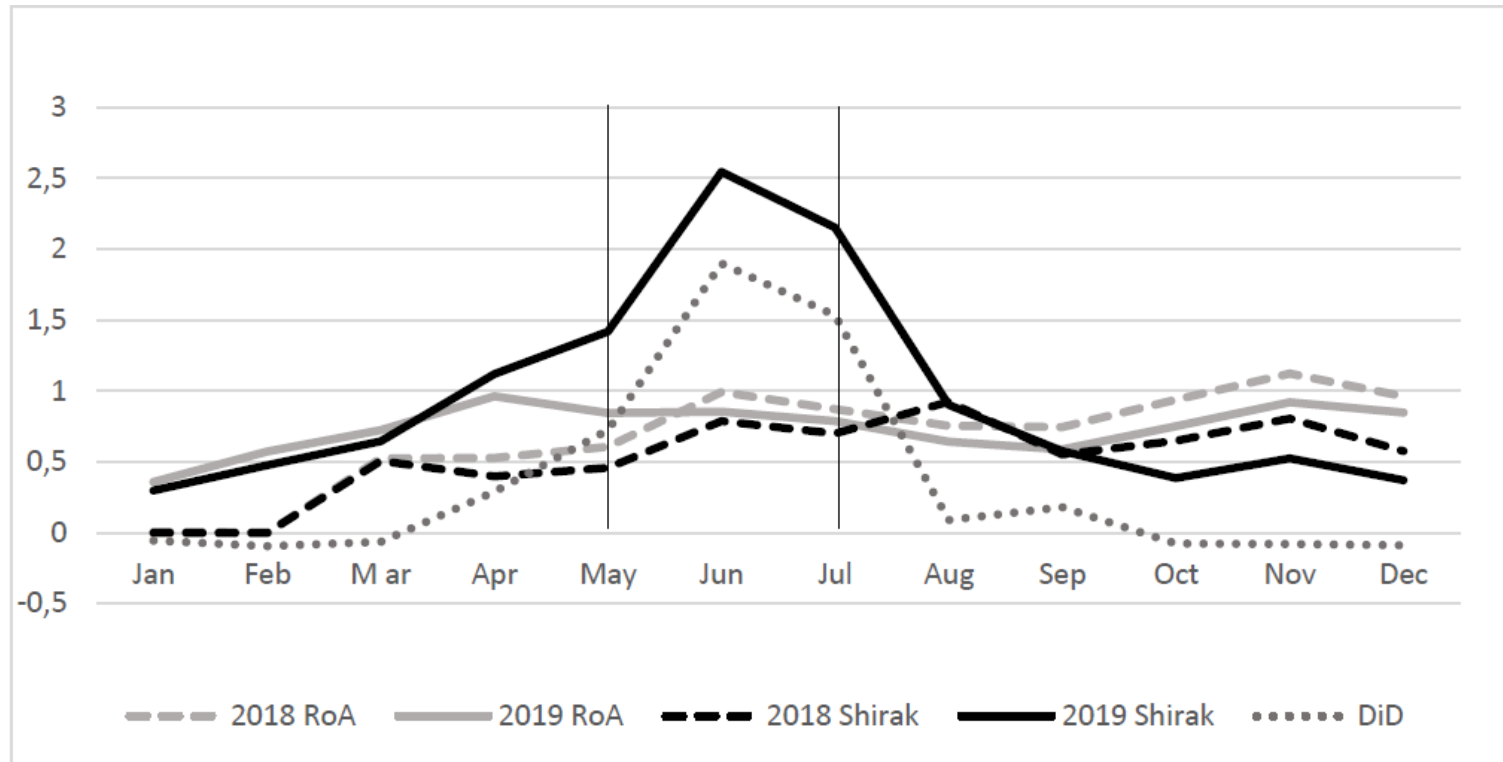
Implementation

Data

- Internal records of the hospitals

- Background data (date of birth, place of residence, GP id)

- Take-up:
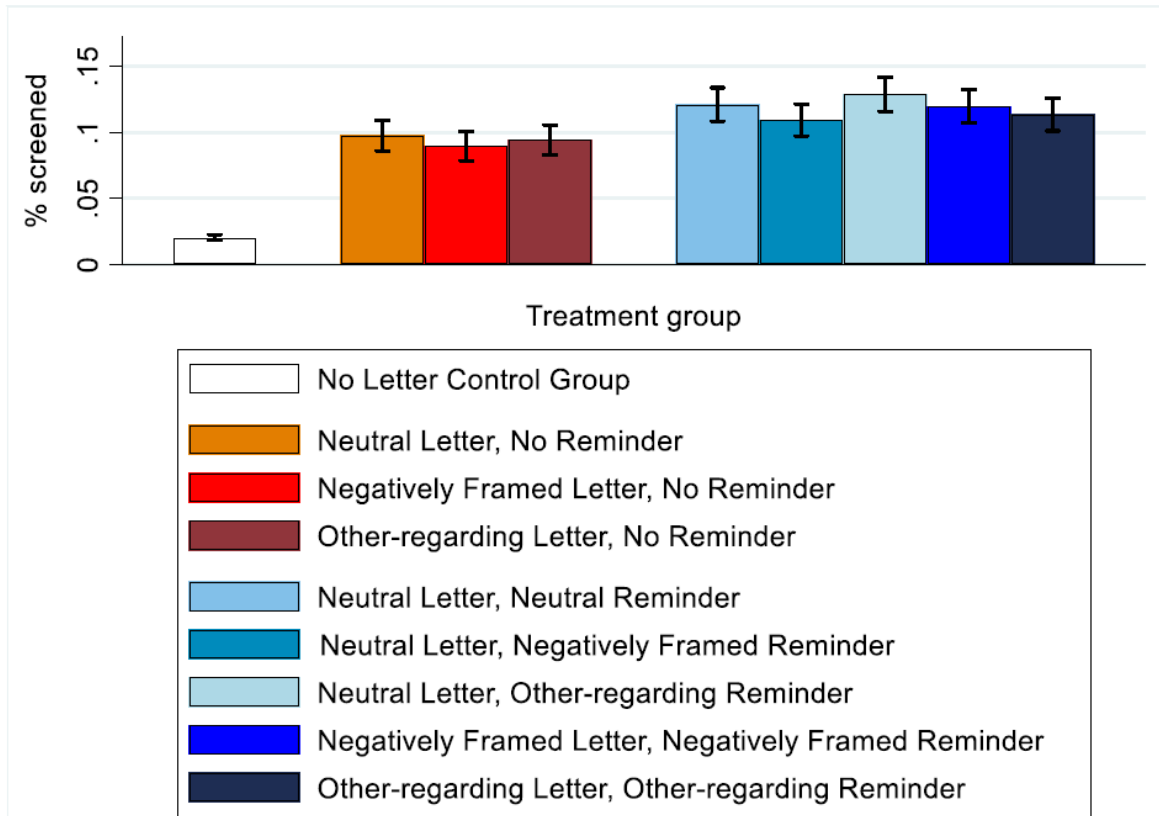   - For the time being: we measure take-up until 19 July 2019

Scheme of the presentation

- Motivation

- Institutional context

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Prima facie evidence: regional data

Screening Participation by Treatment Group

Econometric specification

[i is subject, j is physician, t is treatment]

- Given individual level randomization, non need to cluster by GP (but it makes no difference). Inclusion of covariates makes no difference either

- (Not) receiving messages might depend on (un)observable individual characteristics (area of residence, co-residence with others, time spent at home, etc)

 IV-TSLS, using treatment assignment as an instrument for reception. Given one-side non-compliance only, IV identifies the ATE (Bloom result)

Table 1. The effects of different invitation types on take-up

	(1)	(2)	(3)
Dependent variable	Screening participation	Screening participation	Screening participation
Parameter estimated	ITT - treatment dispatched	ITT - treatment dispatched	TOT - treatment received
Estimation method	OLS	OLS	TSLS
Letter only invitations		0.073***	0.118***
		(0.004)	(0.006)
Neutral Letter, No Reminder	0.077***		
	(0.006)		
Negatively Framed Letter, No Reminder	0.069***		
	(0.006)		
Other-regarding Letter, No Reminder	0.074***		
	(0.006)		
Letter and reminder invitations		0.098***	0.181***
		(0.003)	(0.006)
Neutral Letter, Neutral Reminder	0.100***		
	(0.007)		
Neutral Letter, Negatively Framed Reminder	0.089***		
	(0.006)		
Neutral Letter, Other-regarding Reminder	0.108***		
	(0.007)		
Negatively Framed Letter, Other-regarding Reminder	0.099***		
	(0.007)		
Other-regarding Letter, Other-regarding Reminder	0.093***		
	(0.006)		
P-value of an F-test for joint equality of all treatment effects	<0.01	<0.01	<0.01
P-value of an F-test for joint equality of all "letter only" treatment effects	0.62		
P-value of an F-test for joint equality of all "letter and reminder" treatment effects	0.24		
Mean Outcome, No Letter Control Group		0.021	

Scheme of the presentation

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Conclusions

- To the best of our knowledge the first RCT that studies the impact of invitation letters and reminders on (cervical) cancer screening participation in the developing world

- We find huge impact of invitations letters on cancer screening participation in LMICs

- An invitation letter is particularly effective if followed by a reminder

- Framing of the letters does not seem to matter

Thanks a lot for your attention!

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