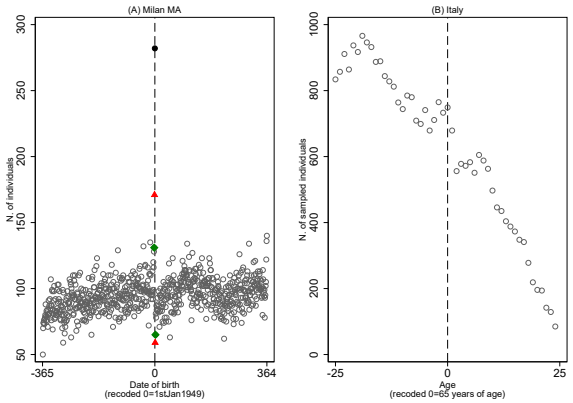
Appendix A. *Vaccination take-up and health: evidence from a flu vaccination program for the elderly* by Brilli Y., Lucifora C., Russo A., Tonello M.

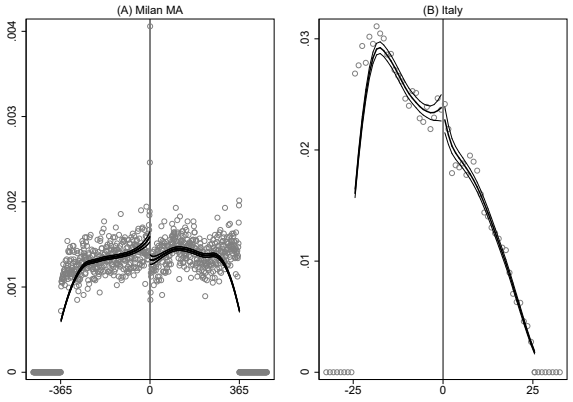
Supplementary material

Figure Appendix A.1
Density of observations in administrative and survey data.



Notes: Panel A reports the density of observations in the administrative data from the Milan MA. The figure shows the number of individuals born in each calendar day of the years 1949 (i.e. aged 64 in 2013) and 1948 (i.e. aged 65 in 2013); the date of birth (horizontal axis) is recoded so that the value 0 corresponds to the cutoff date of January 1, 1949, the positive values to birth dates in 1948 and the negative values to birth dates in 1949; the black dot indicates individuals born on January 1, 1949, the triangles individuals born on January 2, 1949 and December 31, 1948, the diamonds individuals born on January 3, 1949 and December 30, 1948. Panel B reports the density of observations in the 2012-2013 ISH data for Italy. The figure shows the number of individuals sampled by age, recoded so that the value 0 corresponds to the cutoff age of 65. **Source**: own elaborations on administrative data from Milan MA (Panel A) and 2012-2013 ISH data for Italy (Panel B).

Figure Appendix A.2
McCrary test for the manipulation of the running variable in administrative and survey data.



Notes: the figures depict the McCrary test for the density of the running variable around the cutoff in the datasources used in the analysis. Panel A: the running variable indicated on the horizontal axis indicates the date of birth and is recoded so that the value 0 corresponds to the cutoff date of January 1 1949; the estimated discontinuity is -0.1835 (0.0292), with a t-statistics of 6.2842. Panel B: the running variable is defined in years and is recoded so that the value 0 corresponds to the cutoff age of 65; the estimated discontinuity is -0.0209 (0.0417), with a t-statistics of 0.5013. **Source**: own elaborations on administrative data from Milan MA (Panel A) and 2012-2013 ISH data for Italy (Panel B).

Table Appendix A.1
Vaccination rates by data source and by age group: comparison with official statistics.

Panel A. Administrative data for Milan MA	
Age group 50-64	3.7
Age group 60-64	6.1
Age group 65+	39.9
Panel A. ISH data for Italy	
Age group 50-64	13.3
Age group 60-64	19.6
Age group 65+	51.8
Panel C. Official Statistics Min. Health	
C.1. Lombardy	
Age group 50-64	3.7
Age group 65+	48.6
C.2. Italy	
Age group 50-64	9.5
Age group 65+	55.4

Notes: the table reports the vaccination rates by data source and age group. Panel A reports the rates of vaccination against seasonal influenza within the NPPV in the Milan MA for individuals aged more than 50 during the 2013 campaign. Panel B reports the rate of vaccination against seasonal influenza as it appears from the 2012-2013 ISH survey data for all Italy for individuals aged 50 or more. Panel C reports the vaccination rates by age groups and by geographical areas (Lombardy region vs all Italy) as reported by official statistics from the Ministry of Health referred to the 2013 campaign. **Source**: own elaborations on administrative data from Milan MA (Panel A) and 2012-2013 ISH data for Italy (Panel B), before any sample selection performed for the analysis; Ministero della Salute (2019), *Vaccinazione antinfluenzale in Italia: coperture vaccinali nella popolazione generale* (Panel C).

Table Appendix A.2
Vaccination rate for pediatric vaccinations by type of vaccine and geographical area within the Lombardy region.

	DTaP-HepB-IPV-Hib	MMR	Pneumococcal vacc.
Lombardy region w/o Milan MA	96	94.3	93.6
Milan MA	93.1	93	89.2

Notes: the vaccinations DTaP-HepB-IPV-Hib (against Tetanus, diphteria, pertussis, Human epatitis B Virus, polio, haemophilus influenzae B) and MMR (against Measles, Mumps and Rubella) have been made compulsory by Law 119/2017, while the Pneumococcal vaccination is provided free and strongly recommended, but it is not compulsory. The vaccination rates refer to the year 2017. **Source**: Department of Health, Lombardy region (website https://www.dati.lombardia.it/Sanit-/Dataset-Coperture-Vaccinali/ybqq-i78c accessed on July 15, 2020).

Table Appendix A.3
Age thresholds for Statutory Retirement in the calendar years 2012 and 2013.

		2012	2013
Males		66 years	66 years 3 months
Females	Employed	62 years	62 years 3 months
	Self-employed	63 years 6 months	63 years 9 months

Notes: the table reports the age(s) at which individuals are entitled to retire, provided that they have a minimum of 20 years of contributions (*Statutory Retirement*). **Source**: INPS (2019), Prestazioni pensionistiche e beneficiari del sistema pensionistico italiano al 31.12.2018, *Statistiche in breve*, Istituto Nazionale di Previdenza Sociale.

Table Appendix A.4
Test of continuity of variables in administrative data for the Milan MA.

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Variables used for sample selection						
		Ind. with disability		*Ind. In nursing homes*		*No reliable info on GP*
RD Estimate	-0.002	-0.010	0.001	0.001	-0.000	-0.003
	(0.008)	(0.012)	(0.002)	(0.002)	(0.004)	(0.005)
N.Obs.: total	78503	78503	78503	78503	78503	78503
BW (days)	65	62	50	65	66	80
Panel B. Covariates						
		Female		*Urban area*		*Exempt. for chronic disease*
RD estimate	0.016	0.035	-0.004	-0.035	-0.004	-0.012
	(0.016)	(0.022)	(0.014)	(0.025)	(0.009)	(0.013)
N.Obs.: total	68962	68962	68962	68962	68962	68962
BW (days)	48	66	61	50	78	84
		GP's age		*GP's experience*		*GP's number of patients*
RD estimate	-0.029	0.094	0.297	0.532	2.895	-2.248
	(0.199)	(0.343)	(0.314)	(0.543)	(7.116)	(9.726)
N.Obs.: total	68962	68962	68962	68962	68962	68962
BW (days)	64	52	55	48	64	80
Panel C. Other types of exemption from cost-sharing						
	Exempt. for health cond. & low income		*Exempt. for low income*		*Not exempted*	
RD estimate	-0.008	-0.021	0.001	0.014	0.021	0.019
	(0.015)	(0.022)	(0.013)	(0.018)	(0.014)	(0.021)
N.Obs.: total	68962	68962	68962	68962	68962	68962
BW (days)	54	62	53	66	33	45
Order Loc. Poly. (p)	0	1	0	1	0	1

Notes: RD robust estimates with Triangular Kernel and Coverage Error Rate (CER) optimal bandwidth selector. Significance level: *** p<0.01, ** p<0.05, * p<0.1. **Source**: own elaborations on administrative data from Milan MA.

Table Appendix A.5
Test of continuity of variables in ISH survey data for Italy.

	(1)	(2)	(3)	(4)	(5)	(6)
	Ind. with disability	*Female*	*Chronic Disease*	*High-educated*	*Live alone*	*Work in Edu/Health*
RD estimate	-0.025	0.052	-0.021	-0.036	0.034	0.033
	(0.019)	(0.033)	(0.032)	(0.025)	(0.026)	(0.024)
N.Obs.: total	34149	31033	31033	31033	31033	31033
BW (years)	4	5	5	8	4	6
Order Loc. Poly. (p)	1	1	1	1	1	1

Notes: RD robust estimates with Triangular Kernel. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. **Source**: own elaborations on 2012-2013 ISH data for Italy.

Table Appendix A.6
Eligibility for free vaccination at age 65 and take-up: geographical differences between North and South of Italy.

	(1)	(2)	(3)	(4)
Panel A. North of Italy				
RD estimate	0.079**	0.089***	0.078*	0.088**
	(0.034)	(0.031)	(0.044)	(0.043)
N.Obs.: total	13708	13708	13708	13708
BW (years)	2	2	4	4
Avg. Dep.Var. Below Age 65		[0.106]		
Panel B. Centre-South of Italy				
RD estimate	0.074**	0.063*	0.042	0.039
	(0.033)	(0.033)	(0.039)	(0.039)
N.Obs.: total	17325	17325	17325	17325
BW (years)	1	1	4	4
Avg. Dep.Var. Below Age 65		[0.091]		
Order Loc. Poly. (p)	0	0	1	1
Covariates		✓		✓

Notes: RD robust estimates with Triangular Kernel and Coverage Error Rate (CER) optimal bandwidth selector; for the list of covariates included and their definitions see the footnote to Table 1 in the paper. The vaccination rate for the non-treated individuals (i.e. those aged less than 65) is reported in square brackets. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. **Source**: own elaborations on 2012-2013 ISH data for Italy.

Table Appendix A.7
Eligibility for free vaccination at age 65 and take-up: parametric estimates.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A. Milan MA	*BW=1 month*		*BW=3 months*		*BW=6 months*		*BW=12 months*	
Treated	0.068***	0.066***	0.059***	0.059***	0.062***	0.061***	0.079***	0.079***
	(0.018)	(0.017)	(0.010)	(0.009)	(0.007)	(0.007)	(0.005)	(0.005)
N. Obs.: Total	5618	5618	17276	17276	35398	35398	68962	68962
Avg. Dep. Var. 64-y-o	[0.066]							
Panel B. Italy	*BW=2 years*		*BW=3 years*		*BW=4 years*		*BW=5 years*	
Treated	0.096**	0.101**	0.056*	0.058*	0.056**	0.058**	0.051**	0.054**
	(0.041)	(0.041)	(0.030)	(0.030)	(0.025)	(0.025)	(0.022)	(0.022)
N. Obs.: Total	3482	3482	4771	4771	6022	6022	7346	7346
Avg. Dep. Var. Below Age 65	[0.099]							
Linear with interaction	✓	✓	✓	✓	✓	✓	✓	✓
Covariates		✓		✓		✓		✓

Notes: parametric estimates with triangular weights and different bandwidths (BW); the RD estimate is the coefficient of the variable *Treated*, as defined in Table 1 in the paper; for the list of covariates included and their definitions see Table 1 in the paper; heteroskedasticity-robust SE are reported in parenthesis. The vaccination rate for the non-treated individuals (i.e. those aged less than 65) is reported in square brackets. Panel A reports estimates from the administrative data from the Milan MA and considers bandwidths of one, three, six and twelve months before and after the cutoff date of January 1, 1949. Panel B reports estimates from the 2012-2013 ISH survey data for Italy and considers bandwidths of two, three, four and five year from the cutoff age of 65. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

Table Appendix A.8
Robustness of estimates on vaccination take-up using administrative data for Milan MA.

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Sample Selection						
RD estimate	0.056***	0.053***	0.059***	0.057***	0.059***	0.056***
	(0.012)	(0.013)	(0.012)	(0.013)	(0.012)	(0.013)
N.Obs.: total	77876	77876	70319	70319	76070	76070
BW (days)	27	66	28	63	27	65
Whole sample	✓	✓				
No disabled/ind. in nursing home			✓	✓		
No ind. w/o GP info					✓	✓
Panel B. Clustering of SE						
RD estimate	0.059***	0.055***	0.059***	0.057***	0.056***	0.055***
	(0.011)	(0.012)	(0.012)	(0.013)	(0.015)	(0.015)
N.Obs.: total	68962	68962	68962	68962	68962	68962
BW (days)	30	75	30	68	41	84
Date of Birth	✓	✓				
GP			✓	✓		
Municipality					✓	✓
Panel C. Alternative Donut specifications						
RD estimate	0.046***	0.044***	0.056***	0.057***	0.062***	0.064***
	(0.011)	(0.012)	(0.011)	(0.014)	(0.012)	(0.015)
N.Obs.: total	69474	69474	69192	69192	68766	68766
BW (days)	24	64	28	56	29	58
No donut	✓	✓				
Donut 0			✓	✓		
Donut 2					✓	✓
Order Loc. Poly. (p)	0	1	0	1	0	1
Covariates	✓	✓	✓	✓	✓	✓

Notes: RD robust estimates with Triangular Kernel and Coverage Error Rate (CER) optimal bandwidth (BW) selector; for the list of covariates included and their definitions see the footnote to Table 1 in the paper. Panel A reports the estimated coefficients from the analysis performed on all sample (Col. 1-2), the sample without individuals with a disability or institutionalized in nursing homes (Col. 3-4), and the sample without individuals who lack GP's information (Col. 5-6). Panel B reports the estimated coefficients from the analysis in which standard errors are clustered at the date of birth level (Col. 1-2), the GP level (Col. 3-4), and the municipality level (Col. 5-6). Panel C reports the estimated coefficients from the analysis in which observations at the cutoff and born within a day from the cutoff are not dropped (*no donut*, Col. 1-2), only observations at the cutoff are dropped (*donut 0*, Col. 3-4), observations at the cutoff and born within two days from the cutoff are dropped (*donut 2*, Col. 5-6). Significance levels: *** p<0.01, ** p<0.05, * p<0.1. **Source**: own elaborations on administrative data from Milan MA.

Table Appendix A.9
Robustness of estimates on vaccination take-up using ISH survey data.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
RD estimate	0.073***	0.072**	0.078***	0.087***	0.079***	0.061*	0.063**	0.073*
	(0.023)	(0.034)	(0.012)	(0.017)	(0.027)	(0.033)	(0.030)	(0.044)
N.Obs.: total	34149	34149	31033	31033	31033	31033	30284	30284
BW (years)	1	3	1	3	1	5	1	3
Whole sample	✓	✓						
SE clustered by Age			✓	✓				
SE clustered by Region					✓	✓		
Donut 0							✓	✓
Order Loc. Poly. (p)	0	1	0	1	0	1	0	1
Covariates	✓	✓	✓	✓	✓	✓	✓	✓

Notes: RD robust estimates with Triangular Kernel and Coverage Error Rate (CER) optimal bandwidth selector; for the list of covariates included and their definitions see the footnote to Table 1 in the paper. Col. 1-2 report the estimated coefficients from the analysis performed on all sample; Col. 3-4 report the estimated coefficients from the analysis in which standard errors are clustered at the age level, and Col. 5-6 from the analysis in which standard errors are clustered at the region level; Col. 7-8 report the estimated coefficients from the analysis in which observations at the cutoff age of 65 are dropped (*donut 0*). Significance levels: *** p<0.01, ** p<0.05, * p<0.1. **Source**: own elaborations on 2012-2013 ISH data for Italy.

Table Appendix A.10
Eligibility for free vaccination at age 65 and probability of hospitalization: parametric estimates.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	BW=1 month		*BW=3 months*		*BW=6 months*		*BW=12 months*	
Panel A. All hospitalizations								
Treated	-0.013	-0.012	-0.002	-0.002	0.005	0.005	0.002	0.002
	(0.011)	(0.011)	(0.006)	(0.006)	(0.004)	(0.004)	(0.003)	(0.003)
Avg. Dep. Var. 64-y-o				[0.035]				
Panel B. Planned Hospitalizations								
Treated	-0.001	0.001	0.001	0.002	0.002	0.003	0.001	0.001
	(0.009)	(0.009)	(0.005)	(0.005)	(0.003)	(0.003)	(0.003)	(0.003)
Avg. Dep. Var. 64-y-o				[0.024]				
Panel C. Emergency Hospitalizations								
Treated	-0.015**	-0.014**	-0.003	-0.003	0.003	0.003	0.001	0.001
	(0.007)	(0.007)	(0.004)	(0.004)	(0.003)	(0.003)	(0.002)	(0.002)
Avg. Dep. Var. 64-y-o				[0.015]				
N. Obs.: Total	5618	5618	17276	17276	35398	35398	68962	68962
Linear with interaction	✓	✓	✓	✓	✓	✓	✓	✓
Covariates		✓		✓		✓		✓

Notes: parametric estimates with triangular weights and different bandwidths (BW); the RD estimate is the coefficient of the variable *Treated*, as defined in Table 1 in the paper, Panel A; for the list of covariates included and their definitions see Table 1 in the paper, Panel A; heteroskedasticity-robust SE are reported in parenthesis. The hospitalization rate for the non-treated individuals (i.e. those aged less than 65) is reported in square brackets. The figure reports estimates with bandwidths of one, three, six and twelve months before and after the cutoff date of January 1, 1949. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. **Source**: own elaborations on administrative data from Milan MA.

Table Appendix A.11
Robustness of estimates on emergency hospitalization.

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Clustering of SE						
RD estimate	-0.008**	-0.015***	-0.007	-0.014**	-0.007**	-0.014***
	(0.003)	(0.005)	(0.004)	(0.006)	(0.004)	(0.005)
N.Obs.: total	68962	68962	68962	68962	68962	68962
BW (days)	30	40	37	46	33	50
Date of Birth	✓	✓				
GP			✓	✓		
Municipality					✓	✓
Panel B. Alternative Donut specifications						
RD estimate	-0.006	-0.014**	-0.006	-0.014**	-0.005	-0.012*
	(0.004)	(0.006)	(0.004)	(0.006)	(0.004)	(0.006)
N.Obs.: total	69474	69474	69192	69192	68766	68766
BW (days)	37	40	37	40	39	50
No donut	✓	✓				
Donut 0			✓	✓		
Donut 2					✓	✓
Order Loc. Poly. (p)	0	1	0	1	0	1
Covariates	✓	✓	✓	✓	✓	✓

Notes: RD robust estimates with Triangular Kernel and Coverage Error Rate (CER) optimal bandwidth (BW) selector; for the list of covariates included and their definitions see the footnote to Table 1 in the paper. Panel A reports the estimated coefficients from the analysis in which standard errors are clustered at the date of birth level (Col. 1-2), the GP level (Col. 3-4), and the municipality level (Col. 5-6). Panel B reports the estimated coefficients from the analysis in which observations at the cutoff and born within a day from the cutoff are not dropped (*no donut*, Col. 1-2), only observations at the cutoff are dropped (*donut 0*, Col. 3-4), observations at the cutoff and born within two days from the cutoff are dropped (*donut 2*, Col. 5-6). Significance levels: *** p<0.01, ** p<0.05, * p<0.1. **Source**: own elaborations on administrative data from Milan MA.