



Cancer screening uptake: association with individual characteristics, geographic distribution, and time trends in Italy

La copertura dei test di screening: caratteristiche, distribuzione geografica e trend temporali

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Abstract

Background. In Italy, organized screening programmes invite the vast majority of the population for cervical and breast cancer, and about one half of the population for colorectal cancer. Programme activity and quality are closely monitored. Nevertheless, there is a vast spontaneous activity, both public and private, for which information on service and coverage is missing. To estimate actual population coverage for the three types of screening the extent of spontaneous screening needs to be known.

Methods. PASSI is a national telephone-interview surveillance system that continuously collects information about behavioural health risk factors and the diffusion of preventive health interventions. From 2010 to 2013, more than 151,000 18- to 69-year-olds were interviewed. During 2013, 136 out of 147 Italian local health authorities participated in the survey. Information about screening includes: test uptake (Pap smear, HPV, mammography, faecal occult blood test, colonoscopy), date of the last test, provider of the last test (whether paid or for free, proxy of the organized screening programme), reason for not participating in screening, and screening promotion/recommendation received. Individual information on socio-economic characteristics is available.

Results. Seventy-seven percent of the 25-64 year-old women interviewed said they had undergone a Pap smear or HPV test in the three years before the interview, 40% within the screening programme, 37% spontaneously and paying. Seventy percent of the 50-69 year-old women interviewed reported having had a mammography in the two years before the interview, 51% within the screening programme, 19% spontaneously and paying. Thirty-eight percent of the 50-69 year olds interviewed reported having undergone colorectal screening in the two years before the interview, 31% within the screening programme, 7% spontaneously and paying.

All three screening programmes showed a decreasing North-South trend in coverage. From 2010 to 2013, coverage increased for all types of screening; the trend was stronger in the South; the increase was mostly due to the tests performed within the organized programmes. People with low education, economic problems, and immigrants from high migration pressure countries had lower coverage levels. In regions with well-implemented organized screening programmes, test coverage was higher and differences for socio-economic factors were smaller than in regions with incomplete programme activation.

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Keywords: breast cancer, cervical cancer, colorectal cancer, mass screening, opportunistic/spontaneous screening, Italy

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Riassunto

Introduzione. In Italia sono attivi programmi di screening organizzati per il carcinoma della cervice uterina, della mammella e del colon-retto, la cui attività è dettagliatamente monitorata. Ciononostante esiste una intensa attività di screening spontanea, sia nel privato sia nel pubblico, di cui non si conosce il dettaglio delle prestazioni e della popolazione target. Per stimare la reale copertura della popolazione per i tre screening è dunque necessario conoscere il ricorso da parte della popolazione allo screening spontaneo.

Metodi. PASSI è un sistema di sorveglianza nazionale che raccoglie in continuo, tramite interviste telefoniche, informazioni sui fattori comportamentali di rischio per la salute e sulla diffusione degli interventi di prevenzione messi in campo dalle aziende sanitarie nei confronti delle persone tra i 18 e i 69 anni. Dal 2010 al 2013 sono state intervistate oltre 151.000 persone. Nel 2013 hanno partecipato al sistema 136 su 147 ASL italiane. Tra i vari temi indagati ci sono: l'effettuazione dei test di screening (Pap-test e test HPV, mammografia, sangue occulto e colonscopia), la data dell'ultimo test, il setting in cui è stato fatto (a pagamento o meno, proxy del programma di screening organizzato), i motivi di non adesione al programma di screening e gli interventi di promozione (lettera ASL, consiglio sanitario, campagna informativa). Sono raccolte, inoltre, informazioni sociodemografiche individuali.

Risultati. Il 77% delle donne di 25-64 anni intervistate ha eseguito un test di screening cervicale (Pap-test o test Hpv) nei tre anni precedenti l'intervista, il 40% all'interno di programmi organizzati dalle ASL e il 37% su iniziativa personale. Il 70% delle donne intervistate di 50-69 anni ha eseguito una mammografia a scopo preventivo nel corso dei due anni precedenti l'intervista, il 51% all'interno dei programmi organizzati e il 19% su iniziativa personale. Il 38% delle persone intervistate di 50-69 anni ha eseguito esami per la diagnosi precoce dei tumori colon-rettali, il 31% all'interno dei programmi di screening, il 7% su iniziativa personale.

La copertura di tutti i tre test mostra un gradiente Nord-Sud. Nel periodo 2008-2013 le coperture risultano complessivamente in crescita, andamento più evidente nelle regioni meridionali; aumentano soprattutto gli esami eseguiti all'interno dei programmi organizzati. La copertura mostra differenziali per livello di istruzione e difficoltà economiche; è inoltre più alta tra le persone con cittadinanza italiana o provenienti da altri Paesi a sviluppo avanzato (PSA) rispetto agli stranieri provenienti da Paesi a forte pressione migratoria (PFP).

Nelle Regioni con programmi di screening organizzati con buona estensione e adeguatamente funzionanti l'esecuzione dei test di screening è significativamente più alta e le disuguaglianze socioeconomiche nella copertura sono minori.

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Parole chiave: cancro del seno, cancro della cervice uterina, cancro del colon-retto, programmi di screening, screening opportunistico/spontaneo, Italia

INTRODUZIONE

In Italy, in accordance with the European Commission's 2003 Recommendation,¹ the Italian Ministry of Health guidelines recommend the implementation of organized screening programmes for cervical, colorectal, and breast cancer.² These programmes involve active invitation of the entire target population, free testing and treatment, quality assurance in all stages of the process, and process and early outcome monitoring system.

Activation of screening programmes is not complete and uniform throughout Italy.³⁻⁵ Furthermore, cervical and breast cancer screening programmes started when Pap smears and mammography were already in widespread use in the population. For these reasons, in Italy, there is a strong opportunistic/spontaneous uptake of both mammography and, in particular, Pap smears, both in the public and private sector. The spontaneous activity is not precisely measurable, it is not monitored, and its target population is not defined. Any attempt to measure the spontaneous activity through routine or administrative data failed due to strong under-reporting of preventive tests in these databases.^{6,7}

In order to estimate the actual population coverage for the three types of screening it is necessary to know the spontaneous uptake of preventive tests. To date, the most reliable source of information for spontaneous screening are population interviews.⁸ Until 2007, the only national survey estimating mammography

and Pap smear coverage was the National Health interview, which is repeated every five years.⁹ Starting from 2007, the PASSI surveillance has monitored cervical, colorectal, and breast cancer screening coverage with a continuous survey.¹⁰

Aim of this paper is to present the coverage estimates for the three types of screening, their geographical differences, their association with individual socio-economic factors, and their time trends.

METHODS

PASSI is a National surveillance system that continuously collects information via phone calls about behavioural health risk factors and the diffusion of preventive health care services. From 2010 to 2013, more than 151,000 18-69 year-old people were interviewed. During 2013, 136 out of 147 Italian local health units participated in the survey.

The sampling and survey methodologies are described in detail elsewhere.¹¹ Briefly, the surveillance system is based on a random sample of people resident in the area and registered in the list of each Local Health Authority. Samples are stratified by gender and age to respect the proportion of the population (18-34, 35-49, 50-69). Eligibility criteria are: age 18-69, residence, ability to understand and answer the questions in Italian, and not being in a residential institution (hospital, nursing home, military barracks, prison).¹² The Local

Health Authority (LHA) alerts all sampled people with a letter informing them about the interviews, the privacy conditions, and the way to opt out and deny consent to being contacted by phone. The LHA also contacts GPs, asking them to help contact sampled people and explain the scope and aim of the interview. Interviews are conducted mostly by health personnel specifically trained with classroom and online courses. The interview takes about twenty minutes and is either a CATI (Computer Assisted Telephone Interview) or registered on paper with back office data entry. Interviews are stored anonymously in a national database. The questionnaire has closed questions on perceived health status, symptoms, depression, prevalence of chronic diseases and conditions, prevalence of behavioural risk factors, received preventive and health promotion screening interventions, vaccines, and safety on the road and at home.^{13,14}

Information about screening includes: test uptake (Pap smear, HPV, mammography, faecal occult blood test, colonoscopy), date of the last test, provider of the last test (paying or for free, proxy of the organized screening programme), reason for not participating in screening, and screening promotion/recommendation received. Individual information on socio-economic characteristics is available.

Analysis

Coverage was defined as the proportion of people in the target population who had a test within the recommended time: women aged 25-64 who had a Pap smear or HPV test within three years before the interview for cervical cancer; women aged 50-69 who had a bilateral mammography within two years before the interview for breast cancer; women and men aged 50-

69 who had a faecal occult blood test within two years before the interview or a colonoscopy/sigmoidoscopy within five years before the interview for colorectal cancer. For the region of Piemonte, where the screening programme adopts a strategy of a once-in-a-lifetime sigmoidoscopy at the age of 58, the target population was restricted to ages 58-69, and subjects were considered covered if they had had a colonoscopy/sigmoidoscopy in their life.

Regions were classified as having a well-implemented screening programme if more than 75% of the interviewed target population declared they had received the invitation letter.

Associations between coverage and individual characteristics were tested with logistic regression models; time trends were evaluated through Cochrane-Orcutt linear regression models. Time trends for colorectal cancer screening test coverage are limited to the period 2010-2013 because the questions in the questionnaire were changed at the end of 2009.

RESULTS

Cervical cancer screening test coverage

Overall, 77% of the 25-64 year-old women had a Pap smear or HPV test in the three years before the interview. There was a decreasing North-South trend (85% in the North, 84% in the Centre, and 65% in the South and Islands).

Forty percent of the women performed the test within a screening programme for free and 37% performed the test spontaneously paying it entirely or in part.

In northern regions, the proportion of women who performed the test within a screening programme was higher than in southern regions, where spontaneous testing was predominant (figure 1), with the exception of the province of Bolzano

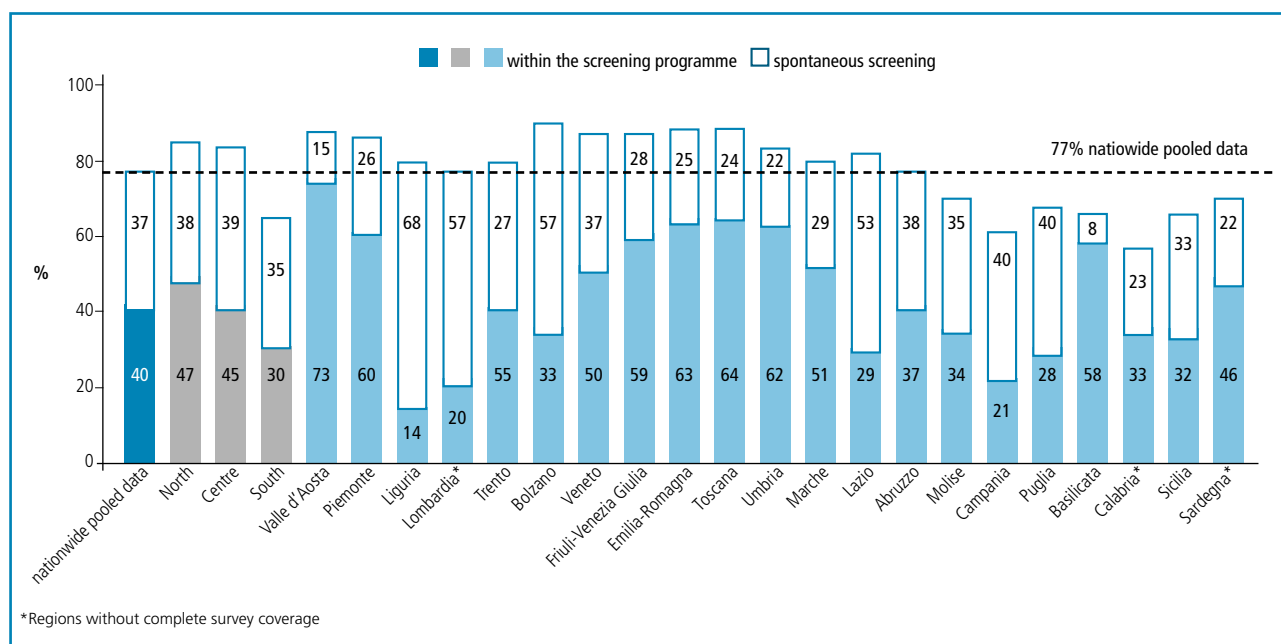
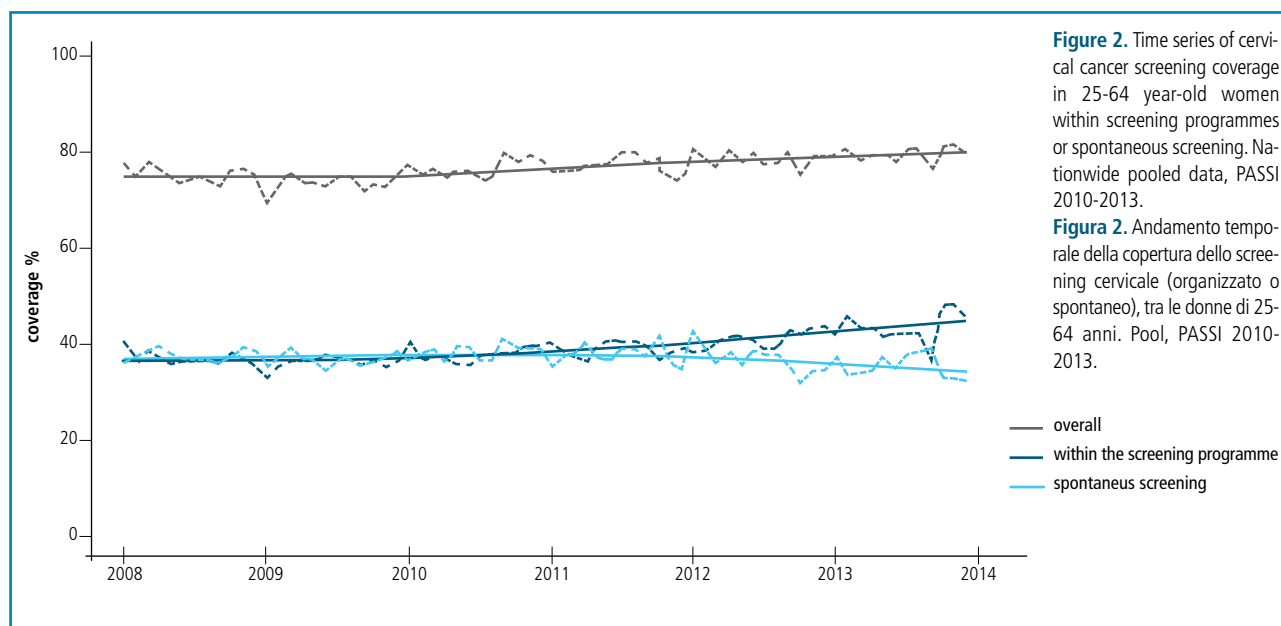


Figure 1. Cervical cancer screening test coverage. Proportion of 25-64 year-old women who had a Pap smear or HPV test in the three years before the interview, within screening programmes or spontaneously, by region. Nationwide pooled data, PASSI 2010-2013.

Figura 1. Copertura di un test per la prevenzione dei tumori del collo dell'utero. Proporzioni di donne di età 25-64 anni che hanno avuto un Pap test o un test HPV negli ultimi tre anni, all'interno dei programmi di screening o spontaneamente. Pool, PASSI 2010-2013.



(Alto Adige), Lombardia and Liguria, northern regions with a low proportion of tests performed within the programmes, and Basilicata, which among southern regions has a low proportion of spontaneous screening. From 2008 to 2013 coverage increased ($p < 0.001$). The trend was appreciable in all three geographic areas, but was stronger in the South. The trend was entirely due to the increase in women who had a test within screening programmes ($p < 0.001$), while the coverage due to spontaneous screening showed a slight decrease ($p = 0.052$) (figure 2). Coverage was higher in 35-49 year-old women, married or with a stable partner, with a medium or high educational level,

without economic problems, and who are Italian or come from industrialized countries (compared to immigrants from high migration pressure countries). Women 50-64 years old, married or with a stable partner, with low education, and who are immigrants from high migration pressure countries more frequently performed the test within the screening programmes. On the contrary, women aged 25-34, highly educated, without economic problems, with Italian nationality or coming from industrialized countries, more frequently performed the test spontaneously (figure 3, table 1). Multivariate analysis confirmed all the associations found (table 1).

	Within a screening programme			Spontaneous screening				
	OR	95%CI		p-value	OR	95%CI		p-value
Age								
25-34	1.00			0.000	1.00			0.000
35-49	1.25	1.18	1.32	0.000	1.24	1.17	1.32	0.000
50-64	1.65	1.55	1.75	0.000	0.77	0.72	0.82	0.000
Married/with stable partner								
yes	1.00			0.000	1.00			0.000
no	0.77	0.73	0.80	0.000	0.80	0.76	0.84	0.000
Education level								
none/elementary	1.00			0.000	1.00			0.000
middle school	1.21	1.11	1.32	0.000	1.49	1.34	1.65	0.000
secondary school	1.17	1.07	1.27	0.000	2.04	1.84	2.26	0.000
academic degree	1.03	0.94	1.14	0.478	2.41	2.16	2.70	0.000
Economic difficulties								
major	1.00			0.004	1.00			0.000
minor	1.10	1.03	1.18	0.001	1.19	1.10	1.28	0.000
none	1.12	1.05	1.20	0.001	1.35	1.26	1.46	0.000
Nationality								
Italian	1.00			0.000	1.00			0.000
foreign	1.47	1.35	1.60	0.000	0.52	0.47	0.57	0.000

Table 1. Logistic regression model to analyze the characteristics associated with cervical cancer screening coverage. Nationwide pooled data, PASSI 2010-2013.

Tabella 1. Copertura di un test per la prevenzione dei tumori del collo dell'utero negli ultimi tre anni. Pool, PASSI 2010-2013.

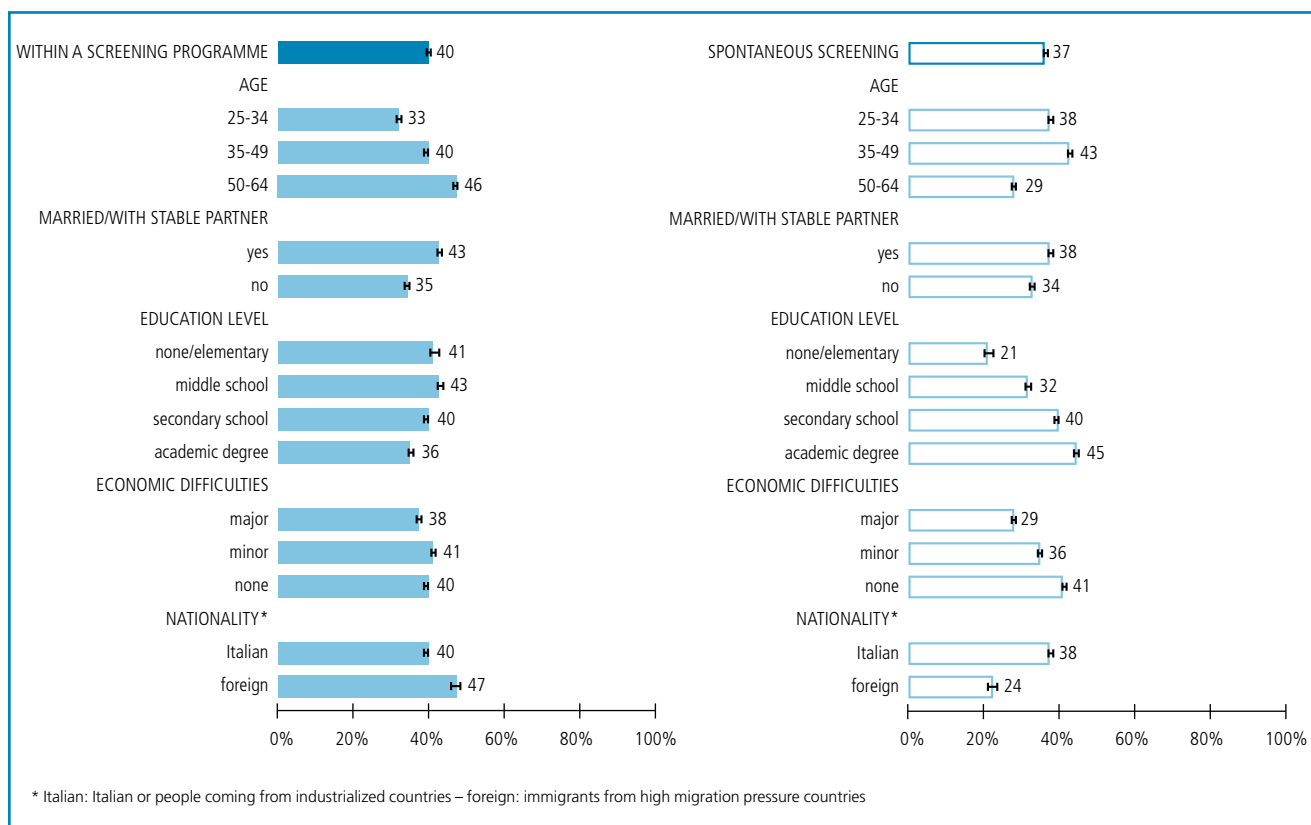


Figure 3. Proportion of 25-64 year-old women who had a Pap smear or HPV test in the three years before the interview, within screening programmes or spontaneously, according to socio-economic characteristics. Nationwide pooled data, PASSI 2010-2013.

Figura 3. Proporzione di donne di età 25-64 anni che hanno effettuato un Pap test o un test HPV negli ultimi tre anni, all'interno dei programmi di screening o spontaneamente, secondo lo stato socioeconomico. Pool, PASSI 2010-2013.

In those regions with well-implemented screening programmes, i.e., in which at least 75% of the target population declared they had received the invitation letter, coverage was higher than in those with incomplete programme activation, i.e., 87% *vs* 72% ($p < 0.001$). Furthermore, in regions with well-implemented programmes the difference in coverage between women with a degree and women with lower education was 16% and the difference between women with major economic difficulties and with no economic problems was 11%; in regions with incomplete programme activation these differences were 38% and 20%, respectively.

Breast cancer screening test coverage

Overall, 70% of the 50-69 year-old women had a mammography in the two years before the interview. There was a decreasing North-South trend (81% in the North, 77% in the Centre, and 54% in the South and Islands).

Fifty-one percent of the women performed the test within a screening programme for free and 19% performed the test spontaneously paying it entirely or in part. The coverage due to spontaneous testing was similar in the three geographic areas, while the part due to organized screening varied (figure 4, p. 14). From 2008 to 2013 mammography coverage slightly increased ($p = 0.060$). The increase was present in all three geographic areas and both in organized programmes and spontaneous

screening, but was stronger in the South and in spontaneous activity (figure 5, p. 14).

Coverage was higher in 50-59 year-old women, married or with a stable partner, with high education, without economic problems, and who are Italian or come from industrialized countries (compared to immigrants from high migration pressure countries). Women 60-69 years old, with poor education, without economic problems, and who are immigrants from high migration pressure countries more frequently performed the test within the screening programmes. On the contrary, women 50-59 years old, with a degree, and who are Italian or come from industrialized countries, more frequently performed the test spontaneously (figure 6, table 2, p. 15). Multivariate analysis confirmed all the associations found (table 2). In regions with well-implemented breast cancer screening programmes, i.e., in which at least 75% of the target population declared they had received the invitation letter, coverage was higher than in regions with incomplete programme activation, i.e., 81% *vs* 60% ($p < 0.001$). Furthermore, in regions with well-implemented programmes the difference in coverage between women with a degree and women with lower education was 8% and the difference between women with major economic difficulties and those with no economic problems was 13%; in regions with incomplete programme activation the difference was 37% in both cases.

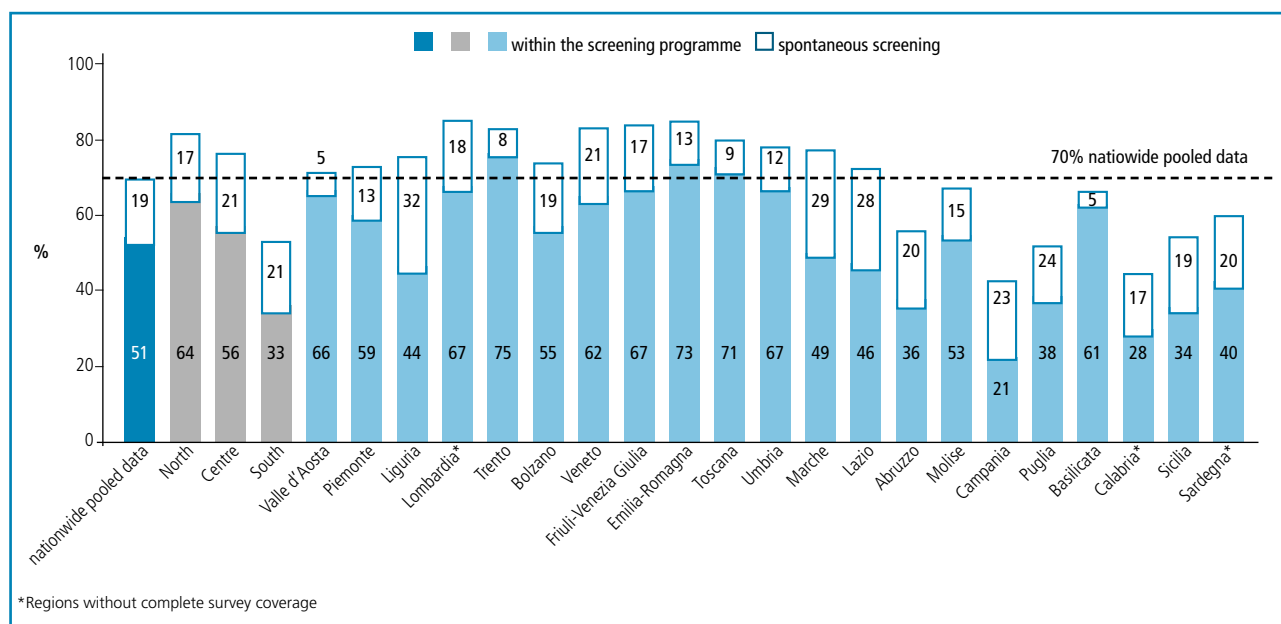


Figure 4. Breast cancer screening test coverage. Proportion of 50-69 year-old women who had a mammography in the two years before the interview, within screening programmes or spontaneously, by region. Nationwide pooled data, PASSI 2010-2013.

Figura 4. Copertura dello screening mammografico. Proporzione di donne di età 50-69 anni che hanno eseguito una mammografia negli ultimi due anni, all'interno dei programmi di screening o spontaneamente. Pool, PASSI 2010-2013.

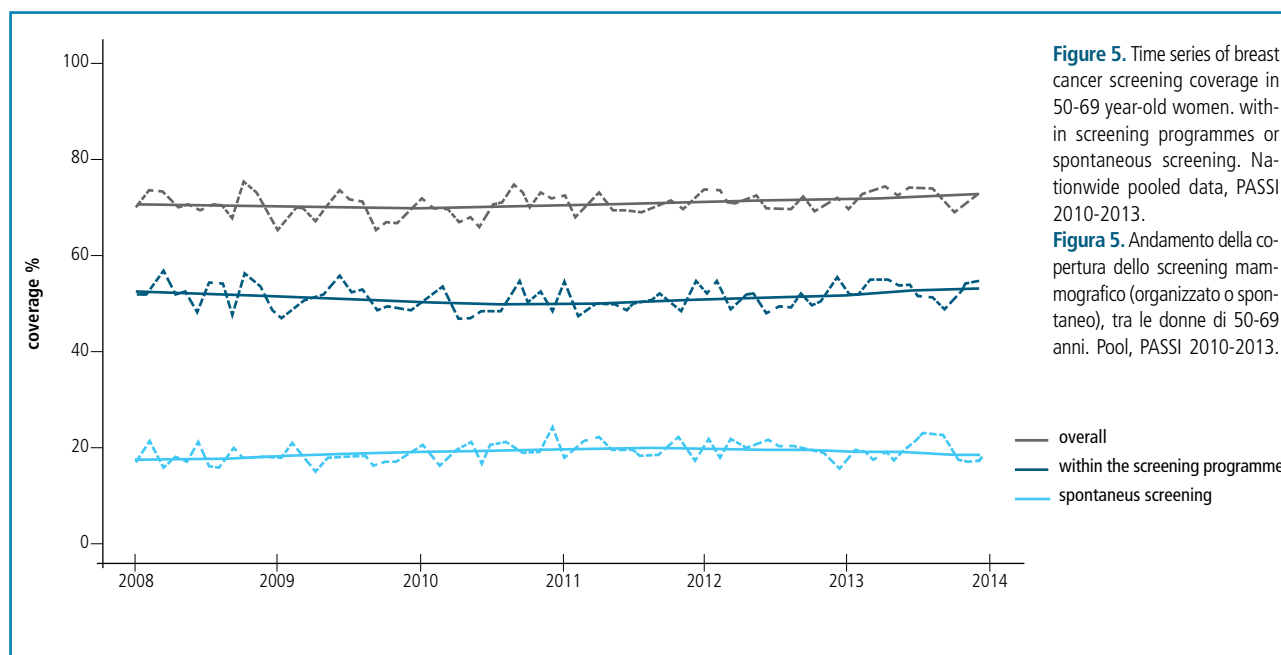


Figure 5. Time series of breast cancer screening coverage in 50-69 year-old women. within screening programmes or spontaneous screening. Nationwide pooled data, PASSI 2010-2013.

Figura 5. Andamento della copertura dello screening mammografico (organizzato o spontaneo), tra le donne di 50-69 anni. Pool, PASSI 2010-2013.

Colorectal cancer screening test coverage

Overall, 38% of people aged 50-69 years were covered for colorectal cancer screening; 33% had a faecal occult blood test in the two years before and 13% a colonoscopy five years before the interview (these data do not include the region of Piemonte). There was a decreasing North-South trend (59% in the North, 41% in the Centre, and 17% in the South and Islands).

Thirty-one percent performed the test within a screening programme for free and 7% performed the test, mainly a

colonoscopy, spontaneously, paying it entirely or in part. The vast majority of occult blood tests was performed within screening programmes, while about half of the colonoscopies or sigmoidoscopies were performed in spontaneous testing settings. The coverage due to spontaneous testing was similar in the three geographic areas, while the part due to organized screening varied (figure 7, p. 16).

From 2010 to 2013, colorectal cancer screening test coverage rapidly increased ($p < 0.001$). The increase was present in all three geographic areas and both in organized programmes and

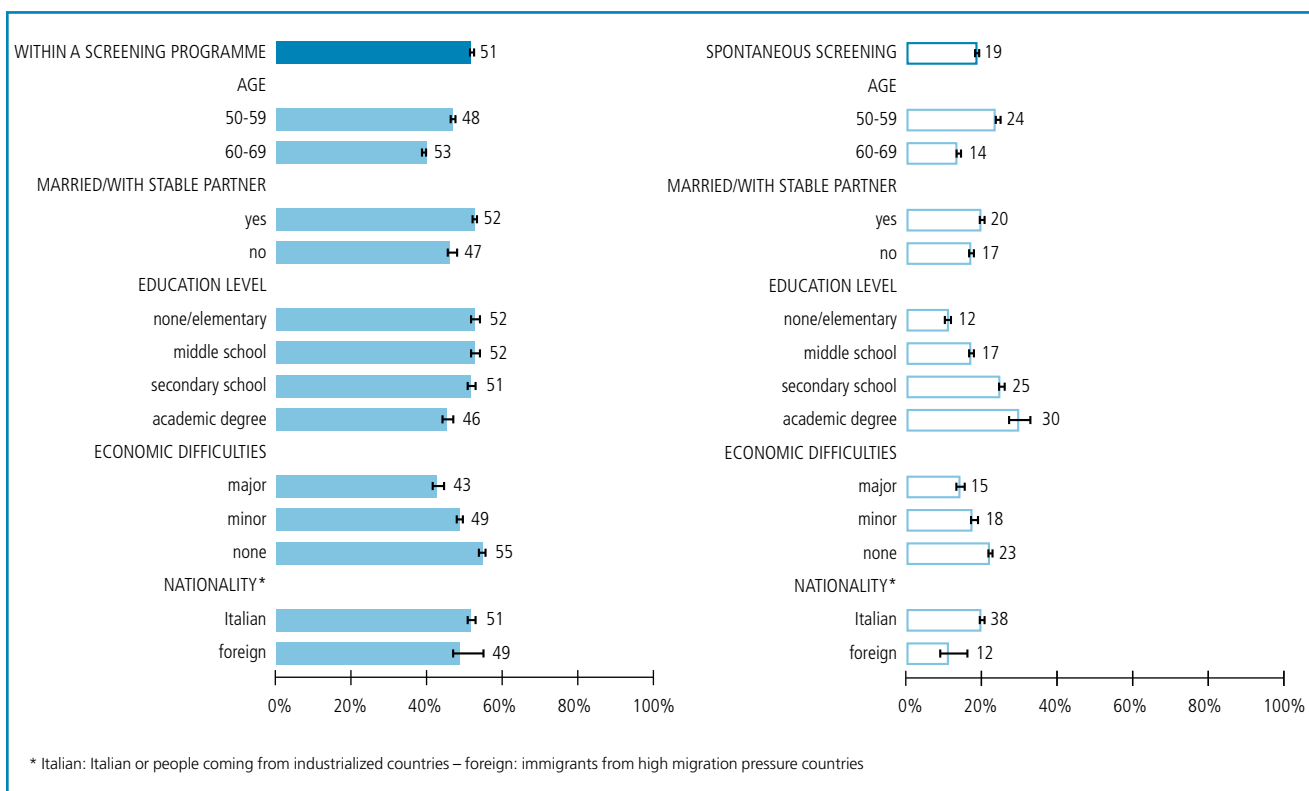


Figure 6. Proportion of 50-69 year-old women who had a mammography in the two years before the interview, within screening programs or spontaneously, according to socio-economic characteristics. Nationwide pooled data, PASSI 2010-2013.

Figura 6. Proporzioe di donne di età 50-69 anni che hanno eseguito una mammografia negli ultimi due anni, all'interno dei programmi di screening o spontaneamente, secondo lo stato socioeconomico. Pool, PASSI 2010-2013.

	Within a screening programme				Spontaneous screening			
	OR	95%CI		p-value	OR	95%CI		p-value
Age								
50-59	1.00				1.00			
60-69	1.18	1.11	1.26	0.000	0.61	0.56	0.66	0.000
Married/with stable partner								
yes	1.00				1.00			
no	0.84	0.78	0.90	0.000	0.83	0.76	0.92	0.000
Education level								
none/elementary	1.00				1.00			
middle school	0.99	0.91	1.08	0.851	1.28	1.13	1.45	0.000
secondary school	0.90	0.82	0.98	0.018	1.93	1.70	2.19	0.000
academic degree	0.72	0.63	0.81	0.000	2.55	2.18	2.98	0.000
Economic difficulties								
major	1.00				1.00			
minor	1.31	1.19	1.44	0.000	1.18	1.03	1.35	0.016
none	1.74	1.58	1.92	0.000	1.30	1.14	1.49	0.000
Nationality								
Italian	1.00				1.00			
foreign	1.14	0.94	1.38	0.171	0.47	0.35	0.64	0.000

Table 2. Logistic regression model to analyze the characteristics associated with breast cancer screening coverage. Nationwide pooled data, PASSI 2010-2013.

Tabella 2. Modello di regressione logistica per la copertura di una mammografia preventiva entro gli ultimi due anni. Pool, PASSI 2010-2013.

spontaneous screening, but was stronger in the northern and central regions. The increase was totally due to tests performed within the organized screening programmes (figure 8, p. 16). Coverage was higher in 60-69 year-olds men, without economic problems, and Italian or coming from industrialized

countries (compared to immigrants from high migration pressure countries).

People aged 60-69, with poor education and without economic problems more frequently performed the test within the screening programmes. On the contrary, those with higher education,

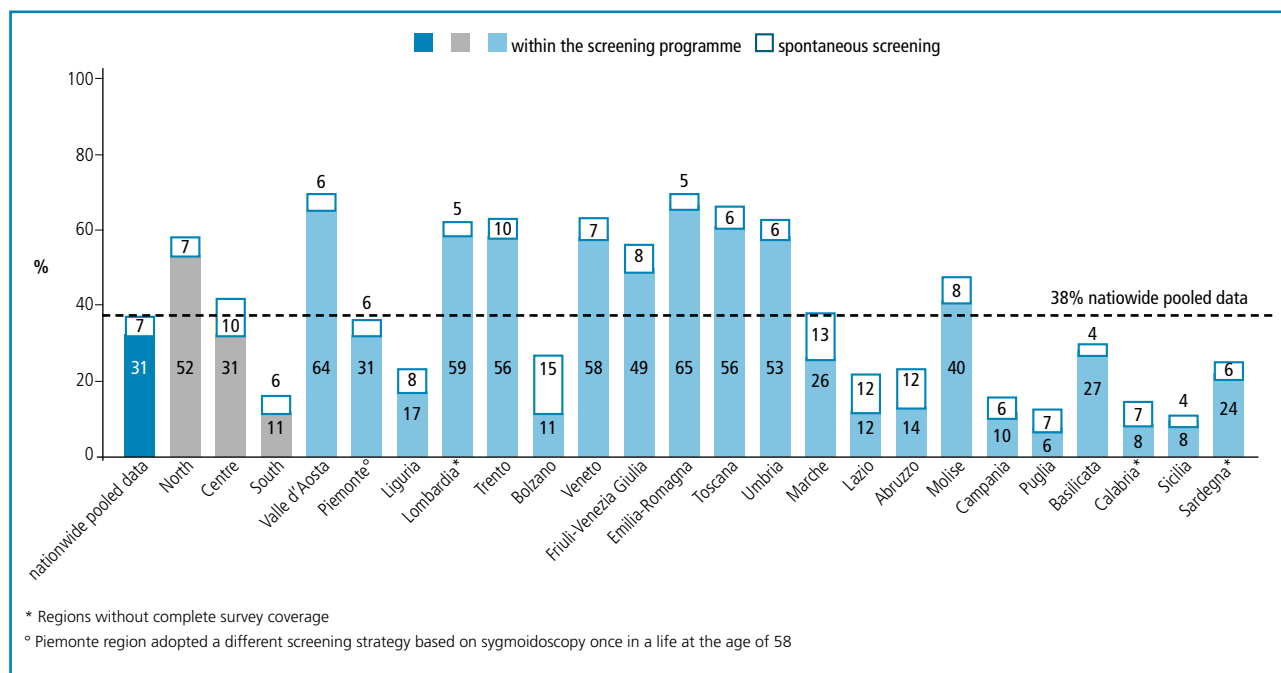


Figure 7. Colorectal cancer screening test coverage. Proportion of 50-69 year-old people who had a faecal occult blood test in the two years before the interview or colonoscopy/sigmoidoscopy in the five years before the interview, within screening programmes or spontaneously, by region. Nationwide pooled data, PASSI 2010-2013.
Figura 7. Copertura dello screening coloretale. Proporzioe di persone di età 50-69 anni che hanno eseguito un test SOF (sangue occulto fecale) negli ultimi due anni o una colonoscopia negli ultimi cinque anni, all'interno dei programmi di screening o spontaneamente. Pool, PASSI 2010-2013.

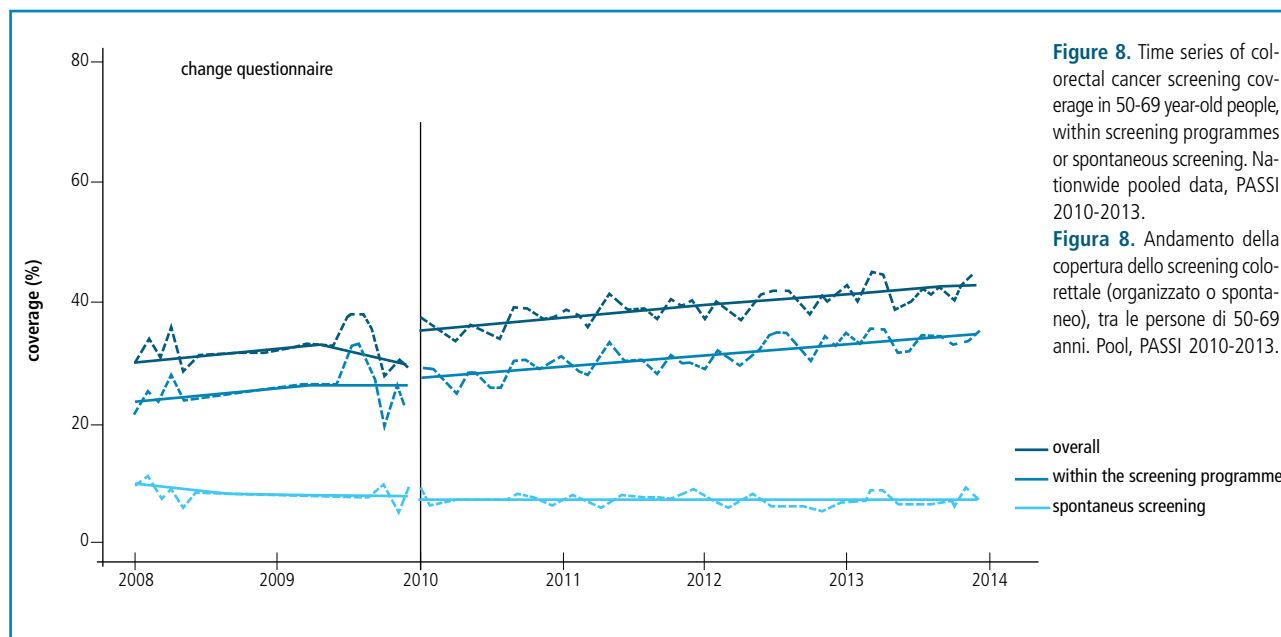


Figure 8. Time series of colorectal cancer screening coverage in 50-69 year-old people, within screening programmes or spontaneous screening. Nationwide pooled data, PASSI 2010-2013.
Figura 8. Andamento della copertura dello screening coloretale (organizzato o spontaneo), tra le persone di 50-69 anni. Pool, PASSI 2010-2013.

Italian nationality or coming from industrialized countries, and without economic problems more frequently performed the test spontaneously (figure 9, table 3). Multivariate analysis confirmed all the associations found (table 3). In regions with well-implemented colorectal cancer screening programs, i.e., in which at least 75% of the target population declared they had received the invitation letter, coverage is higher than in regions with incomplete programme activation: 59% vs 14% (p < 0.001). Furthermore, whereas in regions with well-implemented programmes those with a low level of edu-

cation have higher coverage than people who hold a degree (+8%), the situation is exactly the opposite in regions where programmes are not well-implemented, where people with an academic degree have higher coverage (+24%) than those with a lower level of education. There is also a reduction in the difference in coverage for the economically disadvantaged: 29% vs 41%.

CONCLUSIONS

About three fourths of the female target populations are cov-

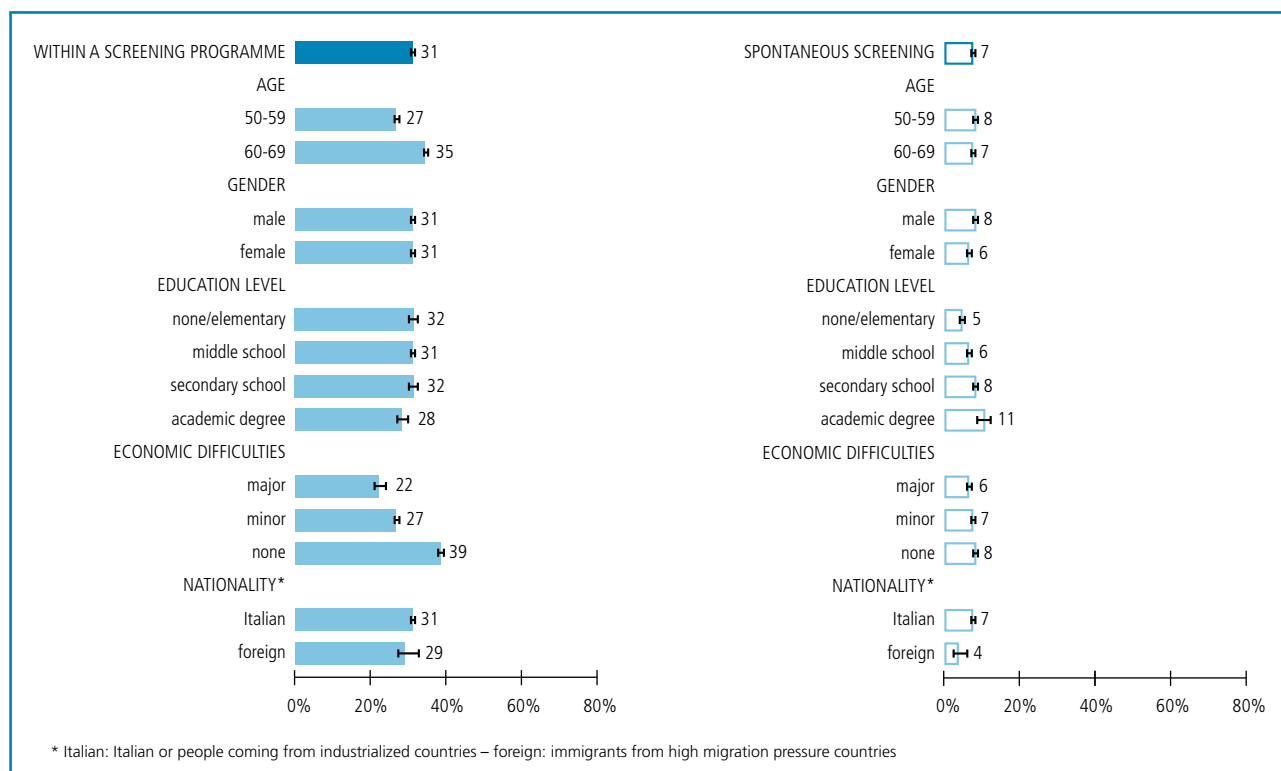


Figure 9. Proportion of 50-69 year-old people who had a foecal occult test in the two years before the interview or a colonoscopy in the five years before the interview, within screening programs or spontaneously, according to socio-economic characteristics. Nationwide pooled data, PASSI 2010-2013.

Figura 9. Proporzioe di persone di età 50-60 anni che hanno eseguito un test SOF (sangue occulto fecale) negli ultimi due anni o una colonscopia negli ultimi cinque anni, all'interno dei programmi di screening o spontaneamente, secondo lo stato socioeconomico. Pool, PASSI 2010-2013.

	Within a screening programme				Spontaneous screening			
	OR	95%CI		p-value	OR	95%CI		p-value
Age								
50-59	1.00				1.00			
60-69	1.36	1.30	1.43	0.000	1.00	0.92	1.09	0.996
Gender								
male	1.00				1.00			
female	1.01	0.97	1.05	0.634	0.79	0.73	0.86	0.000
Education level								
none/elementary	1.00				1.00			
middle school	0.98	0.92	1.04	0.527	1.20	1.06	1.36	0.004
secondary school	0.88	0.82	0.94	0.000	1.59	1.40	1.80	0.000
academic degree	0.63	0.58	0.70	0.000	2.17	1.86	2.52	0.000
Economic difficulties								
major	1.00				1.00			
minor	1.37	1.27	1.48	0.000	1.05	0.91	1.20	0.498
none	2.58	2.39	2.78	0.000	1.13	0.99	1.29	0.071
Nationality								
Italian	1.00				1.00			
foreign	1.12	0.94	1.33	0.192	0.48	0.32	0.71	0.000

Table 3. Logistic regression model to analyze the characteristics associated with colorectal cancer screening coverage. Nationwide pooled data, PASSI 2010-2013.

Tabella 3. Modello di regressione logistica per la copertura di un esame preventivo per la diagnosi precoce dei tumori colorettali entro i tempi raccomandati. Pool, PASSI 2010-2013.

ered by cervical and breast cancer screening, although there are significant differences between northern-central and southern Italy. Colorectal cancer screening coverage is still below 40%. The role of spontaneous screening is relevant for female cancer screening, in particular cervical cancer screening, but the

presence of well-implemented organized programmes makes it possible to reach high coverage levels and reduce inequalities in the access to evidence-based screening.

Conflicts of interests: none declared

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