

The post enumeration survey (PES) of the 15th Italian population census

The PES (Post Enumeration Survey or survey coverage) is regulated by the European Commission (Commission Regulation no. 1151/2010) that obliges Member States to provide, by March 30, 2014, estimates of the undercoverage and the overcoverage of the Population census.

This survey, globally, is carried out by many OECD countries after the end of the census operations. In recent years the techniques for carrying out post-census surveys and statistical methodologies for estimating unknown parameters triggered a serious scientific discussion and several papers are available in the literature.

The main goal of the "Italian" PES is to estimate the number of individuals really and usually resident at the reference time of the 15th General Census of Population and Housing (October 9th, 2011) and the coverage rate, defined as the ratio between the number of individuals found at Census (net of collective households) and the number of individuals really resident. The sampling design is a two-stage with stratification of the primary units (252 municipalities divided in self-representative and non-self-representative) and secondary units (about 2,500 enumeration areas). The survey was designed to ensure the independence of investigations (Census and PES). The households and the individuals usually resident in housing in the enumeration areas selected from the sample at the time of detection PES are being surveyed. The survey took place from April to July 2012, and involved about 1,200 enumerators selected from the "best" of the Census (of course, each of them was given a different enumeration area than that processed during the Census). The PES has detected approximately 329,000 eligible individuals; an accurate phase of Record Linkage (deterministic, probabilistic and manual) between the PES and the Census and the application of a complex estimation model (Dual System model derived by ONS approach) have thus certified the high quality of the 15th General Census of population and housing.

The results of the PES in Italy and regional level are presented in Table 1. As it can be seen, at the national level, the undercover (purified of overcoverage) is 1.07%, which is the legal population of the Census (excluding partnerships) is under enumerated for approximately 642,000 individuals. As far as regional results are concerned, the most noticeable rates of under-coverage occur in the regions where metropolitan cities are located and in Abruzzo, a region that was struck by an earthquake in 2009.

Regarding the levels of undercover for age classes (Table 2), it can be noticed that the error rates of non-enumeration of the Census are concentrated in the younger population group and, in particular, in the 15-29 class (2.23%). Higher age classes, corresponding to stationary individuals, have negligible error rates.

In Table 3, errors of coverage for Italians and foreigners citizens are presented. It should be noticed that, the approximately 642,000 individuals who were missing in the enumeration census, about 500,000 are individuals with foreign citizenship, and this is a signal of the presence of a serious problem in the capture of this portion of the population.

TABLE 1 – PES RESULTS – ITALY AND REGIONS

Regions	N Census (a)	N estimated gross of overcoverage (b)	N estimated net of overcoverage (c)	Gross undercover age (d=b-a)	Overcoverage (e)	Net undercovera ge f=(d-e)	Gross undercoverage rate h=(d/b)*100	Overcoverage rate i=(e/b)*100	Indercoverag e rate h-i)≐(f/b)*100
Piemonte	4,330,669	4,388,399	4,382,103	57,730	6,296	51,434	1.32	0.14	1.17
Valle d'Aosta	125,986	126,782	126,444	796	338	458	0.63	0.27	0.36
Lombardia	9,648,023	9,805,379	9,739,184	157,356	66,195	91,161	1.60	0.67	0.94
Bolzano	499,353	504,164	502,397	4,811	1,767	3,044	0.95	0.35	0.61
Trento	518,964	524,666	522,310	5,702	2,356	3,346	1.09	0.45	0.64
Veneto	4,817,382	4,872,438	4,849,982	55,056	22,456	32,600	1.13	0.46	0.67
Friuli-Venezia Giulia	1,208,411	1,214,516	1,212,259	6,105	2,257	3,848	0.50	0.19	0.32
Liguria	1,560,180	1,584,695	1,580,671	24,515	4,024	20,491	1.55	0.25	1.30
Emilia-Romagna	4,317,113	4,369,882	4,362,076	52,769	7,806	44,963	1.21	0.18	1.03
Toscana	3,655,672	3,722,904	3,718,567	67,232	4,337	62,895	1.81	0.11	1.69
Umbria	879,370	886,506	885,409	7,136	1,097	6,039	0.80	0.12	0.68
Marche	1,534,536	1,545,618	1,543,295	11,082	2,323	8,759	0.72	0.15	0.57
Lazio	5,474,327	5,590,105	5,563,280	115,778	26,825	88,953	2.07	0.47	1.60
Abruzzo	1,303,335	1,337,381	1,327,144	34,046	10,237	23,809	2.55	0.75	1.79
Molise	312,530	313,377	313,052	847	325	522	0.27	0.10	0.17
Campania	5,753,564	5,835,421	5,815,646	81,857	19,775	62,082	1.40	0.34	1.07
Puglia	4,042,843	4,122,902	4,094,730	80,059	28,172	51,887	1.94	0.67	1.27
Basilicata	576,420	578,951	577,909	2,531	1,042	1,489	0.44	0.18	0.26
Calabria	1,953,284	1,971,938	1,963,319	18,654	8,619	10,035	0.95	0.43	0.51
Sicilia	4,986,669	5,056,508	5,045,604	69,839	10,904	58,935	1.38	0.21	1.17
Sardegna	1,633,414	1,650,465	1,648,761	17,051	1,704	15,347	1.03	0.10	0.93
ITALY	59,132,045	60,002,997	59,774,142	870,952	228,855	642,097	1.45	0.38	1.07

TABLE 2 – PES RESULTS – AGE CLASS

Age class	N Census. (a)	N estimated gross of overcoverage (b)	N estimated net of overcoverage (c)	Gross undercoverage (d=b-a)	Overcoverage (e)	Net undercoverage f=(d-e)	Gross overcoverage rate h=(d/b)*100	Overcoverage rate i=(e/b)*100	Under coverage rate (h-i)≅(f/b)*100
0-14	8,324,689	8,455,424	8,451,234	130,735	4,190	126,545	1.55	0.05	1.50
15-29	9,178,167	9,413,645	9,387,954	235,478	25,691	209,787	2.50	0.27	2.23
30-49	17,864,823	18,262,104	18,144,728	397,281	117,376	279,905	2.18	0.63	1.54
50-64	11,576,914	11,653,406	11,596,015	76,492	57,391	19,101	0.66	0.49	0.16
65 and over	12,187,452	12,218,418	12,194,210	30,966	24,208	6,758	0.25	0.20	0.06
TOTAL	59,132,045	60,002,997	59,774,142	870,952	228,855	642,097	1.45	0.38	1.07

TABLE 3 – PES RESULTS – CITIZENSHIP

Citizenship	N Census (a)	N estimated gross of overcoverage (b)	N estimated net of overcoverage (c)	Gross undercoverage (d=b-a)	Overcoverage (e)	Net undercoverage f=(d-e)	Gross undercoverage rate h=(d/b)*100	Overcoverage rate i=(e/b)*100	Under coverage rate (h-i)≅(f/b)*100
Italian	55,135,732	55,501,271	55,280,620	365,539	220,651	144,888	0.66	0.40	0.26
Foreign	3,996,313	4,501,726	4,493,522	505,413	8,204	497,209	11.23	0.16	11.07
TOTAL	59,132,045	60,002,997	59,774,142	870,952	228,855	642,097	1.45	0.38	1.07