

Supplementary Information – European Journal of Population

Title: Seasonal mortality and its impact on spatial inequality in life expectancy across Italy

Figure S1: Italian regions (NUTS2) and groups of regions (NUTS1) used in the analysis



Figure S2. Regional life expectancy at birth, regional life expectancy at birth due to excess seasonal mortality and the related losses, Italian average and the regional standard deviation (SD), Italian regions, female population, 2005-2009, 2010-2014, 2015-2019

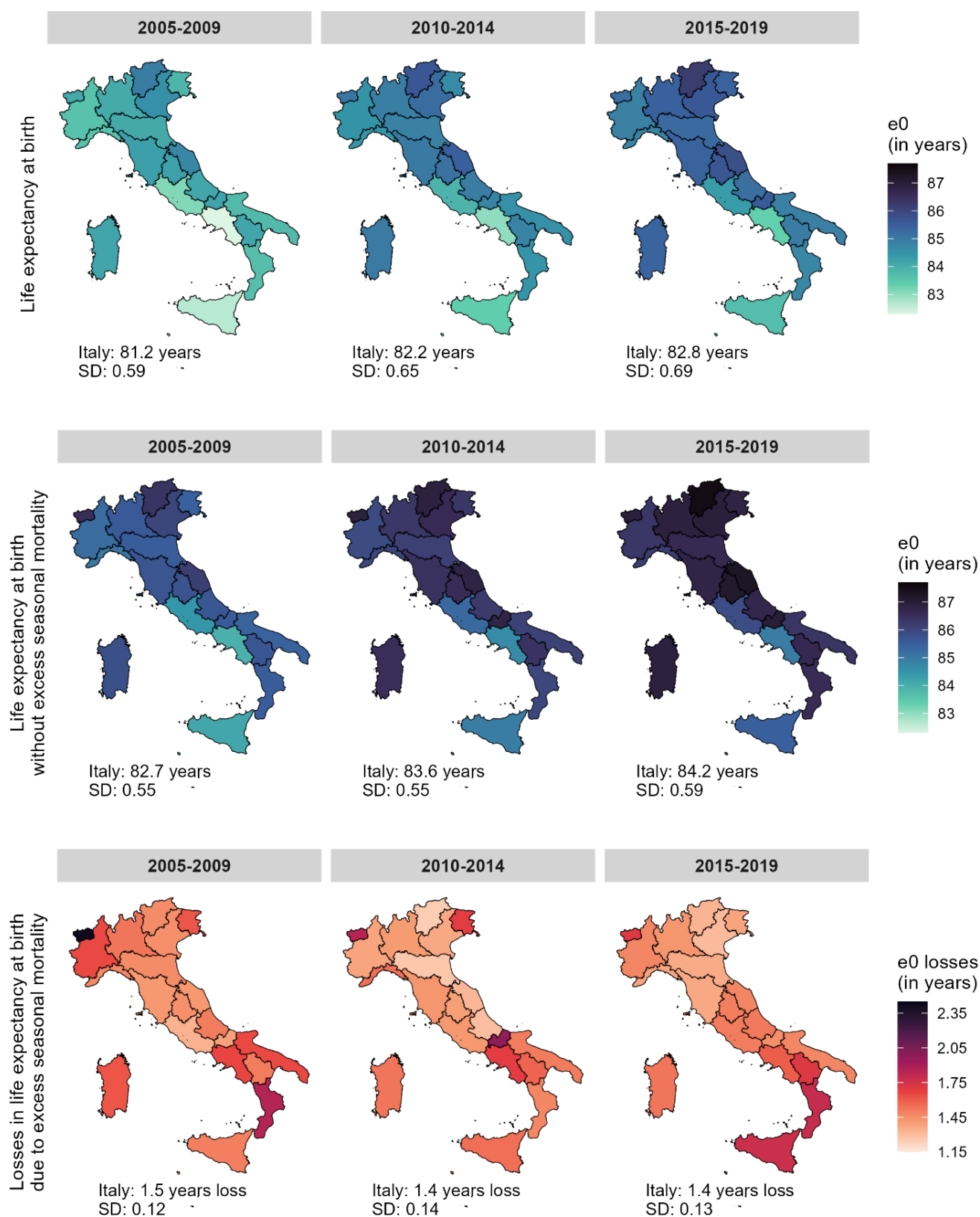


Figure S3. Regional life expectancy at birth, regional life expectancy at birth due to excess seasonal mortality and the related losses, Italian average and the regional standard deviation (SD), Italian regions, male population, 2005-2009, 2010-2014, 2015-2019

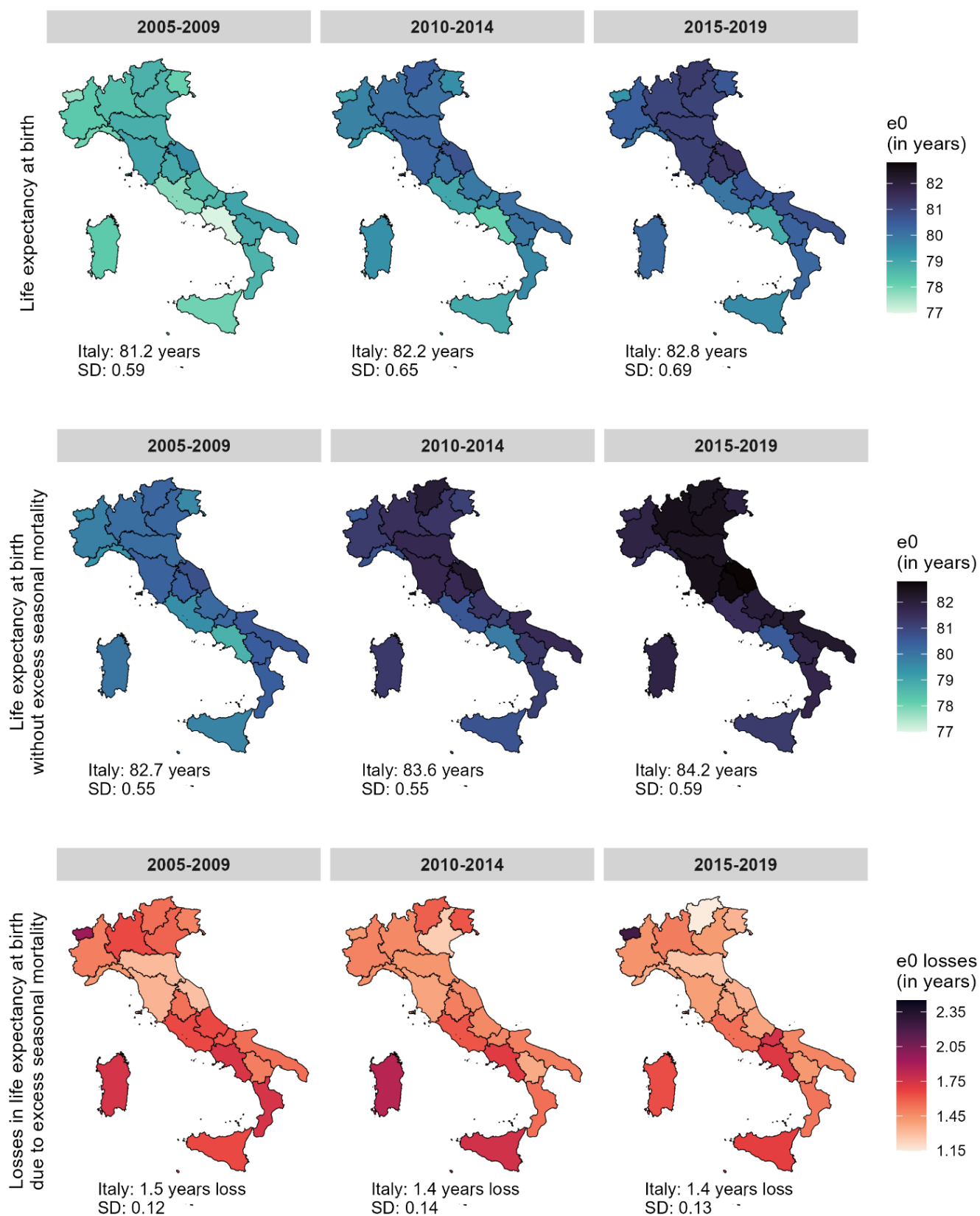


Table S1. Losses in life expectancy at birth by Italian regions and sex, 2005-2009, 2010-2014, 2015-2019 and overall period 2005-2019

Region	2005-2009			2010-2014			2015-2019			2005-2019		
	Total	Males	Females	Total	Males	Females	Total	Males	Females	Total	Males	Females
ITALY	1.52	1.50	1.47	1.41	1.37	1.38	1.44	1.40	1.42	1.42	1.38	1.39
Piemonte	1.61	1.50	1.65	1.48	1.49	1.38	1.48	1.44	1.48	1.48	1.41	1.47
Valle d'Aosta	2.20	1.94	2.42	1.92	1.42	1.85	1.82	2.23	1.71	1.89	1.38	1.45
Liguria	1.48	1.42	1.47	1.45	1.45	1.55	1.36	1.36	1.38	1.34	1.48	1.43
Lombardia	1.66	1.65	1.53	1.48	1.47	1.41	1.51	1.51	1.43	1.50	1.29	1.48
Trentino Alto Adige	1.54	1.55	1.46	1.27	1.59	1.25	1.26	1.15	1.33	1.32	1.35	1.30
Friuli-Venezia Giulia	1.59	1.49	1.62	1.65	1.62	1.69	1.40	1.33	1.38	1.41	1.24	1.32
Veneto	1.55	1.58	1.45	1.36	1.25	1.37	1.40	1.41	1.31	1.36	1.34	1.36
Emilia-Romagna	1.39	1.31	1.46	1.38	1.43	1.27	1.34	1.28	1.36	1.30	1.45	1.33
Toscana	1.38	1.33	1.42	1.45	1.38	1.43	1.43	1.40	1.37	1.38	1.58	1.36
Umbria	1.51	1.54	1.45	1.40	1.50	1.40	1.43	1.38	1.50	1.43	1.30	1.30
Lazio	1.50	1.65	1.34	1.52	1.62	1.42	1.55	1.55	1.51	1.49	1.46	1.42
Marche	1.33	1.29	1.42	1.38	1.46	1.32	1.42	1.34	1.48	1.31	1.52	1.50
Abruzzo	1.70	1.65	1.51	1.45	1.47	1.30	1.48	1.38	1.52	1.47	1.67	1.56
Molise	1.42	1.62	1.39	1.65	1.48	1.98	1.58	1.75	1.45	1.42	1.48	1.41
Campania	1.73	1.73	1.66	1.71	1.70	1.69	1.67	1.71	1.60	1.64	1.29	1.37
Puglia	1.62	1.55	1.65	1.50	1.50	1.51	1.52	1.48	1.48	1.47	1.57	1.61
Basilicata	1.62	1.50	1.51	1.37	1.36	1.58	1.56	1.42	1.71	1.34	1.51	1.54
Calabria	1.80	1.74	1.86	1.48	1.55	1.48	1.70	1.53	1.80	1.60	1.68	1.47
Sicilia	1.55	1.65	1.50	1.75	1.76	1.55	1.74	1.68	1.78	1.54	1.25	1.25
Sardegna	1.59	1.74	1.62	1.79	1.85	1.53	1.60	1.64	1.53	1.60	1.75	1.84

Figure S4. Losses in life expectancy at birth, Italian average and regional range, by sex, 2005-2019

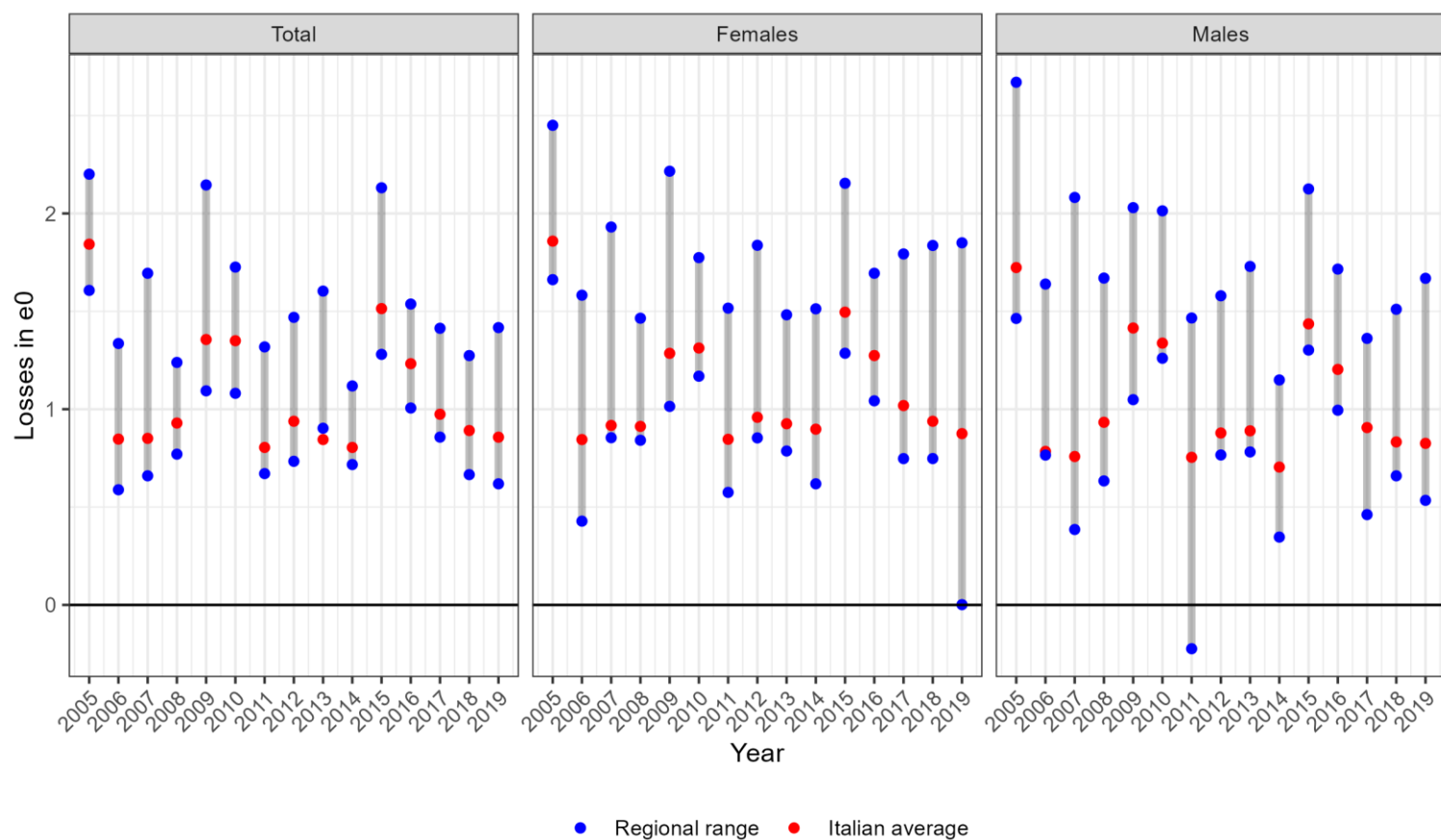


Figure S5. Life expectancy at birth by season and observed annual estimate, total, population, 2005-2009, 2010-2014, 2015-2019

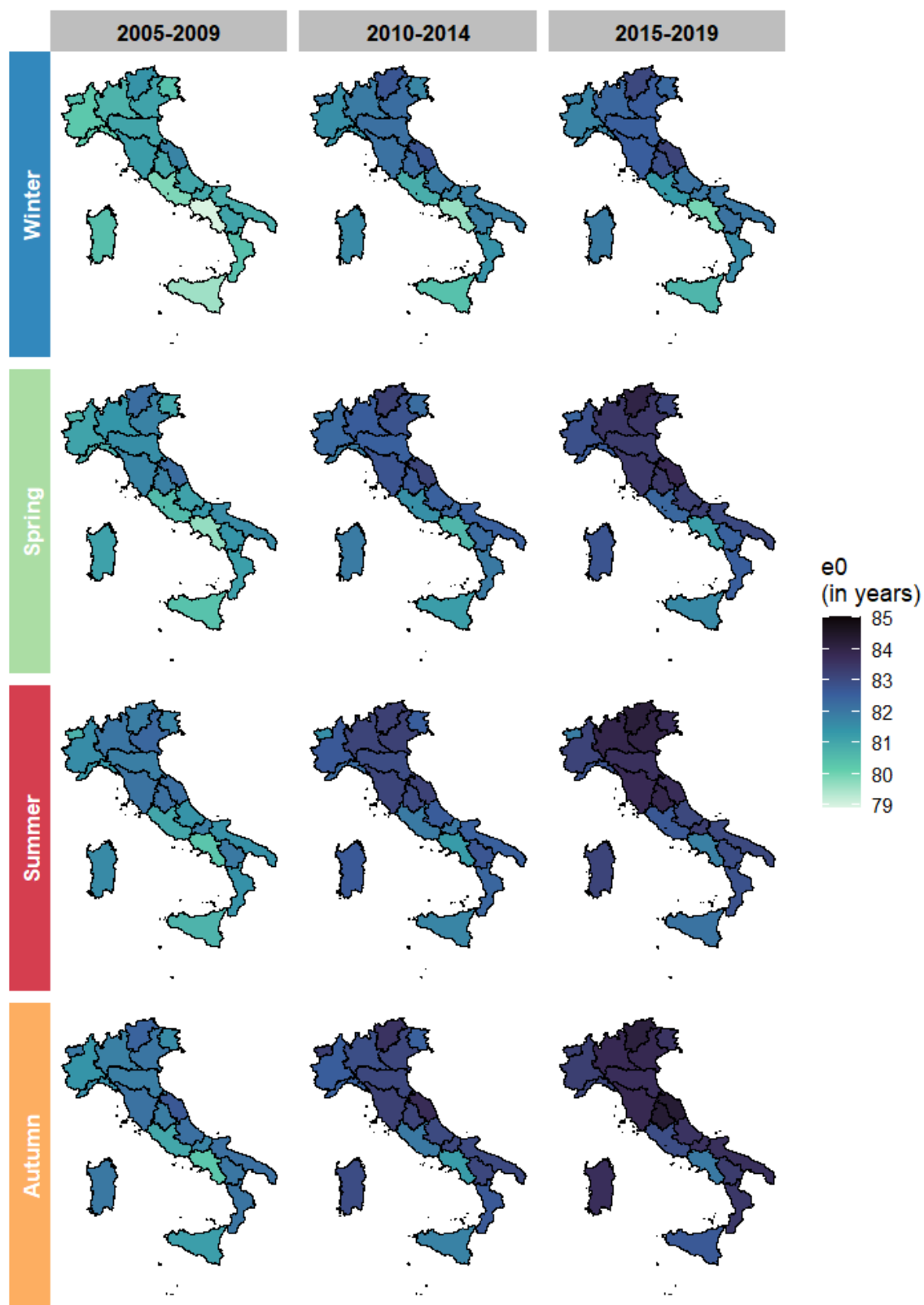


Figure S6. Losses in life expectancy at birth by season, total population, 2005-2009, 2010-2014, 2015-2019

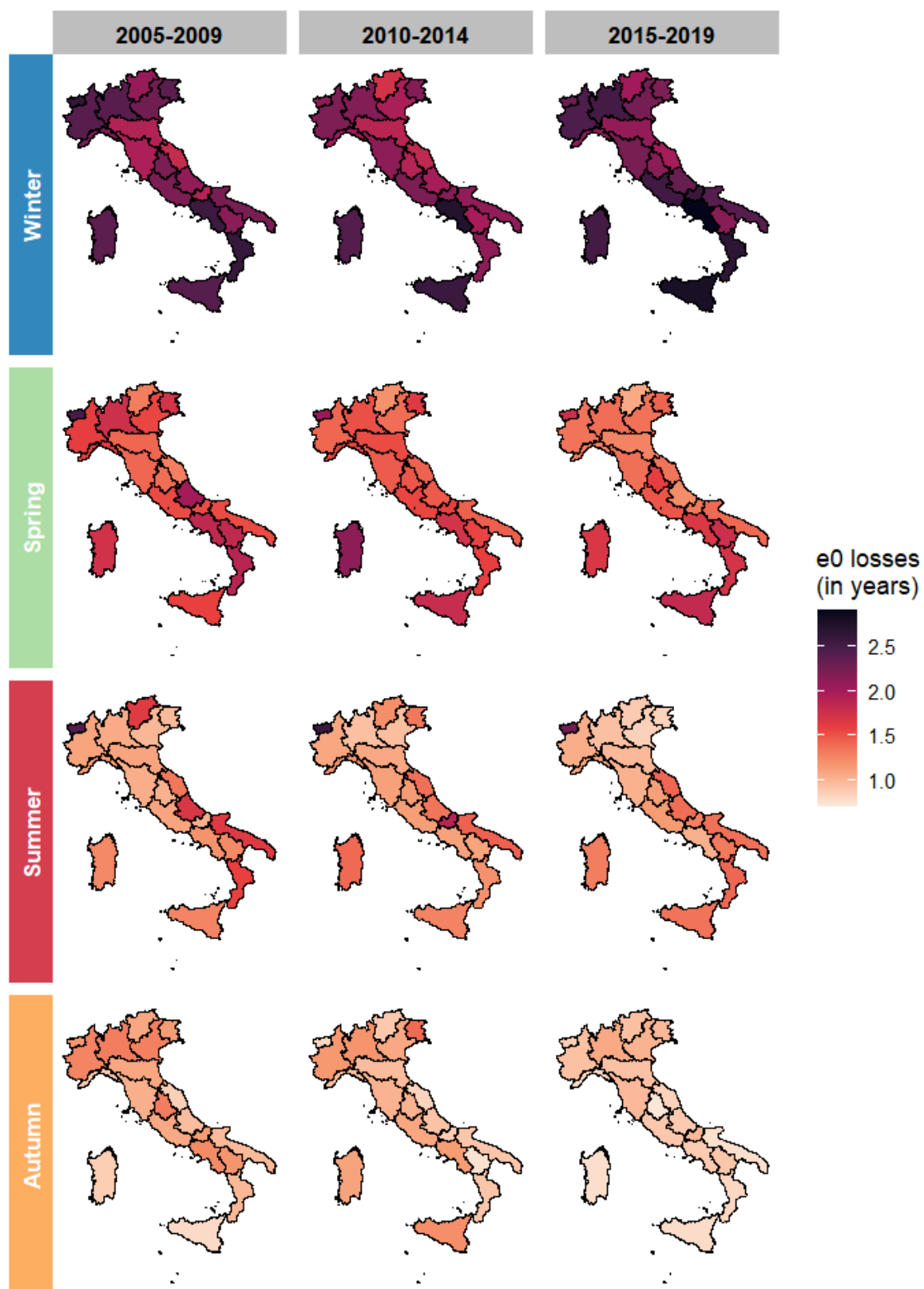


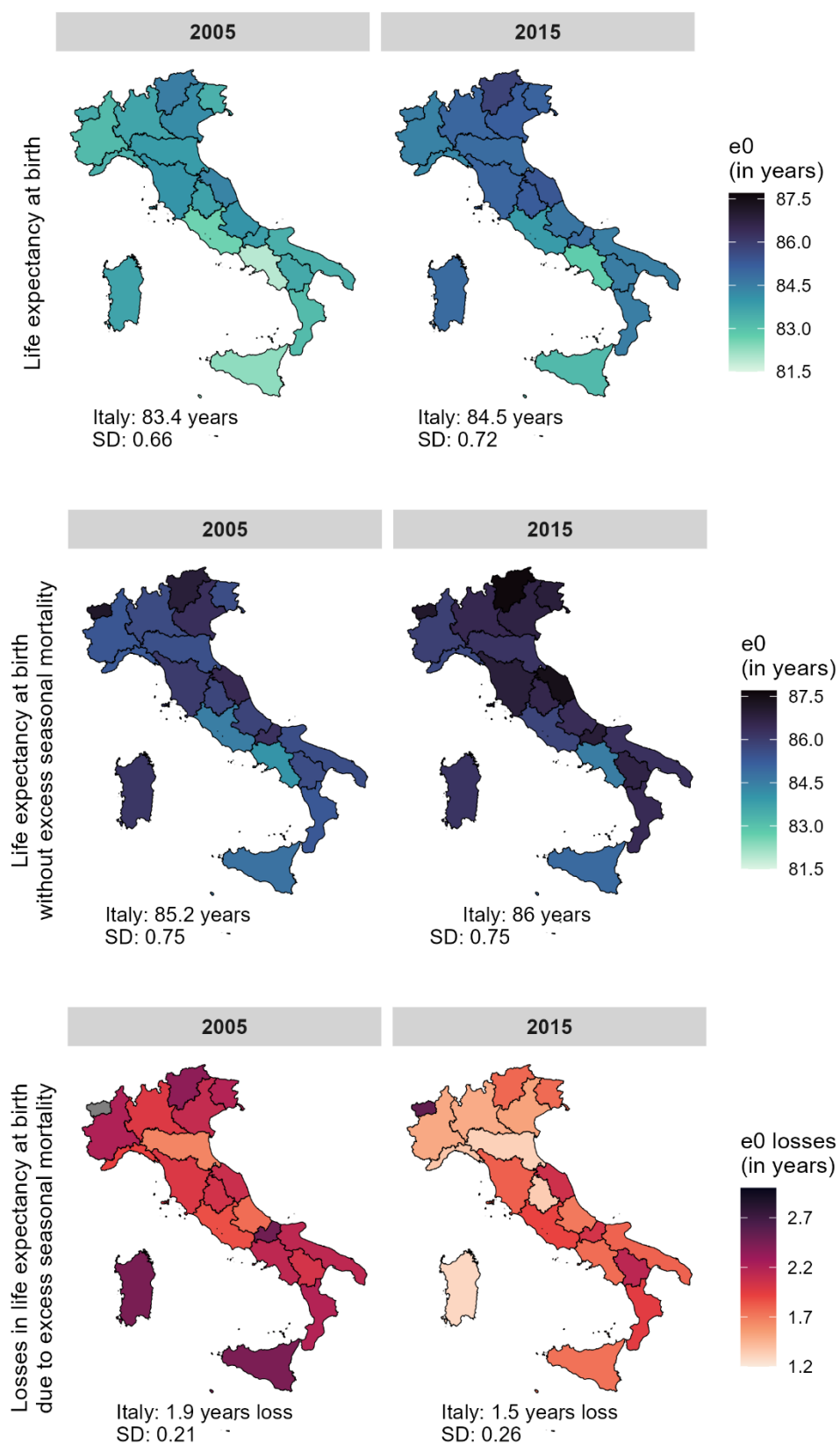
Table S2. Losses in life expectancy at birth (in years) by Italian regions, by season and sex, 2005-2009, 2010-2014, 2015-2019

Region	2005-2009			2010-2014			2015-2019			2005-2019		
	Total	Males	Females	Total	Males	Females	Total	Males	Females	Total	Males	Females
Winter												
ITALY	2.23	2.13	2.21	2.09	1.98	2.10	2.37	2.26	2.38	2.20	2.10	2.19
Piemonte	2.40	2.57	2.13	2.21	2.13	2.15	2.45	2.43	2.38	2.31	2.16	2.35
Valle d'Aosta	2.62	3.24	1.94	2.12	2.50	1.18	2.30	2.28	2.60	2.27	1.83	2.51
Liguria	2.22	2.23	2.08	2.01	2.17	1.93	2.14	2.19	2.08	2.04	2.00	2.19
Lombardia	2.40	2.28	2.35	2.18	2.15	2.09	2.51	2.45	2.43	2.32	2.23	2.28
Trentino Alto Adige	2.08	1.97	2.07	1.72	1.69	2.02	2.02	2.26	1.72	1.90	1.76	1.88
Friuli-Venezia Giulia	2.38	2.37	2.26	2.17	2.31	2.01	2.20	2.23	2.04	2.13	1.92	2.23
Veneto	2.27	2.23	2.20	1.96	2.06	1.73	2.25	2.12	2.25	2.09	2.01	2.06
Emilia-Romagna	1.92	2.07	1.72	1.88	1.89	1.81	2.09	2.16	1.94	1.89	1.73	2.00
Toscana	1.95	2.08	1.79	2.13	2.19	1.96	2.24	2.25	2.10	2.08	1.93	2.13
Umbria	2.22	2.20	2.18	1.91	1.92	1.96	2.14	2.36	1.93	2.09	2.00	2.05
Lazio	2.21	2.01	2.37	2.22	2.05	2.36	2.53	2.44	2.54	2.30	2.41	2.12
Marche	1.80	1.97	1.65	1.84	1.83	1.85	1.99	2.18	1.78	1.82	1.70	1.89
Abruzzo	2.10	1.83	2.10	1.98	1.87	1.94	2.32	2.47	2.10	2.06	2.00	2.05
Molise	1.90	1.84	2.10	2.16	2.35	2.08	2.59	2.45	2.74	2.09	2.22	2.11
Campania	2.55	2.47	2.51	2.72	2.70	2.67	2.90	2.79	2.92	2.66	2.67	2.57
Puglia	2.23	2.34	2.07	2.11	2.12	2.09	2.40	2.37	2.34	2.18	2.14	2.15
Basilicata	2.14	2.06	1.98	1.99	2.35	1.81	2.15	2.50	1.82	1.93	1.75	2.08
Calabria	2.61	2.78	2.42	2.12	2.09	2.19	2.66	2.92	2.33	2.41	2.28	2.50
Sicilia	2.41	2.41	2.45	2.58	2.50	2.44	2.78	2.92	2.60	2.46	2.31	2.54
Sardegna	2.38	2.37	2.55	2.43	2.33	2.32	2.51	2.37	2.58	2.39	2.44	2.27
Spring												
ITALY	1.56	1.53	1.52	1.45	1.43	1.40	1.39	1.33	1.38	1.43	1.40	1.39
Piemonte	1.59	1.68	1.44	1.42	1.29	1.45	1.35	1.34	1.32	1.41	1.34	1.40
Valle d'Aosta	2.50	2.57	2.35	2.08	2.12	1.47	1.75	1.58	2.21	2.02	1.89	1.94
Liguria	1.61	1.59	1.53	1.57	1.70	1.53	1.31	1.38	1.27	1.40	1.41	1.54

Lombardia	1.75	1.60	1.76	1.51	1.40	1.54	1.38	1.36	1.33	1.51	1.49	1.43
Trentino												
Alto Adige	1.30	1.44	1.12	1.20	1.19	1.51	1.06	1.05	1.02	1.15	1.04	1.12
Friuli-Venezia Giulia	1.71	1.78	1.57	1.64	1.72	1.55	1.43	1.40	1.36	1.46	1.30	1.56
Veneto	1.56	1.38	1.64	1.38	1.41	1.26	1.36	1.31	1.33	1.35	1.36	1.29
Emilia-Romagna	1.42	1.51	1.30	1.53	1.32	1.68	1.27	1.35	1.14	1.33	1.28	1.36
Toscana	1.41	1.43	1.39	1.47	1.49	1.36	1.37	1.33	1.32	1.38	1.33	1.37
Umbria	1.38	1.29	1.44	1.49	1.31	1.75	1.59	1.53	1.66	1.47	1.59	1.25
Lazio	1.53	1.39	1.67	1.56	1.44	1.69	1.49	1.41	1.52	1.50	1.61	1.35
Marche	1.29	1.23	1.38	1.43	1.45	1.44	1.35	1.38	1.30	1.30	1.31	1.25
Abruzzo	2.00	2.02	1.77	1.47	1.37	1.45	1.22	1.24	1.16	1.49	1.42	1.52
Molise	1.54	1.28	1.93	1.58	2.18	1.17	1.33	1.15	1.53	1.35	1.45	1.43
Campania	1.84	1.86	1.74	1.72	1.70	1.70	1.66	1.63	1.67	1.67	1.67	1.64
Puglia	1.54	1.54	1.49	1.45	1.36	1.54	1.41	1.32	1.43	1.39	1.45	1.27
Basilicata	1.84	1.76	1.68	1.56	1.56	1.73	1.77	1.94	1.60	1.53	1.52	1.51
Calabria	1.88	1.97	1.81	1.59	1.66	1.58	1.71	1.85	1.51	1.67	1.59	1.72
Sicilia	1.58	1.51	1.70	1.79	1.55	1.82	1.82	1.86	1.75	1.59	1.57	1.57
Sardegna	1.73	1.80	1.84	2.12	1.85	2.18	1.67	1.66	1.64	1.78	1.82	1.68
Summer												
ITALY	1.13	1.15	1.06	1.04	1.05	0.96	1.03	1.04	0.97	1.03	1.05	0.95
Piemonte	1.10	1.06	1.07	1.08	0.97	1.11	1.04	1.05	1.01	1.03	1.00	0.99
Valle d'Aosta	2.42	2.59	2.24	2.58	1.89	2.61	2.27	1.83	2.95	2.33	2.49	1.93
Liguria	1.13	0.98	1.20	1.19	1.21	1.28	1.10	1.03	1.18	1.04	1.18	1.05
Lombardia	1.05	0.92	1.10	0.94	0.80	1.03	0.94	0.81	1.03	0.93	0.99	0.81
Trentino												
Alto Adige	1.63	1.35	1.81	1.21	1.04	1.67	0.88	0.89	0.84	1.20	1.26	1.00
Friuli-Venezia Giulia	0.97	1.05	0.88	1.33	1.28	1.40	0.83	0.79	0.81	0.91	0.85	0.95
Veneto	0.99	0.89	1.04	0.95	0.82	1.00	0.85	0.75	0.90	0.85	0.92	0.74
Emilia-Romagna	1.09	1.00	1.16	1.07	0.90	1.20	0.98	0.87	1.04	0.98	1.04	0.88
Toscana	1.05	1.03	1.06	1.11	1.03	1.12	1.03	0.87	1.09	1.03	1.06	0.94
Umbria	1.03	0.92	1.13	1.14	1.24	1.15	1.12	1.07	1.18	1.07	1.12	0.95

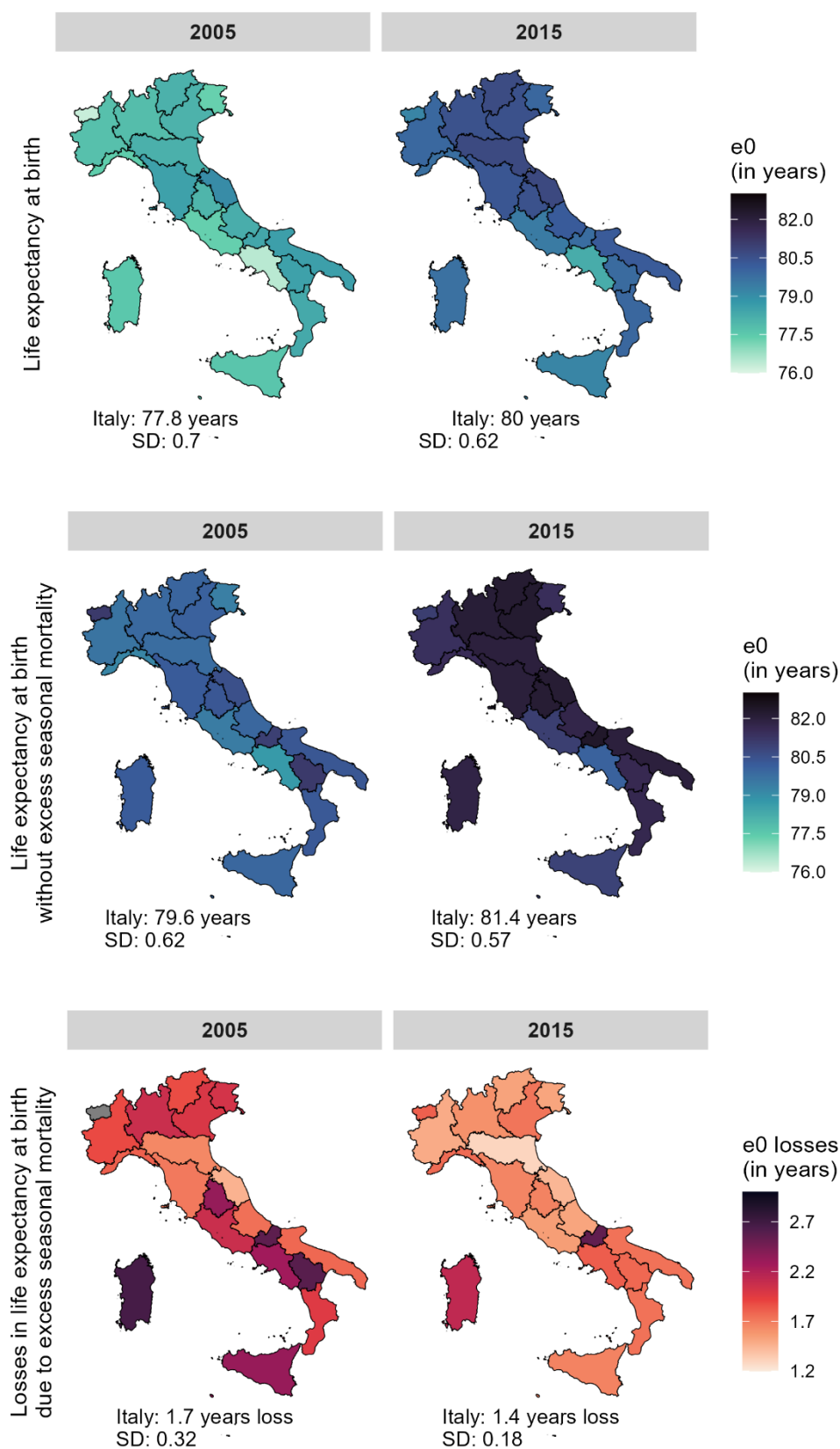
Lazio	1.09	1.01	1.17	1.13	1.04	1.23	1.15	1.11	1.15	1.09	1.16	0.99
Marche	1.33	1.58	1.15	1.37	1.14	1.61	1.42	1.45	1.36	1.31	1.30	1.29
Abruzzo	1.68	1.29	1.81	1.34	1.16	1.42	1.38	1.46	1.25	1.39	1.46	1.27
Molise	1.03	1.32	0.97	1.91	2.14	1.82	1.28	1.28	1.37	1.29	1.30	1.49
Campania	1.19	1.08	1.23	1.11	1.05	1.15	1.03	0.96	1.07	1.04	1.11	0.93
Puglia	1.64	1.62	1.59	1.44	1.53	1.37	1.37	1.33	1.35	1.40	1.41	1.35
Basilicata	1.24	1.09	1.17	1.10	1.31	1.09	1.32	1.12	1.50	1.05	1.13	0.95
Calabria	1.58	1.69	1.48	1.20	1.12	1.33	1.42	1.44	1.33	1.33	1.34	1.31
Sicilia	1.26	1.21	1.38	1.27	1.10	1.24	1.35	1.35	1.35	1.15	1.13	1.15
Sardegna	1.24	1.32	1.36	1.40	0.89	1.69	1.31	1.22	1.37	1.26	1.42	1.05
Autumn												
ITALY	1.06	1.09	0.99	0.98	0.95	0.96	0.84	0.84	0.82	0.92	0.92	0.87
Piemonte	1.26	1.18	1.29	1.16	1.05	1.18	0.94	0.96	0.91	1.07	1.06	1.02
Valle d'Aosta	1.16	1.14	1.15	0.80	0.76	0.33	0.86	1.08	1.04	0.85	0.71	0.86
Liguria	0.88	0.95	0.78	0.95	1.04	0.98	0.79	0.80	0.83	0.78	0.83	0.91
Lombardia	1.30	1.21	1.31	1.18	1.17	1.16	1.06	0.95	1.13	1.13	1.13	1.08
Trentino Alto Adige	1.08	0.97	1.14	0.89	1.04	1.09	0.94	0.97	0.88	0.92	0.86	0.89
Friuli-Venezia Giulia	1.14	1.11	1.13	1.39	1.36	1.45	0.98	0.94	0.96	1.02	0.97	1.04
Veneto	1.28	1.20	1.31	1.07	1.11	0.96	1.01	0.94	1.03	1.04	1.04	1.00
Emilia-Romagna	1.08	1.15	1.01	0.96	0.91	0.99	0.93	0.94	0.90	0.91	0.86	0.95
Toscana	1.03	1.06	1.01	1.02	0.94	1.03	0.98	0.89	1.00	0.97	0.98	0.92
Umbria	1.31	1.28	1.33	1.01	1.05	1.10	0.73	0.90	0.62	1.00	0.99	0.96
Lazio	1.07	0.86	1.30	1.08	1.07	1.13	0.90	0.94	0.85	0.98	1.06	0.89
Marche	0.85	0.83	0.94	0.83	0.80	0.91	0.84	0.82	0.87	0.77	0.83	0.70
Abruzzo	0.96	0.83	0.88	0.92	0.73	1.02	0.88	0.78	0.95	0.84	0.91	0.75
Molise	1.13	1.04	1.41	0.86	1.11	0.77	0.98	0.79	1.21	0.85	1.03	0.87
Campania	1.23	1.11	1.30	1.14	1.13	1.15	0.88	0.79	0.96	1.01	1.09	0.91
Puglia	0.98	0.98	0.97	0.91	0.92	0.94	0.76	0.78	0.70	0.80	0.83	0.76
Basilicata	1.18	1.07	1.09	0.76	1.02	0.72	0.91	1.17	0.70	0.77	0.70	0.85
Calabria	0.99	0.84	1.14	0.91	0.94	0.97	0.81	0.78	0.80	0.84	0.93	0.75
Sicilia	0.79	0.71	0.95	1.21	0.85	1.38	0.78	0.74	0.83	0.79	0.86	0.69
Sardegna	0.86	0.88	1.05	1.10	0.90	1.14	0.77	0.73	0.80	0.85	0.93	0.75

Figure S7. Regional life expectancy at birth, regional life expectancy at birth due to excess seasonal mortality and the related losses, the Italian average and the regional standard deviation (SD), Italian regions, female population, 2005 and 2015



Note: In grey: Aosta Valley, not analysed due to small population size, its values can be considered outliers

Figure S8. Regional life expectancy at birth, regional life expectancy at birth due to excess seasonal mortality and the related losses, the Italian average and the regional standard deviation (SD), Italian regions, male population, 2005 and 2015



Note: In grey: Aosta Valley, not analysed due to small population size, its values can be considered outliers

Table S3. Standard deviations in life expectancy at birth among Italian regions (observed, without overall seasonal excess mortality and season-specific excess mortality), and percentage difference with the observed standard deviation (%Δ), 2005-2009, 2010-2014, 2015-2019

SD	2005-2009	%Δ	2010-2014	%Δ	2015-2019	%Δ
Observed	0.59	-	0.65	-	0.69	-
Without Seasonality	0.55	-7.1%	0.55	-16.2%	0.59	-14.5%
Without Winter	0.56	-5%	0.59	-9.1%	0.63	-8.6%
Without Spring	0.58	-2.4%	0.63	-3.4%	0.66	-4.2%
Without Summer	0.61	3.2%	0.65	0.8%	0.68	-1.3%
Without Autumn	0.60	1.7%	0.63	-1.9%	0.69	1%

Table S4. Standard deviations in Female life expectancy at birth among Italian regions (observed, without overall seasonal excess mortality and season-specific excess mortality), and percentage difference with the observed standard deviation (%Δ), 2005-2009, 2010-2014, 2015-2019

SD	2005-2009	%Δ	2010-2014	%Δ	2015-2019	%Δ
Observed	0.68	-	0.68	-	0.71	-
Without Seasonality	0.65	-3.8%	0.60	-11.4%	0.63	-11.6%
Without Winter	0.65	-4%	0.63	-7.3%	0.67	-6.5%
Without Spring	0.66	-1.9%	0.67	-1.8%	0.69	-3.8%
Without Summer	0.69	2.2%	0.68	0.4%	0.71	-0.9%
Without Autumn	0.69	1.8%	0.68	0%	0.72	1.4%

Table S5. Standard deviations in Male life expectancy at birth among Italian regions (observed, without overall seasonal excess mortality and season-specific excess mortality), and percentage difference with the observed standard deviation (%Δ), 2005-2009, 2010-2014, 2015-2019

SD	2005-2009	%Δ	2010-2014	%Δ	2015-2019	%Δ
Observed	0.57	-	0.63	-	0.67	-
Without Seasonality	0.51	-11.7%	0.56	-13%	0.57	-16.2%
Without Winter	0.53	-7.6%	0.58	-8.3%	0.61	-10.2%
Without Spring	0.55	-2.5%	0.62	-2.4%	0.65	-4.1%
Without Summer	0.58	2.7%	0.65	2.2%	0.67	-1.1%
Without Autumn	0.57	-0.3%	0.62	-2.1%	0.68	0.3%

Figure S9. Contributions of Italian regions to the difference in spatial inequality (Δ SD) between e_0 observed and without excess seasonal mortality, analysed independently by each season, ordered by the observed e_0 in the region, total population, 2005-2019

