

Mortality by Cause of Death Among Immigrants and Natives in a South European Country: The Case of Greece, 2011

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Abstract The aim of the paper is to examine for the first time in Greece mortality by cause of death among immigrants. The analysis makes use of vital registration statistics for 2010–2012 and census data for 2011; standardised mortality ratios are estimated for four distinct groups: natives, migrants from EU-27 (excluding Greece), other Europeans (mainly Albanians) and those from all other countries (mainly Asia/Africa). All immigrants seem to experience favourable mortality from neoplasms but higher mortality from external causes in comparison to Greeks. The results regarding cardiovascular diseases are mixed. Persons originating in Asian/African regions exhibit higher mortality from infectious diseases and TB. The findings highlight the specificities of immigrant mortality which stem from pre-existing conditions in the country of origin as well as from the adverse socio-economic environment in the country of destination. As immigrants experience some excessive ‘avoidable’ mortality implementation of appropriate measures should be a social policy priority.

Keywords Standardised mortality ratios · Cause of death · Migrant groups · Greece

Introduction

Several studies examining mortality levels of immigrants in European countries, Canada and the USA find significant differentials in comparison both to the country of origin and of destination. In most instances immigrants seem to experience lower mortality [1–4]. These favourable patterns are often attributed to the ‘healthy migrant effect’ as first generation immigrants are a selected group of persons who possess distinctive character traits such as self-motivation, ambition and resilience and have better than average health compared to their counterparts in the country of origin [5, 6]. Moreover, migrants often have a healthier lifestyle compared to the native population, including restricted use of alcohol and tobacco products [3, 7, 8]. On the other hand, it has been argued that the lower mortality of immigrants could be a data artifact, mainly related to the ‘salmon effect’, i.e. the repatriation of infirm migrants who eventually die in the country of origin and are, thus, omitted from death statistics in the country of destination [9–11]. However, even in instances that such an effect has been identified, death underregistration of immigrants alone does not explain their mortality advantage [5].

Cause of death is a key aspect of mortality; determining the significance of each cause in a population is critical in assessing priorities in the formulation and implementation of public health policies. The importance of causes varies across population subgroups dependent upon socio-demographic and biological (genetic predisposition etc.) factors, environmental conditions related to the place of residence (pollution, housing etc.), the way of living (health habits, diet, smoking, alcohol consumption, physical activity) as well as quality, availability, accessibility and affordability of healthcare. Regarding immigrants, the situation is more complex; their susceptibility to different diseases and the

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corresponding mortality rates is dependent upon conditions related both to the country of origin and to the country of destination [12].

Greece has traditionally been an emigration country but that changed in the course of the 1990s. The share of migrant population increased from 1.6 to 8.4 % in the period 1991–2011. According to data from the 2011 census, immigrant groups exhibit great heterogeneity regarding their age and sex composition, their origin, living conditions, socio-economic status etc. Albanians constitute the majority 52.7 % of migrants and represent a well established community. Other ethnic groups include Bulgarians, Romanians, immigrants from neighbouring European countries as well as persons originating in Asian and African less developed regions but in smaller proportions. As vital registration data by citizenship were first compiled by the Hellenic Statistical Authority in 2004, a comprehensive analysis of mortality levels of immigrants by cause of death has not been carried out yet. The present analysis is a first attempt to examine this facet of mortality, distinguishing between the native and the immigrant populations, making use of recent vital registration and the 2011 census population data. Identifying differentials in levels and causes for the immigrant groups is a critical first step in formulating and implementing appropriate policies which may achieve a reduction in mortality. This is especially true since migrants often exhibit excessive mortality from ‘avoidable’ causes which can be tackled through the promotion of appropriate preventive health care measures and greater accessibility to medical treatments [13]. Further, since the onset of the recent financial crisis in Greece there has been concern that deterioration of socio-economic circumstances may lead to increased morbidity and mortality, particularly amongst the most vulnerable segments of the population. Indeed it has been suggested that in spite of the continuous decline in all-cause mortality, homicide, suicide and infectious diseases exhibit an upward trend since 2007 [14, 15]. Reforms carried out in the Greek health care system since 2009, due to austerity measures imposed by the IMF, resulted in reduced accessibility and affordability [15]. Such changes may have a detrimental impact on health, particularly during a crisis, when demand for public health care services increases among deprived and vulnerable population groups such as the uninsured and unemployed immigrants.

Data and Methods

Data

In this study we use vital registration statistics on the deaths recorded during 2010–2012 and population data

based on the most recent 2011 census of Greece compiled by the Hellenic Statistical Authority (ELSTAT). According to the official definitions, persons of other than Greek citizenship are classified as immigrants. The data refer to the notion of the resident population, i.e. to people or deceased for whom Greece is recorded as usual place of residence. Population is classified by sex, 5-year age groups and citizenship; the relevant material is available on line via the official site of the ELSTAT (www.statistics.gr). Deaths by cause are cross classified by broad citizenship groups and gender; this statistical information has been kindly provided to the authors by the Hellenic Statistical Authority upon special request.

All mortality indices (see below) are estimated separately for males and females. Due to data restrictions (i.e. available tabulations) four citizenship categories are considered: Greek natives (including a small number of persons having double citizenship, i.e. Greek and another one), immigrants from EU-27 countries (excluding Greece), immigrants from European countries but no EU members and immigrants from all other places including Africa, America, Asia and Oceania. In calculating the mortality indices, 3-year averages of the vital events are taken into account in order to eliminate annual random fluctuations. Deaths by cause are classified according to the ICD-9 (abridged list). The causes of death examined are presented in Table 1.

Table 1 Causes of death examined in the analysis and the corresponding codes according to the ICD-9 classification system (abridged list)

Code	Causes of death
01–07	<i>Infectious diseases</i>
02	Tuberculosis
08–17	<i>Neoplasm</i>
09	Malignant neoplasm of digestive organs and peritoneum
10	Malignant neoplasm of respiratory and intrathoracic organs
12	Malignant neoplasm of genitourinary organs
25–30	<i>Circulatory diseases</i>
26	Hypertensive disease
27	Ischemic heart disease
29	Cerebrovascular disease
31–32	<i>Respiratory diseases</i>
31	Diseases of the upper respiratory track
47–56	<i>External causes of death</i>
47	Transport accidents
54	Suicide and self-inflicted injury
55	Homicide and injury purposely inflicted by other persons

Methods

As for most causes of death registered numbers are fairly small standardised mortality ratios are employed. The standardised mortality ratio (*SMR*) compares the observed number of deaths in the study population to the expected number

$$SMR = \frac{O}{E} \times 100 = \frac{O}{\sum M_x \cdot p_x} \times 100$$

where *O* is the sex–cause specific number of deaths observed during the period under consideration and *E* is the corresponding expected number derived by applying a set of age–sex–cause specific death rates of a reference population (*M_x*) to the actual age structure of the study population (*p_x*). Lower and upper confidence limits of the SMRs (*SMR_L* and *SMR_U* respectively) are obtained as follows [16–19]:

- (a) for large numbers of observed deaths (*O* ≥ 100) 95 % confidence limits are computed employing the Byar’s approximations:

$$SMR_L = \frac{O}{E} \cdot \left[1 - \frac{1}{9 \cdot O} - \frac{1.96}{3 \cdot \sqrt{O}} \right]^3 \times 100$$

$$SMR_U = \frac{O + 1}{E} \cdot \left[1 - \frac{1}{9 \cdot (O + 1)} + \frac{1.96}{3 \cdot \sqrt{O + 1}} \right]^3 \times 100$$

- (b) for small number of observations (*O* < 100) exact confidence limits are estimated, assuming that deaths are Poisson distributed and relying on the mathematical relationship between the Poisson and the Chi square distributions; the SMR confidence limits are:

$$SMR_L = \frac{\frac{1}{2} \cdot \chi^2_{2 \cdot O, 0.975}}{E} \times 100$$

$$SMR_U = \frac{\frac{1}{2} \cdot \chi^2_{2 \cdot O + 2, 0.025}}{E} \times 100$$

For the purposes of the analysis the age–sex and cause of death specific mortality rates of the Greek native population is used as standard mortality schedule. In this way, though the obtained SMRs may not impart to direct comparisons of mortality levels between population subgroups they do allow, for every cause of death, a comparison of each of these groups to Greek natives, taking into account differences in the age structures.

Results

The numbers and the percentage distribution of the population and of deaths by sex for the natives and the immigrant groups used in the analysis are shown in Tables 2 and 3, respectively. The vast majority of the population consists of Greek natives: 91 % of the males and 92 % of the females. The second largest group is ‘immigrants from European countries but non-EU members’ (about 5 %, slightly more males than females). The other two immigrant groups represent each about 1.7–1.8 % of the overall population but whereas persons originating in EU-27 include an excess of women, those from ‘all other countries’ include an excess of men. Immigrants from ‘EU-27 countries (excluding Greece)’ (henceforth noted as ‘EU-27 immigrants’ for short) include a high proportion of Eastern Europeans (Bulgarians 38 %; Romanians 23 %; Polish 7 % etc.) as well as British (8 %), Cypriots (7 %) and other groups in smaller proportions. Immigrants from ‘European countries but non-EU members’ (henceforth noted as ‘non-EU Europeans’) correspond mainly to Albanians (91 %). Finally, immigrants from ‘all other countries’ are persons originating mainly in Asian and African less developed regions as only 5.1 % of that group come from low mortality developed countries such as the USA, Australia and New Zealand. Hence, the latter group is referred to as immigrants coming from ‘less developed countries’. Regarding the percentage distribution of deaths by sex (Table 3), the proportion corresponding to Greek males is 97 % and to Greek females 98 %, higher than the respective shares of natives in the overall population; by contrast, the proportional representation of ‘non-EU Europeans’ is much lower, only about 1 %. This imbalance is partly related to the older age-distribution of the Greek population which contrasts to the younger distribution of most immigrant groups. Similar imbalances can be observed regarding certain citizenships within the broad population sub-groups, such as Bulgarians, Albanians, UK citizens etc. For instance, whereas Albanians represent 91 % of non-EU Europeans, their deaths correspond to only 59 % of the deaths for that group.

Numbers of male deaths and SMRs by cause for each group of immigrants in comparison to the natives are presented in Table 4. For some causes numbers of deaths are quite small and results should be treated with caution. Regarding all-cause male mortality, immigrants from EU-27 and those from less developed countries show a statistically significant excess compared to native men; by contrast, non-EU Europeans do not differentiate significantly. The SMRs for infectious diseases indicate a statistically significant excess among migrants from coun-

Table 2 Population by sex and citizenship group (percentages in parenthesis): 2011 census of Greece

	Both sexes	Males	Females
<i>Greece total</i>	10,815,197 (100.0)	5,302,703 (100.0)	5,512,494 (100.0)
Greek natives	9,903,268 (91.6)	4,835,789 (91.2)	5,067,479 (91.9)
EU-27 excluding Greece	199,101 (1.8)	81,162 (1.5)	117,939 (2.1)
European non-EU	530,213 (4.9)	268,045 (5.1)	262,168 (4.8)
All other countries	182,615 (1.7)	117,707 (2.2)	64,908 (1.2)
<i>Specific categories</i>			
EU-27 excluding Greece	199,101 (100.0)	81,162 (100.0)	117,939 (100.0)
Bulgaria	75,915 (38.1)	28,686 (35.3)	47,229 (40.0)
Romania	46,523 (23.4)	21,003 (25.9)	25,520 (21.6)
UK	15,386 (7.7)	6528 (8.0)	8858 (7.5)
Cyprus	14,446 (7.3)	7295 (9.0)	7151 (6.1)
Poland	14,145 (7.1)	5412 (6.7)	8733 (7.4)
Germany	10,778 (5.4)	4136 (5.1)	6642 (5.6)
All other EU-27	21,908 (11.0)	8102 (10.0)	13,806 (11.7)
European non-EU	530,213 (100.0)	268,045 (100.0)	262,168 (100.0)
Albania	480,824 (90.7)	255,526 (95.3)	225,298 (85.9)
All other non-EU	49,389 (9.3)	12,519 (4.7)	36,870 (14.1)
All other countries	182,615 (100.0)	117,707 (100.0)	64,908 (100.0)
Asia	138,262 (75.7)	91,245 (77.5)	47,017 (72.4)
Africa	25,846 (14.2)	18,237 (15.5)	7609 (11.7)
North America	7248 (4.0)	3223 (2.7)	4025 (6.2)
Caribbean, Central, South America	2564 (1.4)	743 (0.6)	1821 (2.8)
Oceania	1990 (1.1)	855 (0.7)	1135 (1.8)
Citizenship unknown or not clear	6705 (3.6)	3404 (2.9)	3301 (5.1)

tries in less developed regions; for tuberculosis, in particular, there seems to be also a significant excess among EU-27 Europeans, though numbers are quite small. Regarding neoplasms, on the other hand, all migrant groups exhibit much lower mortality compared to native men. The difference is very pronounced for persons originating in less developed countries who seem to experience less than half the mortality of native men and exhibit very low SMRs for all different types of neoplasms. Significantly lower SMRs with respect to respiratory/intrathoracic neoplasms are also apparent among all groups. By contrast, regarding deaths due to diseases of the circulatory system, and with the exception of non-EU Europeans who do not differentiate significantly compared to the natives, all other groups exhibit a significant disadvantage, the magnitude of which is greatest among persons originating in EU-27. If deaths due to ischemic heart disease (IHD) are considered separately, the disadvantage of EU-27 Europeans becomes even more pronounced; they exhibit 3 times higher numbers of deaths than if they experienced the corresponding death rates of Greek males. Persons originating in less developed countries also seem to have higher mortality from IHD. Regarding respiratory diseases, mortality of EU-27 Europeans significantly surpasses that of Greek males.

Finally, there is a statistically significant excess in mortality of immigrant males from external causes which is especially pronounced among EU-27 and persons from less developed regions. Deaths due to homicide are very prominent but transport accidents are also quite important; suicide is significant only among EU-27 male immigrants.

SMRs by cause of death for females are presented in Table 5. Regarding all-cause mortality, EU-27 immigrants again exhibit a significant excess compared to native women; non-EU women also show a significant but modest excess while women from less developed countries exhibit a significant advantage. Regarding cause-specific patterns, non-EU women and especially those from countries in less developed regions have significantly lower SMRs from neoplasms whereas EU-27 women do not differentiate significantly compared to native women. On the other hand, all immigrant women originating in Europe have elevated mortality due to diseases of the circulatory system and more specifically cerebrovascular disease and among EU-27 IHD, too. Women originating in Asian/African countries, however, have significantly lower mortality from cerebrovascular disease. Finally, all three groups of immigrant women exhibit very high SMRs regarding deaths due to external causes; again transport accidents seem

Table 3 Number of deaths by sex and citizenship group (percentages in parenthesis): 2010–2012 annual average vital statistics of Greece

	Both sexes	Males	Females
<i>Greece total</i>	112,193 (100.0)	58,156 (100.0)	54,037 (100.0)
Greek natives	109,559 (97.7)	56,520 (97.2)	53,039 (98.2)
EU-27 excluding Greece	988 (0.9)	597 (1.0)	391 (0.7)
European non-EU	1103 (1.0)	624 (1.1)	479 (0.9)
All other countries	543 (0.5)	415 (0.7)	128 (0.2)
<i>Specific categories</i>			
EU-27 excluding Greece	988 (100.0)	597 (100.0)	391 (100.0)
Bulgaria	156 (15.8)	86 (14.4)	70 (17.9)
Romania	90 (9.1)	61 (10.2)	29 (7.4)
UK	207 (21.0)	130 (21.8)	77 (19.7)
Cyprus	65 (6.6)	36 (6.0)	29 (7.4)
Poland	63 (6.4)	43 (7.2)	20 (5.1)
Germany	136 (13.8)	85 (14.2)	51 (13.0)
All other EU-27	271 (27.4)	156 (26.1)	115 (29.4)
European non-EU	1103 (100.0)	624 (100.0)	479 (100.0)
Albania	650 (58.9)	402 (64.4)	248 (51.8)
All other non-EU	453 (41.1)	222 (35.6)	231 (48.2)
All other countries	543 (100.0)	415 (100.0)	128 (100.0)
Asia	332 (61.1)	257 (61.9)	75 (58.6)
Africa	78 (14.4)	65 (15.7)	13 (10.2)
North America	58 (10.7)	36 (8.7)	22 (17.2)
Caribbean, Central, South America	11 (2.0)	6 (1.4)	5 (3.9)
Oceania	13 (2.4)	8 (1.9)	5 (3.9)
Citizenship unknown or not clear	51 (9.4)	43 (10.4)	8 (6.3)

important; suicides only among EU-27 women and homicides only among non-EU.

Discussion and Conclusion

In this paper the importance of different causes of death for immigrants in Greece in 2011 is examined for the first time. Due to the tabulations provided by the Hellenic Statistical Authority on deaths by cause the analysis was carried out for natives and for three broad categories of migrants; these correspond to EU-27 citizens (except Greece), non-EU Europeans (mainly Albanians) and migrants originating mostly in less developed Asian/African countries. All groups comprise mainly first generation immigrants; the first two groups include a high proportion of persons who established themselves in Greece around 1991 or soon thereafter and originate in neighbouring Balkan and Eastern European countries; the third group represents more recent arrivals from further away. Though fusing countries together may cause specificities to mitigate, the findings indicate marked differences compared to the mortality patterns of the native population which diverge across immigrant groups.

Immigrants, with the exception of non-EU males and Asian/African females, seem to exhibit significantly higher all-cause mortality compared to Greeks. This contrasts with findings of other studies indicating a significant advantage for most migrant groups [1–4]. On the other hand, it is reassuring as it may also imply that the estimates are not strongly affected by the ‘salmon effect’. In fact, immigrants coming from Asian/African countries are very unlikely to afford repatriation expenses in case of illness; they are much more likely to remain in the country and use the Greek health care system. Regarding the other two groups of immigrants, they are more likely to repatriate in such circumstances given the proximity of their countries of origin. Still, this may not hold for Albanians who have been established with their families in the country for longer (especially since the Albanian health care system is not very efficient).

Regarding the cause specific analysis, immigrants coming from other EU-27 countries exhibit higher mortality from diseases of the circulatory system, external causes of death and, males only, from diseases of the respiratory system and TB (though numbers for the latter cause are quite small); on the other hand, males have lower mortality from malignant neoplasms. These results are not

Table 4 Observed number of deaths (OBS), standardized mortality ratios (SMR) and confidence intervals (95 % CI in parenthesis) by selected causes of death and citizenship group: males

Causes of death ^a	Greek natives		EU-27 (excluding Greece)		non-EU Europeans		All other citizenships	
	OBS	SMR	OBS	SMR (95 % CI)	OBS	SMR (95 % CI)	OBS	SMR (95 % CI)
<i>All causes</i>	56,520	100	597	172 (158, 186)	624	95 (88, 103)	415	130 (118, 144)
<i>Infectious diseases</i>	467	100	7	238 (96, 491)	6	98 (36,213)	10	321 (154, 590)
Tuberculosis	43	100	3	695 (143, 2,031)	2	182 (22, 657)	5	890 (289, 2,076)
Neoplasms	16,544	100	88	77 (62, 95)	147	74 (63, 87)	35	41 (29, 57)
Digestive and peritoneum	4474	100	22	75 (47, 114)	41	82 (59, 111)	10	46 (22, 85)
Respiratory and intrathoracic	5648	100	31	70 (48, 99)	42	59 (43, 80)	9	32 (15, 61)
Genitourinary	2887	100	13	92 (49, 157)	20	94 (57, 145)	3	27 (6, 79)
<i>Circulatory diseases</i>	22,263	100	265	215 (190, 242)	205	93 (81, 107)	133	120 (101, 142)
Hypertension	773	100	7	205 (83, 422)	6	121 (44, 249)	1	36 (1, 201)
IHD	6869	100	162	295 (250, 347)	94	83 (67, 102)	76	154 (121, 193)
Cerebrovascular	6296	100	37	131 (92, 181)	54	120 (90, 157)	28	111 (74, 160)
<i>Respiratory diseases</i>	5377	100	38	156 (110, 214)	27	68 (45, 99)	14	63 (34, 106)
Upper track	1781	100	10	138 (66, 254)	8	73 (32, 144)	3	45 (9, 132)
<i>External causes</i>	2273	100	120	323 (267, 386)	145	131 (111, 154)	164	279 (238, 326)
Transport accidents	913	100	37	226 (159, 312)	60	120 (92, 155)	50	185 (137, 244)
Suicide	340	100	17	312 (182, 500)	13	83 (44, 142)	12	152 (79, 266)
Homicide	90	100	7	412 (166, 849)	17	325 (189, 520)	26	907 (593, 1,329)

^a Classification according to the ICD-9, abridged list

Table 5 Observed number of deaths (OBS), standardized mortality ratios (SMR) and confidence intervals (95 % CI in parenthesis) by selected causes of death and citizenship group: females

Causes of death ^a	Greek natives		EU-27 (excluding Greece)		Non-EU Europeans		All other citizenships	
	OBS	SMR	OBS	SMR (95 % CI)	OBS	SMR (95 % CI)	OBS	SMR (95 % CI)
<i>All causes</i>	53,039	100	391	142 (128, 156)	479	114 (104, 125)	128	58 (49, 69)
<i>Infectious diseases</i>	529	100	4	153 (42, 392)	4	97 (26, 248)	1	46 (1, 256)
Tuberculosis	25	100	1	463 (12, 2579)	1	270 (7, 1506)	1	700 (18, 3896)
Neoplasms	10,547	100	86	88 (70, 109)	108	80 (66, 95)	23	40 (25, 60)
Digestive and peritoneum	3214	100	19	82 (49, 128)	31	97 (66, 138)	3	22 (5, 64)
Respiratory and intrathoracic	1233	100	18	133 (79, 210)	10	59 (28, 109)	3	41 (9, 120)
Genitourinary	1450	100	12	83 (43, 145)	20	103 (63, 159)	3	36 (7, 105)
<i>Circulatory diseases</i>	25,126	100	161	165 (140, 192)	196	132 (114, 151)	44	48 (35, 64)
Hypertension	866	100	5	169 (55, 395)	7	155 (62, 319)	1	33 (1, 184)
IHD	4229	100	58	228 (173, 295)	42	115 (83, 155)	14	75 (41, 126)
Cerebrovascular	8740	100	44	140 (102, 188)	65	133 (103, 170)	9	29 (13, 55)
<i>Respiratory diseases</i>	5156	100	28	135 (90, 195)	34	105 (73, 147)	11	57 (29, 102)
Upper track	1920	100	9	128 (58, 243)	10	92 (44, 169)	4	58 (16, 149)
<i>External causes</i>	680	100	43	373 (270, 502)	47	209 (154, 278)	21	328 (203, 501)
Transport accidents	220	100	19	423 (255, 661)	18	193 (114, 305)	5	209 (68, 488)
Suicide	60	100	5	336 (109, 784)	6	204 (75, 444)	1	125 (3, 697)
Homicide	27	100	2	357 (43, 1290)	4	372 (101, 953)	1	323 (8, 1800)

^a Classification according to the ICD-9, abridged list

surprising given the cause of death patterns of these ethnicities in their countries of origin. For instance, Eastern Europeans who comprise more than two-thirds of the group and, especially Bulgarians and Romanians, have fairly high mortality rates from cardiovascular diseases in their countries of origin [20]. Romanian men in their home country as well as Bulgarian and Polish, but to a lesser extent, exhibit also comparatively high mortality from TB [20]. Moreover, deaths due to external causes and injuries seem quite elevated in these countries and a high proportion is related to road traffic accidents just as regarding these ethnic groups in Greece [20]. However, the substantial excess in deaths due to homicide, though a common finding in several studies researching immigrant cause-specific mortality, is not apparent in the mortality statistics of the countries of origin [13, 21]. This is most likely related to the social conditions prevailing within immigrant groups in the host country. Finally, males from EU-27 countries seem to experience significantly lower mortality from malignant neoplasms compared to Greek males. Death rates from cancer in 2008 seem lower in some Eastern European countries, such as Romania, compared to Greece but only marginally so in Bulgaria and Poland [20]. However, Western Europeans, albeit included in low proportions within this group, exhibit even lower mortality from cancers; hence, the difference in comparison to the native Greek population seems more marked.

Immigrant men originating in non-EU countries, in this instance mostly Albanians, do not differentiate significantly compared to Greek males; women, however, seem to have somewhat higher all-cause mortality. The cause-specific analysis indicates an advantage for this group regarding deaths from cancer but a disadvantage with respect to deaths from external causes; women also have higher mortality from diseases of the circulatory system. These results, with the exception of mortality due to external causes, are in agreement with the patterns observed in the country of origin: mortality due to malignant neoplasms is quite low for both sexes but whereas death rates due to cardiovascular diseases among males seem very similar to those of Greek men, among women they are much higher compared to Greek females regarding both IHD and cerebrovascular disease [20, 22].

Immigrants from less developed countries exhibit favourable mortality with respect to neoplasms but males have higher mortality from IHD as well as from infectious diseases and TB compared to native men. Mortality from external causes of death and especially homicide are very high for both sexes. The disadvantage of immigrants due to cardiovascular diseases seems in accordance with statistics showing that IHD is a leading cause of death in East Asia while it is on the increase among African populations [12,

23]. Infectious diseases and TB in particular may be linked to exposure to infectious agents in the country of origin, not having been vaccinated, as well as substandard living conditions, overcrowded accommodation, poor sanitation and poor diet in the country of destination. Moreover, limited access to health care services, particularly for undocumented immigrants, their inability to communicate effectively (language barrier) etc. may contribute to a high incidence.

To conclude, the results of the study indicate that cause-specific mortality of immigrant groups is quite similar to that in the respective countries of origin. This is not surprising given that immigrants in Greece are fairly recent arrivals, carrying along health behaviours and health problems originating in their home country, while acculturation, which may lead to a greater homogeneity in comparison to the host population, has not occurred yet [12, 24–28]. Some similarities are observed across ethnicities: immigrants exhibit an increased risk of dying due to infectious diseases, external causes of death and homicide while they have lower mortality from malignant neoplasms; these findings are quite similar to other studies [1, 13, 29]. On the other hand, the risk of dying from cerebrovascular disease and IHD differentiates between these groups dependent on place of origin. Albanians, a well established group in Greece representing more than half of the immigrants seem to experience the most favourable conditions in comparison to the local population. However, even this well integrated group experiences excessive mortality from external causes (linked to a high incidence of work and traffic accidents) as well as homicide.

The results highlight the specificities of immigrant mortality some of which stem from pre-existing conditions characterising the country of origin and others from the adverse socio-economic environment prevalent in the country of destination [21, 26, 28]. As immigrants in Greece experience excessive deaths from ‘avoidable’ causes such as TB, IHD, suicide etc., appropriate measures should be integrated in the social and health care policies of the Greek State to reduce levels. Prevention should be promoted through spreading of information while, at the same time, accessibility and affordability of public health care services should improve for the more deprived immigrants and those uninsured. This is difficult to achieve in the stern climate of the current economic crisis, of the austerity and the reforms imposed on the Greek health care system. Future analysis should deal with trends by cause taking into account length of residence in the country (when such information becomes available). In this way tendencies and differentials will be clarified and the effectiveness of health and social policies may be assessed.

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