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# Elevated mortality among second-generation children of migrants:

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## Abstract

**Introduction:** the "second-generation" (descendants of migrants) represent the fastest growing sector of the child and young adult populations in Europe today. Research suggest that their mortality is high relative to individuals born to non-migrants. **Sources of data:** peer-reviewed publications. **Areas of agreement:** second-generation status is a marker of elevated mortality risk within Europe in early life (including stillbirth, perinatal, neonatal, *and* infant mortality) and adulthood, particularly if their migrant parent(s) were born outside of Europe. **Areas of controversy:** It remains unclear what causes-of-death are driving this raised mortality or which background factors (e.g., medical, socioeconomic) are most influential. **Growing points:** the second-generation will continue to grow and diversify—now is the time to intervene to address these inequalities. **Areas timely for developing research:** place more emphasis on the role of background factors related to health, migration, integration, and the characteristics of the local area.

**Keywords:** second-generation, children of migrants, mortality, inequality, Europe

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## Introduction

International migration has exerted salient demographic change in the world in the past century; this is something that is likely to continue. This change is so great that the children of migrants (the so called "second-generation") represent the fastest growing sector of the child and young adult populations in many countries across the world today [1]. This includes Europe, where over a quarter of the world's migrants currently reside. This demographic transformation has major implications for population health, public health policy, clinical medicine, social policy, and research. While the evidence reveals that international migrants (the "first-generation") have lower mortality rates than the non-migrant population of the host country (a "healthy migrant effect") [2,3], the evidence relating to their children (the "second-generation") tells a very different story.

In this article, we synthesise evidence relating to the mortality of the second-generation within Europe. The review is organised as follows: we outline how the second-generation are defined (*section 2*), provide a brief statistical picture of the second-generation in Europe today (*section 3*), describe our methods (*section 4*), summarize the extant evidence and introduce the primary factors thought to explain the mortality of the second-generation in early life (*section 5*) and adulthood (*section 6*), before closing by recommending potential areas of intervention (section 7).

## Who are the second-generation?

The children of migrants – specifically children born in the country that their migrant parent(s) are residing in (the "host" country)[A] – are known as the "second-generation". They can also be referred to as the "descendants" or "offspring" of migrants. Exactly how the second-generation are defined can vary within and between countries, rendering comparisons of the evidence base difficult. This heterogeneity reflects a lack of universally accepted definition for "migrant"—including in international law. Any person that moves from their usual of place residence to another, within a country or beyond international borders, for any amount of time, and for any reason can be considered a migrant. For the purposes of this review—to maximise the potential evidence—we refer to migrants as people residing in a country other than their country of birth, as identified directly by the country of birth or indirectly through having foreign citizenship or nationality.

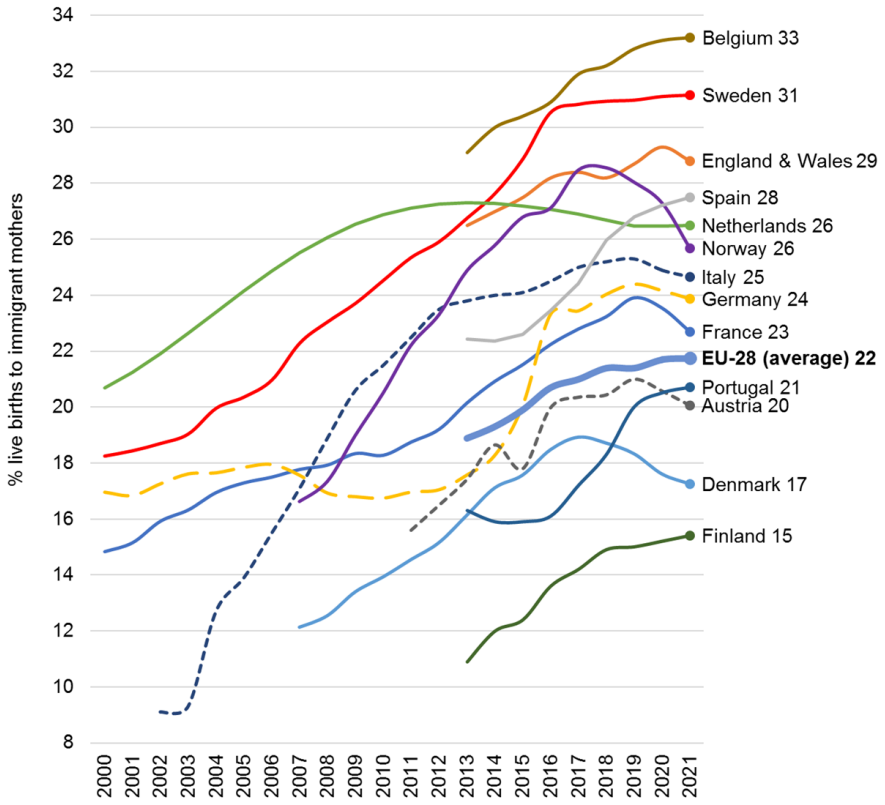
[A] The children of migrants who are born in the country of birth of their parents and arrive as dependents in the host country are known as the Generation 1.5. For example, a migrant arriving in the host country at age 10-years old.

In early life mortality studies (defined here as death before 15-years old), the second-generation are defined exclusively according to the migrant status of the mother. This reflects the higher rates of missing paternal information for a pregnancy or birth [4] and the more salient influence of the biological, medical, demographic, and socioeconomic characteristics of the mother on the health of their child [5]. For adult mortality (defined here as death on or after 15-years old), studies tend to adopt a much more inclusive definition, considering an individual to be second-generation if they were born in the host country to *at least one* migrant parent (the mother and/or the father)[B]. The greater relevance of the father's migration status in the adult mortality of the second-generation reflects a transition away from biological, medical, and health care-related factors (as primary explanations of early life mortality) and towards the social determinants of health.

**A statistical portrait of the second-generation**

Numbers of second-generation within Europe are growing in size and becoming more diverse. The past several decades have witnessed shares of second-generation increase (in absolute and relative terms as a share of total resident populations) in nearly all European countries. In 2019, 21% of all live births in the European Union (EU)/European Economic Area (EEA) were to a migrant mother (**Figure 1**). These relative shares were even higher in major host countries like Belgium (33%), England & Wales (29%), Germany (30%), Norway (30%), Sweden (31%) and Switzerland (45%). The majority of second-generation births (74%) were to a migrant mother born outside of the EU/EEA (**Figure 1**). In comparison, the shares of adult second-generation are comparatively lower and less diverse. In 2021, the second-generation comprised 11% of the EU/EEA resident population aged 15-29 and just 6% of the population aged 30-74 (**Table 1**). Most of the migrant parent(s) of the adult second-generation were born in other parts of Europe (70%) [1]. Together, these patterns reflect the earlier onset of intra-European migration (resulting in a majority "European-origin" adult second-generation today) followed by recent inflows from migrants outside of Europe (resulting in a majority "non-European-origin" infant second-generation).

[B] Some studies differentiate the "second-generation" according to whether one or both of their parents are migrants. Those with two migrant parents continue to be referred to as the "second-generation". Those with a migrant and a non-migrant parent are referred to as the "Generation 2.5". They are differentiated through the idea that having a non-migrant parent might prove to be beneficial to the establishment of status, awareness of rights, and access to opportunities among the children of migrants and their ability or not to adapt and integrate into mainstream society.




Composition (%) of births to immigrant mothers by origin of immigrant mother (2019)

| Mother born in: | EU-28 | non-EU |
|---|---|---|
| France | 12% | 88% |
| Sweden | 15% | 85% |
| Portugal | 17% | 83% |
| Spain | 18% | 82% |
| Italy | 22% | 78% |
| Finland | 23% | 77% |
| EU-28 | 26% | 74% |
| Netherlands | 27% | 73% |
| Germany | 28% | 72% |
| Denmark | 31% | 69% |
| Belgium | 33% | 67% |
| Norway | 36% | 64% |
| England & Wales | 38% | 62% |
| Austria | 41% | 59% |

**Figure 1.** Relative share (%) of live births to immigrant mothers in selected European countries. Notes: **solid lines** (mother's country of birth), **short dashed lines** (mother's citizenship), **long dashed lines** (mother's nationality). Sources: Austria (*Statistik Austria*); Denmark (*Danmarks Statistik*); England & Wales (the *Office for National Statistics*); France (*Institut national de la statistique et des études économiques*); Germany (*Statistisches Bundesamt*); Italy (*I.Stat*); the Netherlands (*Caribisch Nederland*); Norway (*Statistisk sentralbyrå*); Sweden (*Statistiska centralbyrån*). All other derived from Eurostat table "Live births by mother's age and country of birth".

## Methods

In February 2023, extensive searches were conducted in *Scopus*, *PubMed*, and *Web of Science*. The search strings included a combination of terms related to the second-generation (see "*Who are the second-generation*?") and variations on terms related to mortality (e.g., survival, death, longevity) and its different stages (e.g., stillbirth, infant, neonatal, perinatal, adult). The searches were limited to English language. Search strings are provided in **Supplementary file S1**. In line with the guidelines, we limited our reference list by prioritising the inclusion of systematic reviews alongside the inclusion of recent work that post-dated these reviews. **Supplementary file S2** provides basic descriptive information from the studies, including the mortality outcome (perinatal, stillbirth, neo-natal, infant, under-5-years old mortality, and adult mortality), causes-of-death (where studied), the "host" country in which the study was conducted, and the birth countries of the migrant parent(s) of the second-generation. In total, we include three systematic

reviews on early life mortality from 2009 and 2010 [5–7], a systematic review of systematic reviews on early life mortality [8], and 22 studies post-dating the earlier systematic reviews [4,9–29]. For adult mortality, we include 21 studies. No new data were generated in support of this review [1,30–47].

**Table 1.** Relative proportion (%) of the G2 of total resident populations aged 15-74 in 2021.

| **Countries** | **Age bands** | | | |
|---|---|---|---|---|
| | 15-74 | 15-29 | 30-54 | 55-74 |
| Slovenia | 22.4 | 10.1 | 15.2 | 22.4 |
| Latvia | 20.1 | 12.8 | 25.2 | 20.1 |
| Estonia | 19.2 | 12.5 | 22.0 | 19.2 |
| Luxembourg | 16.0 | 31.5 | 11.4 | 16.0 |
| Sweden | 12.2 | 18.5 | 11.1 | 12.2 |
| Belgium | 12.1 | 19.9 | 12.0 | 12.1 |
| Germany | 11.9 | 16.6 | 9.0 | 11.9 |
| France | 11.7 | 12.8 | 13.5 | 11.7 |
| Netherlands | 10.7 | 17.7 | 10.0 | 10.7 |
| Austria | 10.5 | 20.2 | 7.3 | 10.5 |
| Croatia | 9.7 | 19.1 | 8.9 | 9.7 |
| **European Union 27** | **6.9** | **10.9** | **5.7** | **6.9** |
| Norway | 6.1 | 12.6 | 4.7 | 6.1 |
| Ireland | 5.9 | 14.6 | 3.3 | 5.9 |
| Portugal | 4.8 | 15.3 | 3.0 | 4.8 |
| Cyprus | 4.8 | 12.7 | 2.8 | 4.8 |
| Czechia | 4.5 | 3.9 | 3.8 | 4.5 |
| Lithuania | 4.1 | 3.2 | 4.3 | 4.1 |
| Malta | 3.8 | 10.5 | 1.7 | 3.8 |
| Denmark | 3.4 | 6.2 | 2.4 | 3.4 |
| Spain | 2.8 | 8.9 | 1.6 | 2.8 |
| Greece | 2.7 | 8.3 | 1.4 | 2.7 |
| Italy | 2.6 | 9.2 | 1.2 | 2.6 |
| Poland | 2.4 | 0.4 | 1.4 | 2.4 |
| Finland | 2.3 | 6.8 | 1.2 | 2.3 |
| Slovakia | 1.8 | 1.3 | 2.0 | 1.8 |
| Hungary | 1.7 | 2.1 | 1.1 | 1.7 |

*Source: derived from Labour Force Survey (LFS, 2021) online data browser table "population by the educational attainment level of the parents, sex, age, migration status, and educational attainment level)".*

**Early life mortality among the second-generation**

Several systematic reviews of the early life mortality of the second-generation were published in 2009[5–7], followed by a systematic review of systematic reviews in 2018[8]. The 2009 reviews fitted meta-analyses [5–7], the results of which are summarized in **Table 2**. Higher mortality is

found among the second-generation for perinatal, stillbirth, neonatal, *and* infant mortality. This disadvantage is most pronounced among the second-generation with migrant mothers from non-European origins and those with migrant mothers who arrived as "refugees" [5] (notably from former Yugoslavia)[c]. *Gagnon et al.* report higher early life mortality among second-generation with migrant mothers born in Asia, Northern Africa and Sub-Saharan Africa, but not those with migrant mothers who were born in Latin America or other parts of Europe [6]. This geographic variation broadly matches the description of the mortality variation by mothers' birth country in *Gissler et al*. [5] *and* the variation found in the incorporated studies postdating the review [4,9–29].

**Table 2.** Summary of results from meta-analyses on early life **G2** mortality in Europe.

| Study | Outcome | G2 group | Metric | Est. | 95% CIs |
|---|---|---|---|---|---|
| Gissler et al. (2009) | Stillbirth | All G2 | RR | 1.34 | 1.30 - 1.38 |
| | Perinatal | | RR | 1.35 | 1.26 - 1.45 |
| | Neonatal | | RR | 1.34 | 1.30 - 1.38 |
| | Infant | | RR | 1.33 | 1.30 - 1.36 |
| | Stillbirth | Non-Western | RR | 1.88 | 1.58 - 2.23 |
| | Perinatal | | RR | 1.54 | 1.39 - 1.69 |
| | Neonatal | | RR | 1.40 | 1.36 - 1.44 |
| | Infant | | RR | 1.37 | 1.34 - 1.40 |
| | Stillbirth | Refugee | RR | 2.01 | 1.47 - 2.73 |
| | Early neonatal (1) | | RR | 2.77 | 1.85 - 4.13 |
| | Perinatal | | RR | 1.71 | 1.41 - 2.06 |
| Gagnon et al. (2009) | Feto-infant (2) | Asian | aOR | 1.29 | 1.02 - 1.63 |
| | | North Africa | aOR | 1.25 | 1.10 - 1.41 |
| | | Intra-Europe | aOR | 1.14 | 0.75 - 1.72 |
| | | Latin America | aOR | 1.02 | 0.76 - 1.39 |
| | | Sub-Saharan Africa | aOR | 2.43 | 0.99 - 5.96 |
| Bollini et al. (2009) | Perinatal | All G2 | OR | 1.50 | 1.47 - 1.53 |
| | | All G2 in host countries with weaker integration policies | OR | 1.56 | 1.52 - 1.60 |
| | | | aOR | 1.45 | 1.13 - 1.86 |
| | | All G2 in host countries with stronger integration policies | OR | 1.41 | 1.37 - 1.46 |
| | | | aOR | 1.25 | 1.17 - 1.34 |

*Sources: Gissler et al. 2009 [5]; Gagnon et al. 2009 [6]; Bollini et al. 2009 [7]*

Notes: (1) early neonatal mortality (a death occurring 0-6 days after birth) (2) feto-infant mortality (neonatal mortality, infant mortality, and spontaneous abortions). aOR in Bollini et al. (2009) additionally adjusted for age at delivery and parity (3) data from the 22 studies post-dating the reviews are not included in the meta-analyses reported for these systematic reviews.

[c] Defined in the meta-analysis to include those who left home "unwillingly" or had been in resettlement camps.

Simultaneously, these estimates mask a large amount of heterogeneity that reflects the diversity of the second-generation in Europe today. Looking within the world regions used to categorise mother's birth country in **Table 2**, we see marked variation in early life mortality risk. Second-generation born to migrant mothers born in Asia are a prime example. Five studies find elevated stillbirth and infant mortality in second-generation born in Denmark and Norway to migrant mothers born in Sri Lanka and Pakistan, but not Vietnam or Thailand [13,17,20,21,26]. Another study documents elevated neonatal and infant mortality among second-generation born in England & Wales to migrant mothers born in Bangladesh and Pakistan, but not in India [24]. There are also cases where early life mortality among the second-generation with migrant mothers born in the same birth country/region varies by the mother's host country. For example, second-generation with migrant mothers born in Northern Africa have a high early life mortality risk if they were born in France [5,25] and Belgium [10–12], but not if they were born in the Netherlands [5] or in Norway [5,21].

Nevertheless, certain groups do face persistent excess early life mortality risks in Europe. Of all the second-generation defined in the studies, those with migrant mothers born in Turkey [5,10–12,14,16,17,21,26,27,29], Sub-Saharan Africa [5,9–13,16,17,19,21–26,29] (particularly Somali [5,13,16,17,21,26,29]), and Pakistan [5,13,16,17,20,21,24,26,29] are consistently vulnerable to death in early life in Europe. This holds true before *and* after adjusting for a range of potential factors that might help to explain high early life mortality relative to children born to non-migrants. These are explored in **Table 3**.

Beyond mortality from all causes-of-death, congenital anomalies (particularly among second-generation with migrant mothers born in Sub-Saharan Africa, the Middle East and North Africa) [5,9,11,12,16,29], hereditary metabolic diseases [5], infectious diseases [5,9], prematurity conditions [12], intrapartum events (including birth asphyxia) [12], and accidents & injuries [5,29] are identified as *potentially* important causes-of-death. Yet, the evidence relating to specific causes-of-death is limited.

Some of the studies only provide crude and/or minimally-adjusted estimates of mortality (e.g., by year of birth). Many of the studies, however, used statistical methods to adjust for biological, demographic, medical, and socioeconomic background factors that might account for the higher early life mortality risk of the second-generation as compared to children born to non-migrants. **Table 3** provides a list of the factors adjusted for most regularly in the articles. The factors are myriad, complex, interrelated and likely vary in their influence contingent upon the country of

birth of the migrant mother and/or the host country that they are residing in. In line with Gissler et al., adjustment for background factors in the studies post-dating their review only partially explain higher early life second-generation mortality, with sizeable amounts of excess mortality remaining [5]. We present the factors in alphabetical order to avoid assigning a value to specific ones.

**Table 3.** Factors linked to higher early life second-generation mortality (alphabetical order).

| Factor | Description | Studies |
|---|---|---|
| Culture and religion | Cultural and religious practices unique to some of the countries that migrant mothers are born in that lead to lower attendance at prenatal screening, lower or non-consumption of folic acid, reluctance to have a Caesarean section or to terminate a risky pregnancy, the promotion of maternal pre-starvation practices, or female genital mutilation—have all been associated with a heightened risk of early life mortality in the second-generation. The practice of cousin marriages in some countries in which migrant mothers are born is linked to high early life mortality risk through the inherited disorders and congenital anomalies. | 5,7–9,11,12,14–18,21,23,29 |
| Demography | A low (<18) or high maternal age (>35), having never given birth before—or having given birth three or more times—and having a small (<18 months) or large interval (>60 months) between births have been linked to higher early life mortality. These factors vary according to the mother's migrant group. | 4–6,9–29 |
| Health care access and utilisation | Migrant mothers as experiencing higher levels of suboptimal care through delays in diagnosis, treatment and referral, inadequate assessment, poor patient management, and an inability to provide translators to be able to communicate. | 5,6,8,9,11,12,17–19,19,21,23–29 |
| Health of the mother | Specific health conditions (e.g., obesity, diabetes, hypertension, anaemia, infections [HIV, malaria, tuberculosis], deficiency disorders, and pre-eclampsia) increase the risk of early life mortality. Migrant mothers born in certain countries are disproportionately affected by some of these conditions. | 5,7,8,10–12,17–19,19,21–25,27 |
| Integration | National integration policy of the host country as affecting social determinants of health, access to health care and societal attitudes towards migrants. The estimates from Bollini et al. in **Table 2** reveal that the relative excess in early life mortality risk is lower among second-generation born in host countries with stronger policies in place compared to weaker policies. | 5,7,8,14,22,23,27 |
| | Having arrived in the host country recently, an inability to speak the language, having both a migrant mother *and* father, and not having citizenship in the host country are measures of individual-level integration that are associated with a higher early life mortality risk via mechanisms such as downward social mobility and unfamiliarity with the health care system. | 5–8,10–12,18,19,21–26 |
| Migration-related factors | Refugee migrant mothers as being potentially exposed to violence, food shortage, lack of public health service, and psychological stress during their journey to the host country. The "healthy migrant effect" and selection upon the health and social status of the mother as affecting the health of the child. | 5,8,10,14,19,24,28 |
| Racism and discrimination | Elevated maternal stress in migrant mothers due to racism and discrimination in everyday life and the health care system may | 5,7,17,25,27 |

| | | |
|---|---|---|
| | elevated the risk of early mortality. Specific events within the health care system may deter the further utilisation of services. | |
| Social determinants of health (SDH) | Increased exposure of migrant parent(s) to socioeconomic disadvantage in the host country. Most often measured as having a lower education level, a lower graded occupation, a raised risk of unemployment, and lower income. SDH are a known risk factor for an increased early life mortality risk. | 5,7,8,10–12,14–19,21–25,27–29 |

**Adult mortality among the second-generation**

Studies of all-cause mortality find evidence of higher adult mortality among second-generation with migrant parent(s) born outside of Europe relative to adults born in the host country to two parents born in the host country [1,33,35,43–45,47]. Most of this higher mortality is concentrated in men [1,33,35,44,45,48]; it presents most consistently among second-generation with migrant parent(s) born in the Middle East, North Africa (MENA) [1,33,35,43–45,48] and Sub-Saharan Africa [35,43,47,48]. In contrast, there is less indication of any excess in the second-generation with European origins [1,33,35,44,45]. There are even some cases of lower mortality among second-generation adults with migrant parent(s) that are born in Southern Europe [35,44,45]. However, there is evidence of higher mortality among second-generation with migrant parent(s) born in: Ireland living in England & Wales [30], France living in Belgium [35] and Finland [1,33,48] and former Yugoslavia living in Sweden [33,48].

What sets the adult mortality literature apart from the early life mortality literature is the ability to produce mortality estimates for migrants and compare mortality across generations [D]. Doing so provides considerable insight into the adult mortality variation described above. Eight of the twelve studies contribute all-cause mortality estimates for the first-generation [1,35,43,45–47] [E]. When mortality among second-generation with non-European origins is *higher* than mortality among non-migrants; the mortality risk of the first-generation (i.e., migrants) is almost always *lower*. This is the case for migrants born in MENA [35,43,45], Sub-Saharan Africa [35,43,47], Asia [1,47], Central & Southern America [1] and the Caribbean [47] compared to the higher mortality of their respective second-generation population. Conversely, when the mortality of second-generation with European origins is *higher* the mortality risk of the first-generation is higher too [1,30,35,47,48]. So, these isolated instances of raised mortality among second-generation with European origins reflect the perpetuation of existing disadvantage experienced by the first-generation. In contrast, high mortality among second-generation adults with non-European origins indicates a complete

[D] These intergenerational comparisons do not really compare parents to their children but concurrent generations.
[E] This is all but impossible for early life mortality due to the lack of arrivals of very young children arriving from another country in the first year of life – and particularly in the first 28 days when risk of infant mortality is highest.

reversal from a position of relative mortality advantage to one of disadvantage within a single generation.

Studies on cause-of-death in the second-generation in adulthood are scarce and paint a complex picture of specific risks according to the country of birth of their migrant parent(s) and the host country that they are living in. Some studies report increased mortality from *all external causes-of-death combined,* including adults with migrant parent(s) born in Finland, former Yugoslavia, MENA and Sub-Saharan Africa residing in Sweden [1,33,48] and Ireland residing in England and Wales [30], but not Western Europe residing in Sweden [33,48] or Indonesia living in the Netherlands [31]. *Accident & injury mortality* is highly elevated among adults with migrant parent(s) born in Finland and Sub-Saharan Africa living in Sweden [1] and Ireland living in England and Wales [30]. *Substance misuse mortality* is raised among adults with migrant parent(s) born in Northern Africa living in Belgium [45] and in all second-generation groups in Sweden except Sub-Saharan Africa [1,32]—particularly high relative risks are reported among adults with migrant parent(s) born in Finland, Central & Eastern Europe and MENA countries [1]. Studies on *suicide mortality* report a higher risk in second-generation with migrant parent(s) born in other Nordic countries living in Norway [39] and Sweden [1,40,42], contrasting with the lower mortality risk of adults with migrant parent(s) born in MENA residing in Belgium (see Morocco and Turkey) [41] and Sweden [1,40].

Regarding natural causes-of-death, the risk of *all cancer mortality* often closely resembles that of adults born to non-migrants, irrespective of the birth country of the migrant parent(s) or host country [1,31,34–37]. Nevertheless, people with migrant parent(s) born in France and Morocco residing in Belgium stand out for their high relative *all cancer mortality* risks [35,37]. For *lung and liver cancer*—which more closely reflect lifestyle factors such as diet, smoking, and drinking—studies report raised mortality among adults with migrant parent(s) born in France and Morocco living in Belgium [35,37], Ireland in England & Wales [30], and Indonesia in the Netherlands [31], but lower mortality in second-generation with other Western-European (non-French) origins living in Belgium [35,37]. In Sweden, *alcohol-related mortality* is lower for adults with migrant parent(s) born in non-Nordic countries living in Sweden [32]—compared to adults born to non-migrants—but higher among adults with migrant parent(s) born in Finland [49]. *Circulatory disease* (and notably *coronary heart disease*) mortality is raised adults with migrant parent(s) born in Turkey living in Belgium and Sweden [35,38], France and Morocco living in Belgium [35], and Central & Eastern Europe, Denmark, Finland, and Norway in Sweden [1,38]. *Infectious disease mortality* (including HIV and Hepatitis) is elevated among adults with migrant parent(s) born in France,

Morocco, Turkey and Sub-Saharan Africa living in Belgium [35] and Indonesia in the Netherlands [31].

Many of the studies use statistical methods to adjust for background factors that might help to account for the high adult mortality risk of the second-generation as compared to those born to non-migrants. **Table 4** provides a list of the factors regularly adjusted for in the articles. They are myriad, complex, interrelated and likely vary in their influence based upon the birth country of the migrant parent(s) and the host country. We present the included factors in alphabetical order.

**Table 4.** Common explanations of adult second-generation mortality (alphabetical order).

| Factor | Description | Studies |
|---|---|---|
| Adaptation & health behaviours | The retention (or not) of the health behaviours of the migrant parent(s)—as informed by the values and social norms of the birth country—as influencing the mortality risk of the second-generation. For certain origin groups (e.g., adults with migrant parent(s) born in France living in Belgium, Finland in Sweden, and Ireland in England & Wales), the retention of higher levels of smoking and drinking linked to the parental generation may explain their higher mortality risks. For other groups, the loss of protective health behaviours (e.g., lower levels of smoking, drinking and a more nutritious diet) linked to the parental birth country—via adaptation to the unhealthier behaviours of the host society—may explain the higher mortality risks observed. | 1,30,31,33,34,37,38, 40–42,45–47 |
| Health care access and utilisation | The second-generation as experiencing higher levels of suboptimal care through delays in diagnosis, treatment and referral, inadequate assessment, poor patient management. | 1,34,37,41,45,47 |
| Integration | The extent of the integration policy of the host country as directly affecting social determinants of health (see below) and access to health care and indirectly affecting attitudes towards migrants and their children (and the levels of discrimination). | 1,33,35,43,44,47 |
| Migration-related factors | While positive migration in-selection effects (upon health and its determinants e.g., education) are key to the lower mortality of migrants, in-selection effects likely play no role among their children—who do not migrate to the host country. Such effects are thought to initially protect migrants from factors that might increase their mortality (e.g., socioeconomic disadvantage). In the absence of these in-selection effects, the second-generation may be more susceptible to the detrimental effects of such exposures. For adults with migrant parent(s) born in Finland living in Sweden and Ireland in England & Wales, studies shows that their parents are negatively selected into migration. | 1,30,31,33,34,39,40, 42,44,45,47 |
| Racism and discrimination | Migrants may be better prepared, and may even expect, to be subjected to direct and indirect forms of discrimination and racism. This may not be the case for the second-generation who are born in the host country and—unlike their parents—can also experience these instances of discrimination and racism as children. Such experiences may lead to a rise in stress, hostility, depression, feelings of hopelessness, and a rise in risk-seeking behaviours linked to external causes-of-death. | 1,38–40,43–45,47 |

| | | |
|---|---|---|
| Social determinants of health (SDH) | The increased exposure of second-generation adults—or their parents—during the life course to social disadvantage in the host country. Migrants, despite often being positively selected socioeconomically from their birth country, experience some downward social mobility after arriving in the host country. The second-generation may thus also be exposed to this social disadvantage from a much earlier age. Most often measured as having a lower education level, lower graded occupation, a raised risk of unemployment, and lower income. SDH is a well-known risk factor for an increased risk of adult mortality. | 1,30,31,33,35,38–40,43–47 |

**Discussion**

With the general exception of second-generation with European origins, who have comparable early life and adult mortality to individuals born in the host country to non-migrant parents, the evidence reveals raised early life and adult mortality risks among second-generation with non-European origins. Of all the second-generation groups, children with migrant mothers born in Turkey, Somalia, and Pakistan face the most sizeable and pervasive early life mortality risks. In adulthood, second-generation with migrant parent(s) born in MENA and Sub-Saharan Africa have higher all-cause mortality risks in several host countries. Congenital anomalies, hereditary diseases, communicable diseases, immaturity and intrapartum events are considered *potentially* important causes-of-death in early life. In adulthood, the evidence points to a variant impact of natural and external causes contingent upon the country of birth of the migrant parent(s) of the second-generation[F]. In general, the evidence relating to causes-of-death is *very* limited. Yet, we must take care not to over-generalise. Not all second-generation with migrant parent(s) born outside of Europe have higher mortality compared to those born to non-migrants. Similarly, not all second-generation with migrant parent(s) born in other parts of Europe have similar risks to children born to non-migrants. Various examples are highlighted throughout the course of this review.

This heterogeneity in mortality risk according to the birth country of the migrant parent(s) and the host country reflects the complex interplay—and varying effect—of the background factors combining to generate the mortality risks of the second-generation (see **Table 3** and **Table 4**). In early life and adulthood, social disadvantage often plays a crucial role in reducing disparities

[FF] The prevalent role of external causes-of-death in some second-generation groups likely reflects their young age profiles. Many second-generation groups (particularly non-European origin) are concentrated at ages around the "mortality accident hump" an age range between 15 and 40 in which mortality is driven by causes like accidents & injuries, suicides, homicides and substance misuse. On the other hand, the more prevalent role of natural causes-of-death in groups such as second-generation Irish in England & Wales, French in Belgium and Finnish in Sweden additionally reflects that said groups are older and have reached ages where natural causes-of-death are influential.

between the second-generation and people born to non-migrants, even if material differences typically remain. It is true, however, that measures of social disadvantage (e.g., education level, income, and unemployment) are the type of background factors that are most readily available in the data sources used to examine mortality in the second-generation. Many of the background factors that we believe to be important (e.g., racism and discrimination, integration, and parental in-migration selection effects) are difficult to conceptualise, let alone adequately measure and adjust for in statistical analyses. Even information on more "tangible" factors, such as the health of the mother (in early life) or health behaviours of the second-generation (in adulthood) are not routinely linked to mortality data. Consequently, it is rarely possible to perform analyses of mortality among the second-generation that give equal consideration to all relevant background factors.

This diversity inherent within the second-generation in Europe, combined with our inability to comprehensively quantify the role of, and relationships between, various different background factors render the design of effective policies and interventions difficult. Nevertheless, three common areas of intervention could help us to ameliorate the mortality situation of all second-generation.

**First**, the clear division in mortality situation of the second-generation according to whether or not their migrant parent(s) were born within or outside of Europe further emphasises the urgent priority to tackle racism, xenophobia and discrimination within wider society and the European health care systems. They represent fundamental determinants of health and must be considered as such when formulating approaches to public health. This focus will help to address known causes of mortality in early life such as late and poor access to antenatal care, but would also begin to tackle structural issues that are likely to underline higher adult mortality due to external causes.

**Second**, it is essential to re-evaluate the effectiveness of national migrant integration policies. The second-generation as having comparable life outcomes to those born in the host country to two non-migrant parents is regarded as one of the key markers of the successful integration of migrant populations [1]. That the second-generation in Europe are exposed to an elevated risk of mortality from birth right through to adulthood is alarming and suggests that much more could be done to protect migrants and their children and promote their economic integration and fuller participation in wider society. Future migration integration policies must as a matter of urgency acknowledge and explicitly engage with the second-generation issues highlighted here and take

a comprehensive intergenerational approach to migration and health that has been lacking so far.

**Third**, social determinants of health are regularly found to play an important role in explaining the higher mortality of the second-generation in the studies incorporated in this review. As such, continued action towards reducing inequalities in social determinants of health, like education, income, social protection, working life conditions, unemployment, and job insecurity, can only have a positive effect upon the early life and adult life chances of the second-generation in Europe.

Yet, to truly address these disparities, it is essential for decision makers to engage with affected communities to co-create intervention and policy tailored to each specific community's needs. We acknowledge that this is no mean feat, given the amount of heterogeneity that has come to define the second-generation living in Europe today. Nevertheless, a top-down paternalistic approach to the diverse challenges encountered by the second generation will ultimately fail to identify, elucidate and solve the wide-ranging number of problems that need to be addressed. A genuine approach to co-production will begin to address a clear imbalance of knowledge and power.

To improve our understanding of the mortality patterns of the second-generation and to better inform policies aimed at improving their mortality situation, **Box 1** proposes futures avenues of research. These should be considered alongside two general recommendations for research on the mortality of the second-generation in Europe. First, to report absolute *and* relative risks in mortality to give a fuller picture of these inequalities and their importance[G]. Second, and, where possible, the disaggregation of the origins of the migrant parent(s) to the lowest level possible (i.e., to birth country rather than region) so as to avoid masking potential inequalities in specific groups.

[G] In absolute terms, in 2018 mortality in infancy (34 deaths per 100,000 live births) and young adulthood (ages 15-29, 36 deaths per 100,000 residents) in the European Union are very low and have been falling steadily over time. Many of the studies in this review produce relative risks, notably in adulthood. It is important to see both absolute and relative risks to gain a fuller understanding of the implications of raised mortality within the second-generation.

**Box 1. Suggestions for future research based upon the current evidence**

1. Examine changes in second-generation mortality over time. A*re differences to people born to non-migrants increasing, decreasing, or stable over time?*
2. Produce more evidence on causes-of-death. *Can we say more about which causes drive higher second-generation mortality in early life and adulthood?*
3. Investigate more how adult mortality varies by age in the second-generation. *Is the excess constant over age or are there particular ages where risk is highest?*
4. Consider the health behaviours of the mother (in early life) and adult second-generation (in adulthood) independently *and* as a potential explanatory factor in the higher mortality risks of the (infant and older adult) second-generation.
5. Place more emphasis on the role of the reason for migration of the parents, alongside their birth country. *Are specific risks associated with the reason for migration that are not adequately captured by parental birth country alone?*
6. In both early life and adulthood, explore how having two migrant parent(s), as opposed to one migrant parent might differentially affect risks of mortality. *Is there additional disadvantage associated with having two migrant parents?*
7. Look beyond national-level variation to understand how the mortality risk of the second-generation varies according to the specific part of the host country that they live in. *Are there characteristics associated with certain local areas (e.g., segregation) that elevate the mortality risks of the second-generation?*

Second-generation status is clearly a marker of elevated mortality risk in Europe. A premature death constitutes the most fundamental of all of life's inequalities; every other type of inequality is contingent upon being alive [1]. People who migrate to a new country do so with hopes for a better future for themselves and their children. This hope—at least with respect to expectations of life—has so far failed to materialise in Europe. The second-generation are losing decades of potential life via avoidable mortality from causes that are preventable (i.e., via effective social, public health, and primary interventions) and/or treatable (i.e., via timely and effective health care intervention [secondary prevention and treatment]). The people behind the numbers should not be forgotten. Something is going wrong in Europe; it should be a priority to find out what. There should be zero delay in enacting policies to tackle structural issues such as institutional racism and discrimination, social determinants of health and deaths of despair, and healthcare

access that are likely underlying causes of these findings. This should be done on the basis of a precautionary principal which is appropriate given the urgency and scale of the issues we have identified.

**Glossary**

***Adult mortality***

Death on or after age 15-years old (*World Health Organisation*).

***Birth country***

The country in which the migrant parent(s) of the second-generation were born in (and migrated from).

***External causes-of-death***

Mortality due to accidents and violence that can include environmental events, circumstances and conditions as the cause of injury, poisoning, and other adverse implications (*World Health Organisation*).

***Host country***

The country in which the migrant parent(s) are living in (and the second-generation were born in).

***Infant mortality***

Death within the first 365 days of life (*World Health Organisation*).

***Integration***

The process by which migrants become accepted into society, both as individuals and as groups. Integration refers to a two-way process of adaptation by migrants and host societies. It implies the consideration of the rights and obligations of migrants and host societies, access to different kinds of services and the labour market, and of identification and respect for a core set of values that bind migrants and host communities in a common purpose (*International Organisation for Migration*).

***Migrant***

An umbrella term, not defined under international law, for a person who moves away from his or her place of usual residence, within a country or across an international border, temporarily or permanently, and for a variety of reasons (*International Organisation for Migration*). Here, we refer to migrants as individuals residing in a country other than their country of birth, as

identified directly by their country of birth or indirectly through having foreign citizenship or nationality.

***Natural causes-of-death***

Mortality resulting from diseases, medical conditions, and/or natural processes (*World Health Organisation*).

***Neonatal mortality***

Death within the first 28 days of life (*World Health Organisation*).

***Perinatal mortality***

The number of fetal deaths past 22 (or 28) completed weeks of pregnancy plus the number of deaths among live-born children up to the first seven completed days of life (*World Health Organisation*).

***Second-generation***

The children of migrants – specifically children born in the country that their migrant parent(s) are residing in (the "host" country). In early life mortality studies (defined here as death before 15-years old), the second-generation are defined exclusively according to the migrant status of the mother. For adult mortality (defined here as death on or after 15-years old), studies tend to adopt a much more inclusive definition, considering an individual to be second-generation if they born in the host country to at least one migrant parent (i.e., a migrant mother and/or migrant father).

***Social Determinants of Health***

Non-medical factors that affect health. They are the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life. These forces and systems include economic policies and systems, development agendas, social norms, social policies and political systems. Examples include income and social protection, education, unemployment and job insecurity, working life conditions, housing, basic amenities, early child development, social inclusion and non-discrimination (*World Health Organisation*).

***Stillbirth***

A baby who dies after 28 weeks of pregnancy, but before or during their birth (*World Health Organisation*).

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**Supplementary file S1.** Database searches

***Scopus***

( TITLE-ABS-KEY ( mortality OR death OR infant AND mortality OR perinatal AND mortality OR neonatal AND mortality OR infant AND death OR perinatal AND death OR neonatal AND death OR life AND expectancy OR longevity OR surviv* OR stillbirth ) AND TITLE-ABS-KEY ( second-generation OR child* OR descendant* OR offspring ) AND NOT TITLE-ABS-KEY ( cell* OR surgery OR molecul* OR clinic* OR antipsy* OR drug* OR treatment OR protein OR kidney OR vaccin* OR pollut* ) ) AND NOT TITLE-ABS-KEY ( "soil" OR "vaccin*" OR "*biolog*" OR "bird*" OR "cancer" OR "veteri*" OR "DNA" OR "genetic*" OR "gene" OR "genes" OR "cell*" OR "tox*" OR "medic*" OR "animal*" OR "disease*" ) AND NOT ( SUBJAREA ( agri OR bioc OR immu OR neur OR phar ) OR SUBJAREA ( ceng OR chem OR comp OR eart OR ener OR engi OR envi OR mate OR math OR phys ) )

***Web of Science***

((ALL=(mortality OR death OR perinatal mortality OR neonatal mortality OR infant death OR perinatal death OR neonatal death OR longevity OR surviv* OR stillbirth)) AND ALL=(second-generation OR descendants of immigrants OR descendants of migrants OR children of immigrants OR children of migrants OR offspring of immigrants OR offspring of migrants OR immigrant descendants OR migrant descendants OR immigrant children OR migrant children OR immigrant offspring OR migrant offspring))

***PubMed***

((mortality OR death OR infant mortality OR perinatal mortality OR neonatal mortality OR infant death OR perinatal death OR neonatal death OR life expectancy OR longevity OR surviv* OR stillbirth) AND (second-generation OR descendants of immigrants OR descendants or migrants OR children of immigrants OR children of migrants OR offspring of immigrants OR offspring of migrants OR immigrant descendants OR migrant descendants OR immigrant children OR migrant children OR immigrant offspring OR migrant offspring) AND ((excludepreprints[Filter]) AND (humans[Filter]) AND (english[Filter])) AND ((excludepreprints[Filter]) AND (humans[Filter]) AND (english[Filter])) AND ((excludepreprints[Filter]) AND (humans[Filter]) AND (english[Filter]))) NOT (randomized) NOT (drug*) NOT (trial) NOT (case report) NOT (clinic) NOT (antipsy*) NOT (surgery) AND ((excludepreprints[Filter]) AND (humans[Filter]) AND (english[Filter])) AND ((excludepreprints[Filter]) AND (humans[Filter]) AND (english[Filter])) AND ((excludepreprints[Filter]) AND (humans[Filter]) AND (english[Filter])) AND ((excludepreprints[Filter]) AND (humans[Filter]) AND (english[Filter])) AND ((excludepreprints[Filter]) AND (humans[Filter]) AND (english[Filter])) AND ((excludepreprints[Filter]) AND (humans[Filter]) AND (english[Filter])) AND ((excludepreprints[Filter]) AND (humans[Filter]) AND (english[Filter])) AND ((excludepreprints[Filter]) AND (humans[Filter]) AND (english[Filter]))

**Supplementary file S2.** Basic information on the studies incorporated into the review.

| Outcome | Cause-of-death | Host country | Birth country/region of migrant parent(s) |
|---|---|---|---|
| Perinatal<br><br>(5 studies; 2 systematic reviews**: 2 meta-analyses**) | Asphyxia and unexpected deaths prior to onset of labour [12], congenital malformations [9,11,12], infections [9], intrapartum events [12], prematurity and foetal growth [9,12] | Spain [9], Belgium [10–12], Norway [13] | All EU-27 [10], new EU-27 [11], other EU-15 [11], Western Europe [9], Eastern Europe [9–11] |
| | | | Turkey [10–12], Maghreb region [10], Northern Africa [9,11], Morocco [12], Sub-Saharan Africa [9–12], Somalia [13], Afghanistan [13], Iraq [13], Asia [9], Pakistan [13], Philippines [13], Sri Lanka [13], Thailand [13], Vietnam [13], Latin America [9] |
| Stillbirth<br><br>(11 studies; 1 systematic review**: 1 meta-analysis**) | N/A | Austria [14], Belgium [14,15], Denmark [14,16,17], Germany [14,18], Netherlands [19], Norway [4,14,20,21], Spain [22], Sweden [14,23], Switzerland [14], United Kingdom [14] | EU [22], Western Europe [23], Germany [17], Iceland [17], Norway [17], Denmark [21], Sweden [17,21], Mediterranean countries [18], Eastern Europe [23], former Yugoslavia [16,17,21], other Europe [22], Poland [17,21], Romania [17], Russia [21], Ukraine [17], Lithuania [17], |
| | | | Turkey [14,16,17,21], Turkey/Morocco [19], Africa [19,23], Morocco [21], Sub-Saharan Africa [22], Somalia [16,17,21], Middle East [23], Afghanistan [17,21], Iran [17,21], Iraq [17,21], Lebanon [16,17], Syria [17] Asia [19,23], East Asia [19], Asia & Oceania [22], Pakistan [16,17,20,21], Philippines [17,21], Sri Lanka [21], Thailand [17,21], Vietnam [17,21], China [17], Latin America [23], South America & the Caribbean [22] |
| | | | All [4,15], high-income countries [15], middle income-countries [15], low-income countries [15], Europe & America [18], other Western [19], other non-Western [19] |
| Neonatal<br><br>(4 studies; 3 systematic reviews**; 1 meta-analysis**) | N/A | Belgium [15],<br><br>Netherlands [19], Spain [9], United Kingdom [24] | Western Europe [9], other Western [19], Eastern Europe [9] |
| | | | Turkey/Morocco [19], Africa [19], Northern Africa [9], Sub-Saharan Africa [9,24], Asia [9], East Asia [19], South Asia [19], India [24], Pakistan [24], Bangladesh [24], Latin America [9], Caribbean [24] |
| | | | All [15], high-income countries [15], middle income-countries [15], low-income countries [15], White [24], other non-Western [19], |
| Infant<br><br>(9 studies; 2 systematic reviews**; 2 meta-analyses**) | Congenital malformations [16], , perinatal causes [16], Sudden Infant Death Syndrome [16] | Denmark [16,17], Belgium [15]<br><br>France [25],<br><br>Norway [20,26], Switzerland [27,28], United Kingdom [24] | Europe [26], Germany [17,26,27], Iceland [17], Norway [17], Sweden [17,26], Denmark [26], United Kingdom [26], France [27], Italy [27], Portugal [27], Spain [27], Eastern Europe [25], former Yugoslavia [16,17], Kosovo [27], Macedonia [27], Poland [17,25,26], Romania [17,25], Russia [25], Lithuania [17], Ukraine [17] |
| | | | Turkey [16,17,25–27], Africa [26], Northern Africa [25], Algeria [25], Morocco [25], Tunisia [25], Sub-Saharan Africa [24,25], Western Africa [25], Cameroon [25], Comoros [25], Democratic Republic of Congo [25], Guinea [25], Ivory Coast [25], Madagascar [25], Mali [25], Senegal [25], Somalia [16,17,26], Afghanistan [17], Iran [17], Iraq [17], Syria [17], Lebanon [16,17], Asia [26], Pakistan [16,17,20,24,26], India [24], Bangladesh [24], , Philippines [17], Thailand [17], Vietnam [17,26], China [17,25], the Americas [25], North America [26], USA [26], South America [26], Caribbean [24], Haiti [25], Oceania [25]. |

| | | | |
|---|---|---|---|
| | | | All [15], high-income countries [15], middle income-countries [15], low-income countries [15], OECD [28], other non-OECD [28], EU/EEA [28], White [24] |
| Under-5<br>(1 study) | Congenital malformations [29], external causes [29], perinatal causes [29], Sudden Infant Death Syndrome [29] | Denmark [29] | Norway [29], Sweden [29], Former Yugoslavia [29] |
| | | | Turkey [29], Somalia [29], Afghanistan [29], Iraq [29], Iran [29], Lebanon [29], Pakistan [29] |
| Adult<br>(21 studies) | Accidents & injuries [1,30,31], alcohol-related [31,32], all external causes [30,31,33], all natural causes [33], cancers (all) [1,30,31,34–36], cancer (lung) [30,31,35–37], cancer (other specific sites) [31,36,37], cardiovascular diseases [30,31,37], circulatory diseases [1], coronary heart disease [38], infectious diseases [31,35], other diseases & medical conditions [1], other external causes [1], respiratory diseases [30,31], substance misuse [1,32], suicide [1,30,31,39–42] | Belgium [35,41,43], France [44,45], Netherlands [31,34,46], Norway [39], Sweden [1,33,36,38,40,42], United Kingdom [47] | Europe (EU) [42], Europe (non-EU) [42], Western Europe [36,39,40], Nordic [1,32,36,39,42], Denmark [36,38], Finland [1,33,36,38,40], Norway [36,38], other Western Europe [38], Austria [36], Germany [36], France [35–37], Netherlands [35–37], Ireland [30], United Kingdom [36], Southern Europe [38,40,44,45], Greece [36], Spain [36], Italy [35–37,41], Central & Eastern Europe [1], Eastern Europe [33,36,39,40], Central Europe [38], Eastern Europe [38], former Yugoslavia [33,36] Baltic states [38], Russia [36,38], Estonia [36], Poland [36], Romania [36] |
| | | | Turkey [34,35,37,38,41], Africa [39], Northern Africa [44,45], Morocco/Tunisia [43], Sub-Saharan Africa [1,35,43], Black Africa [47], the Middle East [1,33,40], Morocco [34,37,41], Asia (inc. Turkey) [39], China & other Asia [47], India [47], Pakistan & Bangladesh [47], Asia [1,36], Indonesia (the Moluccans) [31,46], North America [36], United States [36], North America & Oceania [39], Central & Southern America [1,39], Suriname [34], Antilles/Aruba [34], Black Caribbean [47], non-European [40], other non-European [33] |
| | | | All [1,34,36,42], Black other [47], other Western [1], Western [33,35], non-Western [35], non-Nordic [32] |

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