SOLIDARITY

Cost of exclusion from healthcare

The case of migrants in an irregular situation

FRA EUROPEAN UNION AGENCY FOR FUNDAMENTAL RIGHTS

The report addresses matters related to human dignity (Article 1), non-discrimination (Article 21), social security and social assistance (Article 34) and health care (Article 35), falling under the Titles I 'Dignity', III 'Equality', and IV 'Solidarity' of the Charter of Fundamental Rights of the European Union.

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FRA – European Union Agency for Fundamental Rights
Schwarzenbergplatz 11 – 1040 Vienna – Austria
Tel. +43 158030-0 – Fax +43 158030-699
fra.europa.eu – info@fra.europa.eu

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Foreword

In 2011 the European Union Agency for Fundamental Rights (FRA) published three reports on the fundamental rights of migrants in an irregular situation in the European Union (EU). At the time, FRA found that EU Member States' policies concerning their access to healthcare services vary substantially, often only allowing access to emergency healthcare.

Although economic considerations must be applied cautiously and cannot be used to justify a lack of compliance with fundamental rights, together with public health considerations, FRA understands that cost effectiveness is an important issue in the debate on access to healthcare for migrants in an irregular situation. Therefore, following requests by experts representing major stakeholders in a meeting organised by FRA in March 2012, the agency agreed to follow up on its 2011 publications and examine cost implications.

This report aims to estimate the economic cost of providing regular access to healthcare for migrants in an irregular situation, compared with the cost of providing treatment in emergency cases only. Two specific medical conditions – hypertension and prenatal care – were selected as examples, and their associated costs were calculated using an economic model. This model was then applied to three EU Member States: Germany, Greece and Sweden.

The testing suggests that providing access to regular preventive healthcare for migrants in an irregular situation would be cost-saving for governments. Moreover, as the model only includes costs incurred by healthcare systems, not costs incurred by the patient or society at large, it is likely that the cost savings are underestimated.

This report shows that providing access to healthcare to migrants in an irregular situation would not only contribute to the fulfilment of the right of everyone to enjoy the highest attainable standard of physical and mental health, but would also be economically sound. Obligations deriving from an inclusive interpretation of international human rights law would thus be supported by economic arguments.

Constantinos Manolopoulos
Director a. i.

List of abbreviations

A&E	Accident and emergency sector
ESC	European Society of Cardiology
ESH	European Society of Hypertension
EEA	European Economic Area
EU	European Union
FRA	European Union Agency for Fundamental Rights
HIV	Humans Immunodeficiency Virus
LBW	Low birth weight
MI	Myocardial infarction i.e. heart attack
NGO	Non-Governmental Organisation
NICE	UK National Institute for Clinical Excellence
OECD	Organisation for Economic Co-operation and Development
PICUM	Platform for Cooperation on Undocumented Migrants
PPP	Purchasing Power Parity rate
RR	Relative risk
SHI	*Gesetzliche Krankenversicherung* (Public Statutory Health Insurance)
WHO	World Health Organization

Contents

Figures

Tables

Introduction

Aim of the report

This report presents an economic model to analyse and compare the costs of providing regular access to healthcare for individuals with the costs incurred if these persons are not provided such access and, as a result, need to use more expensive emergency healthcare facilities. It does so by analysing two medical conditions: hypertension and prenatal care. To better illustrate its application in practice, the model has been applied to three European Union (EU) Member States, Germany, Greece and Sweden.

The model is based on a decision tree that presents mutually exclusive pathways. For example, migrants can either be hypertensive or normotensive (have normal blood pressure). If hypertensive, they can either be screened for the condition or not, and if screened, they can be treated for the condition or not. Clinical evidence suggests that the timely uptake of treatment reduces the risks of more serious cardiovascular events, such as a stroke. The decision tree uses clinical research data to estimate the probability of these events occurring and to calculate the costs and benefits associated with the possible outcomes.

The model only includes costs incurred by healthcare systems, not costs incurred by the patient or society at large, such as costs for carers for those who suffered a stroke. It is possible that the cost-savings are underestimated. A number of parameters required to elaborate the economic model are subject to uncertainty. To address this issue and to test the model's robustness, certain parameters have been changed in the sensitivity analysis.

Excluding persons from regular access to healthcare discourages early detection and treatment of preventable conditions. It leaves populations dependent on community health centres and other voluntary initiatives and increases the likelihood that healthcare services are only contacted in case of an emergency.

Some research shows that most of the short-term cost-savings from excluding individuals from healthcare and notably from primary care – meaning regular visits to a doctor – might be lost by shifting the costs to healthcare providers in secondary or community settings. A 2010 study by Johns Hopkins University in Baltimore, United States (US), found that late treatment of HIV positive patients in the US adds tens of thousands of dollars in healthcare costs over the first several years of their treatment. For each patient, the average increase in cumulative treatment expenditures between early and late presenters (individuals diagnosed at a late stage of the disease and entering in care late) ranged from USD 27,275 to USD 61,615 (€24,818–€56,064 as of July 2015) over the course of the first seven to eight years of treatment. Costs are higher for late presenters since they tend to be more ill than early presenters. Late presenters are more often hospitalised, need to be put on costly antiretroviral therapy and antibiotics, and must often be treated for other diseases that have been exacerbated by a weakened immune system.[1] Another 2010 study conducted in the Netherlands shows that "early detection and treatment of migrants with chronic Hepatitis B virus (HBV) is likely to be cost-effective, even using low estimates for HBV prevalence, participation, referral, and treatment compliance."[2]

This report presents the analysis of a follow-up study by the European Union Agency for Fundamental Rights (FRA) to its 2011 publications on the situation of migrants in an irregular situation. Although economic considerations must be applied cautiously and cannot be used to justify a lack of compliance with fundamental rights, together with public health considerations, cost effectiveness is an important issue in the debate on access to healthcare for migrants in an irregular situation. At a meeting organised by FRA on 'Healthcare for irregular migrants' in March 2012, experts therefore requested the agency to examine these cost implications.

FRA contracted a consortium formed by Matrix and the European Public Health Alliance (EPHA) to undertake desk research including:

- **clinical literature and health-economic literature** which was searched using relevant medical subject headings and free-text terms. Studies published in languages other than English were not reviewed. All searches were conducted on core medical databases, such as Medline.
- **legislation and practice** on access to healthcare for migrants in an irregular situation in the three EU Member States selected to test the model, including literature by FRA, PICUM, Médecins du Monde and updates provided by PICUM monthly newsletters.

Based on this, the consortium, in close coordination with FRA, developed a decision tree-based model (see Figure 1) and populated it to calculate the cost of providing regular access to healthcare for migrants in an irregular situation as opposed to the cost of emergency

1 Johns Hopkins Medicine (2010); National Institute of Allergy and Infectious Diseases (2012).
2 Veldhuijzen, I. K. *et al.* (2010).

healthcare in three EU Member States. During an expert workshop organised at FRA in June 2013, medical professionals validated the various steps of the economic model presented in this paper.

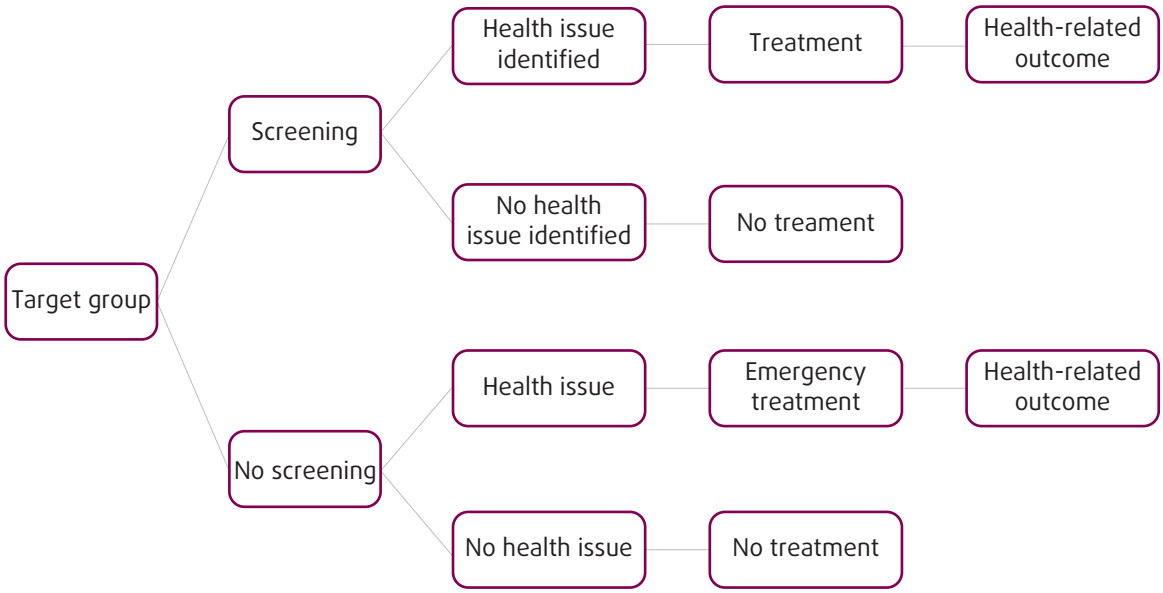
The decision tree is the simplest form of analytical modelling in economic evaluation. In this model, alternative options are represented by a series of pathways or branches that examine whether it is cost-effective to provide access to normal, preventive care compared with providing emergency treatment in a situation where a condition has not been treated and results in a more serious health conditions, such as a stroke in the case of hypertension left untreated and a low birth weight in the case of prenatal care.

This decision-tree is a simple, static model which is considered particularly suitable for acute health condition that needs intervention.[3] The model allows for a basic comparison of costs by looking at the worst-case health scenario for each condition. It does not consider less severe outcomes for untreated conditions, nor does it consider changing circumstances, recurring outcomes over time, external factors that may influence the take-up of care, costs or benefits to society at large, or opportunity costs.

The model is based on calculations per person or per 1,000 persons; however, the size of the target population has also implications for the overall cost analysis of providing access to regular healthcare to migrants in an irregular situation. There are no reliable and up-to-date estimates on the number of migrants in an irregular situation in EU Member States, but such numbers vary considerably between countries.

This publication focuses on economic considerations. Healthcare policies should, however, also be guided by public health considerations. Moreover, they must respect requirements deriving from international and European human rights law, as well as provisions included in EU law, briefly summarised in the next section and more extensively analysed in previous FRA reports, including the 2011 report on *Migrants in an irregular situation: access to healthcare in 10 European Union Member States*.

Figure 1: Decision tree model



Source: *FRA, 2015*

3 Petrou, S. *et al.* (2011).

The right to health

The right to health is a basic social right. The United Nations (UN) International Covenant on Economic, Social and Cultural Rights (ICESCR), which has been ratified by all 28 EU Member States, enshrines in its Article 12 "the right of everyone to the enjoyment of the highest attainable standard of physical and mental health". Core obligations derived from this right apply to everyone, regardless of status. The 2008 Optional Protocol to the ICESCR (to which five EU Member States were party on 15 November 2014) established a procedure for the submission of complaints by or on behalf of individuals or groups of individuals whose economic, social and cultural rights set forth in the Covenant were violated.

When it comes to the provision of healthcare, European human rights law allows some differentiation in the provision of healthcare between migrants in a regular and those in an irregular situation; case law by the European Committee for Social Rights is, however, reducing this gap.[4] FRA's 2011 report on migrants in an irregular situation provides a detailed analysis of the right to health as it applies to persons not lawfully staying in the territory of a state.[5]

Human rights law contains specific provisions concerning child, prenatal and post-natal healthcare. Article 24 of the UN Convention on the Rights of the Child (CRC) provides specifically for children's access to healthcare services and obliges states to "ensure appropriate prenatal and post-natal healthcare for mothers". Article 12 (2) of the UN Convention on the Elimination of all Forms of Discrimination against Women (CEDAW) provides similar healthcare rights to pregnant and lactating women.

At EU level, the Charter of Fundamental Rights of the European Union (the Charter) includes the right to healthcare under Article 35, which states that "[e]veryone has the right of access to preventive healthcare and the right to benefit from medical treatment under the conditions established by national laws and practices". The Charter's application is limited to those matters that fall within the scope of EU law. Although it does not make any distinction on the ground of nationality, it does make the exercise of the right to healthcare subject to national laws and practices. The reference to national laws and practices appears to allow for variation between the national systems, but it cannot be read as providing a maximum standard. Rather, national laws establish a minimum standard and Article 52 on the scope of the Charter remains applicable, which shall not prevent Union law to provide more extensive protection. The Court of Justice of the EU (CJEU) may review national laws and measures in this regard.

Secondary EU law regulates access to healthcare for persons affiliated with a national health scheme in their EU Member State or in another state of the European Economic Area (EEA) which also includes Iceland, Liechtenstein and Norway, provided they are entitled to the necessary treatment[6] when they visit other EU/EEA Member States. This is also valid for Switzerland.[7]

Other EU law instruments regulate the access to healthcare for a variety of categories of persons and require some of them to have health insurance before they are granted a particular status or admission into the Member State territory, as illustrated in Table 1.

EU law does not address the question of access to healthcare for migrants in an irregular situation, except in situations involving individuals who have been given a period for voluntary departure and for those whose removal was formally postponed: on the basis of the Return Directive (2008/115/EC), these two categories are entitled to "emergency healthcare and essential treatment of illness". This is the same level of access to healthcare accorded to asylum seekers.

The limited enforceability of legally binding international law provisions on the right to health, the vague language used in such provisions, combined with the need to implement human rights law in countries with different healthcare systems, all has led to a divergent understanding and application of the right to health across the EU. This in turn has resulted in diverging healthcare services offered to migrants in an irregular situation. In some EU Member States, migrants in an irregular situation are entitled to a broad range of healthcare services, including, for example, regular visits to doctors. Other Member States only offer limited access to emergency healthcare. An overview of national policies, as applied in 2011 by Member States, can be found in FRA's 2011 report *Fundamental rights of migrants in an irregular situation in the European Union*. In practice, lack of legal access is partly mitigated by voluntary initiatives or local-level projects.

4 European Committee of Social Rights (2005); European Committee of Social Rights (2014).
5 FRA (2011a), pp. 11–14; FRA (2011b), pp. 71–73.
6 European Commission (2004), Art. 19 (1); CJEU (2010), paras. 58 and 61.
7 Decision 2012/195/EU of the Joint Committee established under the Agreement between the European Community and its Member States, of the one part, and the Swiss Confederation, of the other, on the free movement of persons of 31 March 2012 replacing Annex II to that Agreement on the coordination of social security schemes, OJ 2012 L 103.

Table 1: Access to healthcare for various categories of persons under EU secondary law

Category of persons	EU legal instrument	Legal reference	Access to healthcare
EU nationals, EEA and Swiss nationals and their family members*	Free Movement Directive (2004/38/EC)	Art. 7 (1) (a) and Art. 24 Art. 7 (1) (b) and Art. 24	If working or self-employed, they receive treatment equal to that of nationals. If they are otherwise economically self-sufficient, these persons must show that they have health insurance for themselves and their family members.
Reuniting family members of third-country nationals	Family Reunification Directive (2003/86/EC)	Art. 7 (1) (b) (c)	Before family reunification, a sponsor may be required to prove that they have health insurance cover for themselves and the members of their family, as well as sufficient, stable and regular resources.
Long-term residents	Long-Term Residents Directive (2003/109/EC)	Art. 5 (1) (b) and Art. 5 (1) (a) Art. 11 (1) (d)	Before obtaining long-term residence status third-country nationals and their family members are required to provide evidence of health insurance and sufficient stable and regular resources. They receive treatment equal to that of nationals.
Victims of trafficking in human beings	Anti-Trafficking Directive (2011/36/EU)	Art. 11 (5)	Assistance and support measures for victims of trafficking encompass necessary medical treatment, including psychological assistance, counselling and information.
Recognised refugees and subsidiary protection status holders	Qualification Directive (201/95/EU)	Art. 30	They have access to healthcare equal to that of a Member State national.
Asylum seekers	Reception Conditions Directive (2013/33/EU)	Art. 19	Necessary healthcare, which must include at least emergency care and essential treatment for illness, necessary medical or other assistance for those who have special needs.
Migrants in an irregular situation who have been given a period for voluntary departure and for those whose removal was formally postponed	Return Directive (2008/115/EC)	Art. 14 (1)	Emergency healthcare and essential treatment of illness. Particular attention must be paid to the situation of vulnerable persons.
Persons intercepted/ rescued at sea by Frontex	Rules on Frontex-coordinated sea operations Regulation (EU) No. 656/2014	Art. 4 (4)	"Participating units shall address the special needs of [...] persons in need of urgent medical assistance."

Note: ** For EEA and Swiss nationals, see: Agreement on the European Economic Area, 2 May 1992, OJ 1994 L 1/3, Part III, Free Movement of Persons, Services and Capital and Agreement between the European Community and its Member States, on the one part, and the Swiss Confederation, on the other, on the free movement of persons, signed in Luxembourg on 21 June 1999, entered into force on 1 June 2002, OJ 2002 L 114/6.*

Source: FRA, 2015

Target groups

This economic analysis focuses on migrants in an irregular situation. These are third-country nationals without authorisation to stay in the territory of an EU Member State. Although they represent only a fraction of the uninsured population, the policies regulating their access to healthcare diverge within the EU. For the past two decades, civil society organisations and human rights bodies have advocated for the extension of health benefits to these migrants.

Migrants in an irregular situation are not the only group of persons who, either in the absence of health insurance or for other reasons, are barred from accessing healthcare services beyond emergency treatment.

Uninsured nationals and persons with a low income who cannot pay the patients' contribution required for certain healthcare services also face this issue. EU nationals who make use of their free movement rights may face similar difficulties, particularly when they are no longer insured in their home country and have not yet obtained or have lost, for example, due to unemployment the health insurance in the host country. Under EU law, asylum seekers are only entitled to "necessary healthcare" (see Table 1). Table 2 provides examples of the categories of persons who do not have full access to healthcare services in the three EU Member States used to illustrate this economic model.

The economic model to calculate the costs of providing regular access to healthcare presented in this report could also be applied to develop a cost analysis for other categories of persons deprived of regular access to healthcare. More research is, however, necessary to determine which parts of the model would be applicable. Further information would be required concerning who is excluded from healthcare and other social protection nets and why, and their epidemiologic profile. Different population groups are likely to have different health needs and patterns of access to health services: an 18-year old, for example, seeking their first job will have quite different needs than a 70-year old impoverished pensioner with a cardiovascular condition. Another important component of the economic model to calculate healthcare costs is the average length of time the different groups stay in a country, which is likely to vary.

Table 2: Categories of persons with limited access to healthcare, three EU Member States

	Germany	Greece	Sweden
Nationals without health insurance*	Persons excluded from health insurance before it became compulsory in 2009 and who have not repaid their contributions are only entitled to emergency care. The federal statistical office (Destatis) reported 137,000 uninsured nationals in Germany in 2011.	Persons excluded from health insurance after being unemployed for one year are only entitled to emergency care. According to Eurostat, in January 2013, around 17.5 % of the Greek population aged between 15 and 74 were long-time unemployed.	All nationals have health insurance from birth.
Certain profiles of EU nationals exercising free movement	EU, EEA and Swiss nationals not (or no longer) covered by their national nor by healthcare system of the host country.	EU, EEA and Swiss nationals not (or no longer) covered by their national nor by the host country healthcare system (e.g. EU nationals unemployed for over a year not covered by health insurance in their home Member State).	Information on this group is not available for Sweden.

Asylum seekers	During their first 48 months in Germany, they are only entitled to treatment for severe illnesses or acute pain and everything necessary for curing, improving or relieving the illnesses and their consequences, pre- and post-natal care, vaccinations, preventative medical tests and anonymous counselling and screening for infectious and sexually transmitted diseases. After 48 months, they have the same entitlements as nationals.	As soon as they are registered, they are entitled to the same healthcare services as Greek citizens. In practice, delays in registering asylum applications limit their access to healthcare.	Adults are entitled to subsidised care that cannot be deferred, such as prenatal, maternal and reproductive healthcare. Children and children whose parents' application for asylum failed are entitled to the same benefits as children residing lawfully in Sweden.
Migrants granted a temporary toleration (*Duldung*) in Germany	They receive the same access to healthcare as asylum seekers residing in Germany for less than 48 months.	Category does not exist in Greece.	Category does not exist in Sweden.
Migrants in an irregular situation	They receive the same access to healthcare as asylum seekers residing in Germany for less than 48 months. For non-emergency treatment, reimbursement has to be approved by the municipal social services department, which has to share information on the migrant with the police. Fear of apprehension discourages migrants from approaching healthcare institutions for non-emergency services.	Only emergency healthcare. All children have access to healthcare at the same level as Greek nationals.	Since July 2013, same level as asylum seekers.

Notes: ** This table does not consider that those with health insurance may not be able to afford the costs required for specific healthcare services.*

*Legal sources for asylum seekers, tolerated persons and migrants in an irregular situation: Germany, Law on support to asylum seekers (*Asylbewerberleistungsgesetz*, AsylbLG 1997 as amended); Greece, Circular by the Ministry of Health, 2 May 2012, Registration number ΑΔΑ: Β49ΚΘ-55Π which also provides an overview of the relevant legislation; Sweden, Law 2013:407 on healthcare for certain foreigners who stay in Sweden without necessary permission (*Lag (2013:407) om hälso- och sjukvård till vissa utlänningar som vistas i Sverige utan nödvändiga tillstånd*), Section 7 (for migrants in an irregular situation); Medical care for asylum seekers and others Act 2008:344 (*Lag (2008:344) om hälso- och sjukvård åt asylsökande m.fl*), Section 6 and Communicable Diseases Act (2004:168).*

Sources: Germany, Destatis, Press release, 20 August 2012 and Eurostat, database tables lfsq_urgan and lfsq_upgal (accessed on 10 December 2014) and (2013a)

1 Developing an economic model to calculate healthcare costs

This chapter describes the basic choices made to develop an economic model to calculate healthcare costs and its frame. It illustrates the reasons for selecting the two specific medical conditions that illustrate the economic model, which though based on the same considerations, has been adapted to reflect the specific circumstances of the medical conditions examined. The chapter also explains the reasons for selecting the three EU Member States used to test it. It also provides general considerations relating to cost calculations, and a list of the limitations of the economic model presented.

1.1. Choice of medical conditions

The economic analysis focuses on comparing the costs for regular healthcare with those for emergency care in two specific clinical areas: the provision of care for patients with hypertension and the provision of prenatal care. FRA selected the two medical conditions based on the following considerations:

- **prevalence of conditions among migrants in an irregular situation**: the conditions must reflect the health needs of migrants in an irregular situation within each Member State. The non-governmental organisation (NGO) *Médecins du Monde* is the primary source of data concerning the prevalence of certain health conditions among migrants in an irregular situation.[8] Médecins du Monde's survey covers 1,125 adults accessing services across 11 countries. Roughly the same number of men (50.9 %) and women (49.1 %) were surveyed. More than half (55 %) of adults interviewed were under the age of 35. Participants aged 55 or over only accounted for 8 % of the sample. The survey illustrates the different health conditions present in this category of migrants;
- **cost impact of each condition if untreated**: to be relevant from a cost-saving point of view, only conditions which result in costly treatment were selected;
- **impact on vulnerable persons**: the extent to which the condition affects particularly vulnerable groups was also a key deciding factor. The CRC and CEDAW provide specific rights for pregnant women and children;
- **data availability**: data must exist within the literature and FRA's network of experts to populate each of the economic models.
- **cost and complexity of analysis**: the 'decision tree' models the cost impact of a condition left untreated. It also includes all the possible health outcomes, should the individual choose to treat the condition, or not, at any point during illness. Some conditions require a more complex and costly model to accurately account for the many possible outcomes.

Based on these five characteristics, the following five conditions were first considered: prenatal care, hypertension, diabetes, asthma and skin diseases. The following medical conditions were rejected for various reasons: prostate cancer (only affects men); mental health (broad category which is complex to analyse); communicable diseases, such as HIV or Hepatitis B (options for detection and treatment are offered already in several EU Member States); and allergies or ear infections typical for children (children already have broader access to healthcare in several EU Member States).

Desk research was undertaken to evaluate each of the five pre-selected medical conditions based on the five key characteristics listed above. Table 3 summarises the findings.

8 Médecins du Monde (2009).

Table 3: Overview of health conditions considered for the model

Characteristics	Prenatal health issues	Hypertension	Diabetes type II	Asthma	Skin diseases
Prevalence among migrants in an irregular situation surveyed in 2008*	0.54 %**	4.27 %	4.00 %	2.05 %	5.16 %
Cost impact if conditions are untreated	Significant costs	Significant costs	Significant costs	Moderate costs	Minimum cost
Impact on vulnerable persons	High	Medium	Medium	Medium	Medium
Likelihood of data availability	High	High	High	Moderate	Unknown
Complexity of analysis	Moderate	Moderate	High	Moderate	Moderate

Notes: ** Figures are taken from Médecins du Monde (2009). They reflect health problems reported by migrants in an irregular situation who visited healthcare services provided by Médecins du Monde and other partners in 2008. They do not reflect the estimated prevalence of health conditions among the target population.*
*** This percentage includes women who declared having 'complicated pregnancy/delivery' or 'pregnancy, childbirth symptoms or complaints and family planning' issues.*

Source: FRA, 2015

Hypertension and prenatal care were selected for the analysis. Hypertension shows a combination of relatively high prevalence and high costs. Although prenatal care issues were not very prevalent among the migrants surveyed by Médecins du Monde, they impacted significantly on vulnerable persons.

1.1.1. Care provision for patients with hypertension

Hypertension often leads to cardiovascular conditions such as ischemic heart disease, which includes myocardial infarction (MI), and stroke – the two leading causes of death for both men and women worldwide in 2014.[9]

Prevalence: it could be argued that hypertension is not a suitable condition for this study because it is more prevalent in older age groups, and migrants in an irregular situation tend to be relatively young. However, 4.27 % of respondents in the Médecins du Monde survey reported symptoms of arterial hypertension. The same survey also noted that 20.4 % of those migrants in an irregular situation who were refused care the last time they had been ill had cardiovascular complaints (the second most frequent category of illness by biological system after hemato-immunology).[10] Hypertension is the main diagnosis for those presenting cardiovascular symptoms.

Cost impact if condition is untreated: cardiovascular conditions are a burden to public health in terms of economic costs (condition treatment and management) and opportunity costs (time spent away from work, responsibility placed on caregivers and communities and other financially immeasurable social strains).[11] When hypertension is diagnosed and treated, the risk of complications is greatly minimised.[12] The treatment is well known and generic drugs are available, which makes it affordable for European health systems. Treatment guidelines at the primary healthcare level are clear and, according to medical community consensus, effective.[13]

Data availability: desk research identified sources which outline the unit cost of various conditions, such as angina, stroke myocardial infarction and death.[14]

While hypertension can contribute to a number of cardiovascular complications, hypertension itself can be relatively easily defined as 'hypertensive' or 'not hypertensive', as indicated by blood pressure measurements. This makes the analysis of the costs and benefits of treatment versus non-treatment relatively simple.

1.1.2. Provision of prenatal care

Prevalence: of the women interviewed, 19.3 % reported gynaecology and obstetrics needs. This category included not only pregnancy-related problems but also other gynaecological conditions. Of the women interviewed, 1.1 % reported experiencing pregnancy/delivery complications.[15] Approximately one in every 17 respondents acknowledged gynaecology and obstetrics needs.

Cost impact if the condition is untreated: the cost of delaying prenatal care has been widely studied. For

9 WHO (2014).
10 Médecins du Monde (2009), p. 75 and p. 84.
11 Berto, P. and Lopatriello, S. (2003).
12 Hansson, L. *et al.* (1998).
13 See, for example, United Kingdom, NICE (2011).
14 Ward, S. *et al.* (2005).
15 Calculation based on data presented in Médecins du Monde (2009), p. 75.

example, a study from 2000 in California compared pregnant women in an irregular situation who benefitted from prenatal care with those who did not. The study shows the latter are much more likely to deliver low birth weight or premature infants. The cost of postnatal care for these newborns is substantially higher than for those with prenatal care. This means that "for every dollar cut from prenatal care, [they] expect an increase of USD 3.33 in the cost of postnatal care and USD 4.63 in incremental long-term cost".[16] The authors of the study conclude that the absence of public healthcare funding would lead to a substantial increase of low birth weight, prematurity and postnatal costs. Other scientific studies[17] show that migrants in an irregular situation encounter major problems accessing preventative healthcare compared to legal residents. The lack of healthcare pre-delivery increases the risk of mortality and morbidity of newborns.

Most EU Member States that limit the access of migrants in an irregular situation to healthcare allow for certain healthcare services to be provided to pregnant women. The study of these conditions remains relevant because these women are often only granted access to certain prenatal care services, and not in all EU Member States.[18]

Data availability: desk research yields several publicly available statistics regarding the prevalence of low birth weight by country. For example, organisations such as the WHO and UNICEF collect data on the prevalence of low birth weight in each country, as it is a key indicator of population health. There is also some data on the relationship between access to prenatal care and incidences of low birth weight. A 2003 study conducted in the U.S. concludes that babies with low birth weights and whose mothers did not have access to prenatal care showed higher rates of mortality, respiratory diseases, haemorrhage, retinopathy and bronchopulmonary dysplasia.[19]

Modelling the impact of prenatal care on low birth weight is moderately complex. Although low birth weight may have many causes, sufficient evidence shows that lack of prenatal care increases the probability of it occurring. The time in which prenatal care can be delivered is constrained by the duration of the pregnancy and point of birth. The possible outcomes of the care are labelled 'normal' birth weight or 'low' birth weight. Although there are numerous potential complications about the health of the mother and infant, there is sufficient existing literature to illustrate the costs and benefits of access to prenatal care versus lack of access to such care.

16 Lu, M. *et al.* (2000), p. 237.
17 Wolff, H. *et al.* (2005); Wolff, H. *et al.* (2008).
18 See FRA (2011a), pp. 23–24; FRA (2011b), p. 80, which reported that only four out of the 10 states provided full access to pre- and post-natal care in 2011.
19 Herbst, M. A. *et al.* (2003).

1.1.3. Other medical conditions

Other medical conditions were rejected based on the following considerations.

Despite being prevalent, thus fulfilling one criteria for the model, skin diseases have the smallest treatment costs. Access to healthcare would reduce the progression of skin disorders, reducing hospital costs. However, preliminary research did not identify any studies that measured the benefit of early treatment of skin disorders and decreased hospital costs. This is mostly because many skin diseases are not severe – only 2 % of primary care physician-diagnosed eczema cases are severe, for instance.[20] In addition, most mild and moderate cases of eczema are treated with emollients that do not require a prescription and can be purchased over the counter at pharmacies. Therefore, it is expected that healthcare coverage for skin disorders will not reduce costs. As a result, skin disorders have not been selected as a condition for the economic model.

Diabetes, also common, has significant treatment costs and requires complex analysis. Furthermore, a study on Diabetes Type II has already been undertaken for the United Kingdom.[21] Some complications of diabetes include acute myocardial infarction, stroke, peripheral artery disease, nephropathy and retinopathy. Peripheral artery disease, nephropathy and retinopathy can result in amputations of the foot or lower leg, kidney failure requiring transplant or long-term dialysis, and limited vision or permanent blindness. Complications are mainly treated in secondary care and involve high costs. Analysing diabetes presents several challenges. The condition can go undetected for years, as early symptoms can be general. Diabetes can be treated by lifestyle changes: incorporating a healthy diet and monitoring blood glucose levels. Some individuals, however, require medication, particularly as the condition progresses. Adherence to medication and patient compliance with recommended lifestyle changes are major factors in the probability of disease progression. For the economic model to successfully capture the costs of the disease and its various complications, it must account for underdiagnosis, variation in patient compliance to medication and lifestyle changes, and all the potential primary and secondary complications, which is highly complex. For these reasons, diabetes has not been selected.

No studies were found comparing the results of individuals who had access to asthma care with those who did not. Rather, several studies were identified that compared access to 'usual care' in comparison to 'recommended' care.[22] For example, patients experiencing moderate asthma symptoms are recommended

20 Garside, R. *et al.* (2005).
21 Médecins du Monde (2011).
22 Kemp, L. *et al.* (2010); Campbell, J. *et al.* (2008).

inhaled corticosteroids (ICS). However, not all patients can access ICS and instead continue to use 'usual care' treatments, such as short-acting beta-2 treatments. In a study conducted in 2003, patients across 32 countries were randomly chosen to receive either ICS or usual care treatments to measure the incremental health costs saved by providing ICS.[23] The results of the study indicate that access to ICS generates moderate cost-savings due to reduced hospital stays, emergency visits and drug use. However, in the case of migrants in an irregular situation, it is likely that they do not even access 'usual care'. Therefore, using such sources would underestimate the benefit of access to healthcare, since access to recommended care would generate even larger benefits when compared to no care. Asthma was not selected for the economic model because the necessary data to reflect the benefits of healthcare access were not available.

1.2. Choice of Member States to apply the model

Germany, Greece and Sweden are the three Member States used to explain the economic model. These countries were selected based on different criteria. First, they differ substantially in the way they handle access to healthcare for migrants in an irregular situation. During the initial stages of research, migrants in an irregular situation in all three states were in law or practice only entitled to emergency healthcare (legislative changes introduced in Sweden in 2013 extended access to regular healthcare to migrants in an irregular situation). In Germany, access beyond emergency healthcare is legally provided but the migrant's personal data is reported to the police. This discourages migrants in an irregular situation from approaching public healthcare providers. Second, the three Member States also differ substantially in the way public authorities are involved in healthcare provisions. Each of these countries have a different financing model. In Sweden, healthcare funding comes primarily from taxation, and services are mainly delivered by public healthcare entities (Beveridge model). In Germany, healthcare is funded through premium financed social or mandatory insurance (Bismarck model) and delivered by a mix of private and public providers.[24] Greece has a state-funded system complemented by private insurance.

Overview of the healthcare systems and cost regulations in the three EU Member States where the model is applied

Germany

Germany's healthcare system is a social insurance contribution-based system.[25] The Public Statutory Health Insurance (SHI, *Gesetzliche Krankenversicherung*) has been compulsory also for self-employed persons since 2009. This health insurance covers employees earning up to a certain amount and includes their dependants. Those earning beyond that threshold and the self-employed are given the option to stay with the SHI or to contract private insurance (*Private Krankenversicherung*).[26] The amount paid to the scheme varies according to income, not health risk. Employers and employees share the health insurance contributions equally, leaving the welfare system to contribute on behalf of the unemployed through the compulsory insurance (*Pflichtversicherung),* which also falls under the SHI.[27] Over 200 competing non-profit health insurance funds operate the system, which is regulated by the government.

Patients also participate in cost sharing. In 2004, the government introduced copayments (€10 per quarter) for visits to a physician with exemptions for persons under the age of 18, recipients of unemployment allowances and those with low incomes, individuals injured at work and pregnant women. These copayments led to an increase in out-of-pocket payments, which accounted for 13.2 % of total health expenditure in 2010, up from 10 % in 1992.[28] Measures were put in place to prevent individuals from financial difficulty as a result of these copayments. Cost sharing is generally limited to 2 % of household income per annum (1 % for the chronically ill).[29]

23 Sullivan, S. D. *et al.* (2003).

24 For a categorisation of different healthcare systems, see Lameire, N. *et al.* (1999).
25 Döring, A. and Paul, F. (2010).
26 Germany, Social Code (SGB), Book V, Section 5.
27 Germany, Social Code (SGB), Book V, Chapter 8, Titles 3–5.
28 Clarke, E. and Bidgood, E., Civitas (2013), p. 9.
29 *Ibid.*

The statutory accident insurance covers payments in case of accidents in the workplace or on the way to the workplace, even if the employer has never paid the contributions and the injured person is neither lawfully employed nor lawfully staying in Germany. In the absence of work contracts or lawful stay, practical obstacles may make implementation difficult.

Greece

A combination of public and private resources finances the healthcare system in Greece. Public financing is based on social insurance and tax.

Many costs are covered by the patient. Out-of-pocket expenditure accounts for 37.6 % of total health expenditure.[30] In recent years, the Greek government has significantly reduced public spending on health and has increased the cost of accessing healthcare services.[31] As of October 2010, all public hospitals instituted an upfront €5 fee for services[32] and every medical act after the consultation must be paid for by the patient (e.g. €30 for a blood test).[33] This has resulted in more people being excluded from healthcare services because they cannot pay. In polyclinics run by the NGO Médecins du Monde, traditionally targeting migrants excluded from the healthcare system, the percentage of Greek citizens seeking medical assistance more than doubled in 2011. Many of them are retired older citizens whose pensions have been substantially reduced by the recent austerity measures.[34] In 2011, 31.1 % of Greeks were at risk of poverty or social exclusion (versus 22.6 % in the Eurozone).[35]

Patients may also pay for services covered by social insurance but bought outside the system because of time, cost, quality or for unethical reasons, such as bypassing waiting lists or ensuring more doctor attention.[36]

Sweden

The 1982 Health Care Act (*Hälso- och sjukvårdslagen*) regulates the healthcare system in Sweden. The county councils (*landsting*) are responsible for all healthcare services and control hospital structure.[37] Healthcare is predominantly financed through national and local general taxation (85 %). Private health insurance plays a supplementary role and covers 2.5 % of the population.[38]

Co-payments exist for most health services in Sweden. In 2011, the fee for consulting a physician in primary care varied between SEK 100 (€11) and SEK 200 (€22) across the county councils. The fee for consulting a specialist at a hospital varied between SEK 230 (€25) and SEK 320 (€35) in the same year. In almost all county councils, children and young people (under 20 years of age) are exempt from patient fees for healthcare and for dental care. At the prenatal primary care clinics, regular check-ups are given free of charge during the entire pregnancy.[39]

30 Economou, C., European Observatory for Health Systems and Policies (2010).
31 Kondilis, E. *et al.* (2013).
32 Greece, Common Ministerial decision by the Ministry of Health, Ministry of Employment, Ministry of Finance and Ministry of Sea Islands and Fisheries, 29 December 2012 Registration number ΑΔΑ: 4Α9ΞΘ-Ρ. The Circular by the Ministry of Health registration No. Υ4α/οικ.1329/4.1.2011 excludes asylum seekers, refugees and persons with at least 67 % disability are exempted.
33 Greece, Hellenic Republic Ministry of Finance (2011).
34 Cahuvin, P. and Simonnot, N., Médecins du Monde (2013a).
35 Vilaplana, C. L., Eurostat (2011).
36 Economou, C., European Observatory for Health Systems and Policies (2010).
37 Glenngård, A. *et al.* (2005), p. 22.
38 Thomson, S. *et al.* (2009).
39 EOHSP (2012).

1.3. Calculating costs

A decision tree model is used to represent mutually exclusive pathways where probabilities determine the likelihood of different events occurring. For example, a migrant woman in an irregular situation can be either pregnant, or not pregnant. If pregnant, she can either access prenatal care or not access prenatal care. Clinical evidence suggests that timely uptake of prenatal care decreases the risk of giving birth to a low birth weight baby.[40] Similarly, migrants in an irregular situation can be either hypertensive or normotensive. If hypertensive, they can either be screened for the condition or not. If screened, they can be treated for the condition, or not. Clinical evidence suggests that timely uptake of treatment for hypertension can reduce the risks of more serious cardiovascular events such as stroke or myocardial infarction (MI).[41]

The decision tree uses clinical research data to estimate the probability of these events occurring, as well as the economic costs and benefits associated with the possible outcomes.

1.3.1. Adopting a conservative approach

FRA adopted a conservative approach for this analysis to ensure robust conclusions. This means that cost-savings could be underestimated.

First, the model excludes costs not incurred by the healthcare system. Economic analysis considers the costs and benefits of any policy or process. However, it is important to be clear within the analysis as to who pays the costs and who receives the benefits. This is known as the 'perspective'. The economic model presented in this paper adopts a healthcare system perspective. This means that all the costs associated with hypertension and prenatal care refer to the costs borne by the health systems. This was the most relevant approach, as the research question focused on the potential cost-savings for each Member State based on providing early, regular access to healthcare.

Therefore, the model only considers the economic costs associated with the provision of care, not costs incurred by society (loss or limitation of human capital), lost opportunity costs, or other external or social costs. These calculations are beyond the scope of this analysis. The potential long-term consequences of having a stroke entail considerable social and economic burdens for individuals and society.[42] Medical conditions may lead to unemployment of the patients or their carer, or cause long-term care costs associated with disabilities. A study conducted in the United Kingdom shows that stroke treatment costs and productivity losses result in a total societal cost of GBP 8.9 billion (€12.6 billion as of July 2015) a year: Direct care accounts for approximately 50 %, informal care 27 % and indirect costs 23 %.[43] Preventing an initial stroke will decrease the likeliness of subsequent episodes, which are likely to be more severe and thus more costly.[44]

This implies that the costs to society are actually significantly underestimated by the model, which may support the idea of granting access to preventive primary care as opposed to limiting access to emergency care.

Though such costs incurred by society are not included in the present economic analysis, they should be taken into consideration when evaluating the benefits of preventive measures, such as providing access to hypertension treatment. Adding such costs to the analysis would increase the cost-savings associated with preventing an acute event.

Second, the model is based on the assumption that every migrant entitled to access regular healthcare services also uses these services. For hypertension, however, a different scenario is included in the sensitivity analysis to test the cost-savings of the model in case those with access to preventive care do not actually seek treatment. A sensitivity analysis tests the robustness of the model in the presence of uncertainty. Under the sensitivity analysis, certain parameters are changed to account for the relationship between inputs and outputs. It ultimately shows whether changes in particular variables affect the outcomes of the model. For example, the sensitivity analysis can show whether access to preventive care still saves costs even when the costs of particular healthcare tests or the number of persons accessing healthcare change. The extent to which a population accesses and utilises services also depends on financial, organisational and social or cultural barriers. The economic analysis is therefore 'normative'. It models a preferred approach to healthcare utilisation, rather than an attempt to quantify the extent to which those entitled to access regular healthcare services do not make use of it. Furthermore, the model does not consider that some migrants in an irregular situation – although formally excluded from regular healthcare – have access to services provided by NGOs or other civil society initiatives.

40 See, for example, Eastman N.J. (1947), pp. 343–352, Tokuhata G.K. et al (1973), pp. 163-185, Debiec K.E., *et al.* (2010), pp. e1–e6, cited in Okorah E.M. et al (2012), pp. 89–97.
41 See, for example, Lewington S., *et al.* (2002), pp. 1903–1913 cited in Mancia G. *et al.* (2013).
42 Fattore G. *et al.* (2012).
43 Saka, O. *et al.* (2009).
44 See, for example, Jørgensen, H. S. *et al.* (1997), pp. 891–895.

Third, assumptions have been made that may not necessarily correspond to reality, and certain costs have been excluded. For example, it is assumed that all screened hypertensive patients receive treatment until death, which may not necessarily be the case. The model for prenatal care does not consider the health outcomes for the mother, potentially underestimating the real cost benefit of providing prenatal care.

1.3.2. Establishing a timeframe for calculating costs and benefits

Economic costs and benefits vary over time. For this research, the healthcare system benefits generated from avoiding hypertension and prenatal care-related conditions are calculated on an annual basis. This allows the model to consider the benefits in the short- and long-term.

This is particularly important when considering the length of stay of migrants in an irregular situation in a particular country. On average, if they only stay in a country for five years, it can be expected that some long-term costs associated with hypertension may not be incurred by the country's healthcare sector, since the migrant would have left the Member State by that time. To account for the uncertainty of lengths of stay, the results of the hypertension model are presented for three different timeframes: one year, five years and a patient's lifetime (with a life expectancy of 80 years[45]). For the prenatal care model, the base time considered was one year, as all relevant costs and benefits considered for this population are likely to occur during pregnancy and shortly after. Hence, although prenatal care refers to the period before birth, the model extends past this period, as specific costs may be incurred after birth as a result of lack of access to prenatal care.

1.3.3. Discounting costs and benefits

The costs and benefits of providing preventive care to migrants in an irregular situation are realised over time. To evaluate them, it is necessary to compare the costs and benefits of different time periods. Doing so requires a discount rate,[46] which determines the future costs and benefits relative to current costs and benefits. For this research, all costs and benefits incurred for periods longer than one year were discounted by 4 %, as recommended in the European Commission Impact Assessment Guidelines.[47] All costs reported in this document relate to healthcare prices applied in 2013.

1.3.4. Data sources used in this model

The model requires the identification, estimation or calculation of the various costs and benefits associated with each possible health outcome, and the probability of each outcome. Health economics often relies on clinically validated assumptions or calculations using proxy estimates.[48] Therefore, the health economic analysis of migrants in an irregular situation, for whom limited robust research data are available, will require some calculations using estimates and evidence-based assumptions. The economic analysis presented in this paper should therefore be seen as only a first step in attempting to quantify the costs associated with a situation for which little economic evidence currently exists, and which further research will be able to test and strengthen.

A first draft of the model was tested in three EU Member States (Germany, Greece and Sweden), using cost and benefit data sourced through desk research. Despite efforts to source country-specific cost and benefit data, no such data were available. Rather, other evidence sources were used. Because of its extensive cost-effectiveness research, the UK National Institute for Clinical Excellence (NICE)[49] is a major source of health economic data. UK data were used as a primary data source and adjusted to reflect country-specific circumstances (see below) in parts of the models. To make the economic analysis as country-specific as possible, an expert workshop with health professionals and health economists from the three EU Member States used to test the model was organised at FRA premises in June 2013. During this workshop, experts were asked to validate the applicability of source data or to provide other data where possible. The initial assumptions were updated to include more country-specific data. In addition, the sensitivity analysis (see Section 1.4.) identifies the impacts of under- or over-estimated costs (resulting from the use of inaccurate or non-country specific data) on the findings.

1.3.5. Adjusting non-country specific data to reflect specific country circumstances

Where country-specific data necessary to test the model could not be sourced, Purchasing Power Parity

45 Average life expectancy now exceeds 79 years across the countries of the Organisation for Economic Co-operation and Development (OECD), see OECD (2011), p. 79.

46 Discounting adjusts the time value of money so all flows of costs and benefits (occurring at different points in the future) are expressed in terms of their present net value. The discount rate discounts the sum of costs and benefits from the period they occur, back to the present.

47 European Commission (2009b), p. 38.

48 See, for example, United Kingdom, NICE (2007), Ch. 8.

49 Because the UK operates a single payer system, health economic analysis (published by NICE) is used to guide resource allocation. For this reason, NICE guidelines are a very rich and diversified source of cost and effectiveness data. All NICE guidelines follow quality standards, ensuring that only robust evidence from accredited sources are included in the development of the guidelines.

rates (PPPs) were used to calculate the country-specific equivalent costs. This methodology calculates relative, country-specific costs using non-country specific data. Cost data obtained through sources from outside Germany, Greece and Sweden were adjusted using the OECD 2008 PPPs for health consumption.[50] This is the most recent and stable data set available.

Table 4 presents the PPPs for health consumption used when testing the model in Germany, Greece and Sweden. For example, if the UK's GBP is used as the index currency,[51] for every GBP 1 spent on healthcare in the UK, €1.26 is necessary to obtain the same 'quantity' of healthcare in Germany. Therefore, if an appointment to screen for hypertension in the UK costs GBP 29.83, it will cost €37.58 in Germany, €30.42 in Greece and €40.57 in Sweden. These calculations have only been used where country-specific data were not available.

1.4. Sensitivity Analysis

Some parameters required to elaborate the economic model are subject to uncertainty. To address this issue, a sensitivity analysis is performed. Sensitivity analysis is a technique used to quantify confidence in the conclusions of the economic model. In this simulation, key parameters of the model are changed within a specific range to assess their effect on the final outcome and to predict alternative outcomes of the same course of action.

Sensitivity analyses were performed for both conditions. A number of parameters were varied, including the time horizon and likelihood of access or take-up of care. The time horizon refers to the length of time covered by the economic model: one year, ten years and patient lifetime. The take-up of care level was adjusted from 100 % to 70 % to test the cost-savings of the model in case those with access to preventive care do not actually seek treatment, despite being insured. It also accounts for insured patients who experience emergencies.

By allowing these parameters to vary within a specific range, the impact on the final economic output can be analysed. Sensitivity analysis calculates whether over- or underestimating a particular cost or factor impacts on the conclusions of the analysis. It also ensures that any conclusions drawn from the analysis are robust.

1.5. Limitations of the model

The economic model presented is static; it focuses on an individual group of migrants at a specific time and their associated health outcomes. It does not consider the influx of new migrants, societal changes or population composition over time. This also means that the analysis does not consider migrant mobility. To include this would create additional complexities in calculating costs and benefits, for instance in cases where the provision of care is (or is not) provided in one Member State and then years later the costs are incurred by the system in a different Member State to which the migrant moved on (e.g. if a stroke occurs and the individual needs emergency treatment). This is particularly relevant for the hypertension model.

Table 4: Purchasing Power Parities rates (PPPs) for health

Country	PPPs derived from OECD dataset 2008[54]
Index currency (GBP)	GBP 1
Germany	€1.26
Greece	€1.02
Sweden	€1.36

Note: OECD data is converted into GBP as the index currency for comparison, since much of the cost data used in this report comes from UK data.

Source: OECD 2008 dataset

50 OECD (statistics), *Monthly comparative price levels*.
51 The OECD data use USD as a reference currency unit. In Table 4, the OECD data is converted into GBP as the index currency for comparison, since much of the cost data used in this report comes from UK data.
52 *Ibid.*

Using a static model therefore allows for a very basic cost analysis. The individual either receives or does not receive treatment, and costs are incurred if the condition requires emergency care. A more dynamic model would require a more complex analysis; this is, unfortunately, beyond the scope of this report. However, efforts were made to try to overcome this issue, as explained in Section 2.6.

Finally, applying the model to specific EU Member States requires using proxy data, particularly when estimating costs, as real data may not be easily available. This limitation, and how to overcome it, is described in Chapters 2 and 3 when presenting the hypertension and prenatal care models, and in the annexes when testing the models in the three EU Member States.

2 Economic model for hypertension

2.1. Model structure

Hypertension is screened and treated based on the European Society of Hypertension (ESH) and the European Society of Cardiology (ESC) guidelines for the management of hypertension.[53] As validated by experts, these guidelines are considered best practice for the management of hypertension and are widely followed across Europe. They were therefore used to design the conceptual models for evaluating the costs related to hypertension screening and prevention. It should be noted that using the guidelines for the analysis is thus based on the assumption that healthcare is delivered in accordance with these guidelines. In practice, this may not always be the case.

Hypertension is considered the main modifiable risk factor for cardiovascular events (such as stroke and myocardial infarction, MI), which represent a major burden to public health. This model includes myocardial infarction and stroke as possible outcomes of hypertension, although other health effects are possible.[54] The model was simplified because other conditions that result from hypertension, such as diabetes, often go undiagnosed and untreated in populations with full access to healthcare. The outcomes and costs of these conditions can therefore be difficult to quantify. On the other hand, stroke and MI are severe conditions and often result in an emergency admission to acute care. Therefore, both the incidence of stroke and MI, and their associated costs, are relatively easy to quantify and model. As it only quantifies some, but not all, of the associated outcomes, the model's estimate is conservative, likely underestimating the costs of denying access to preventative care.

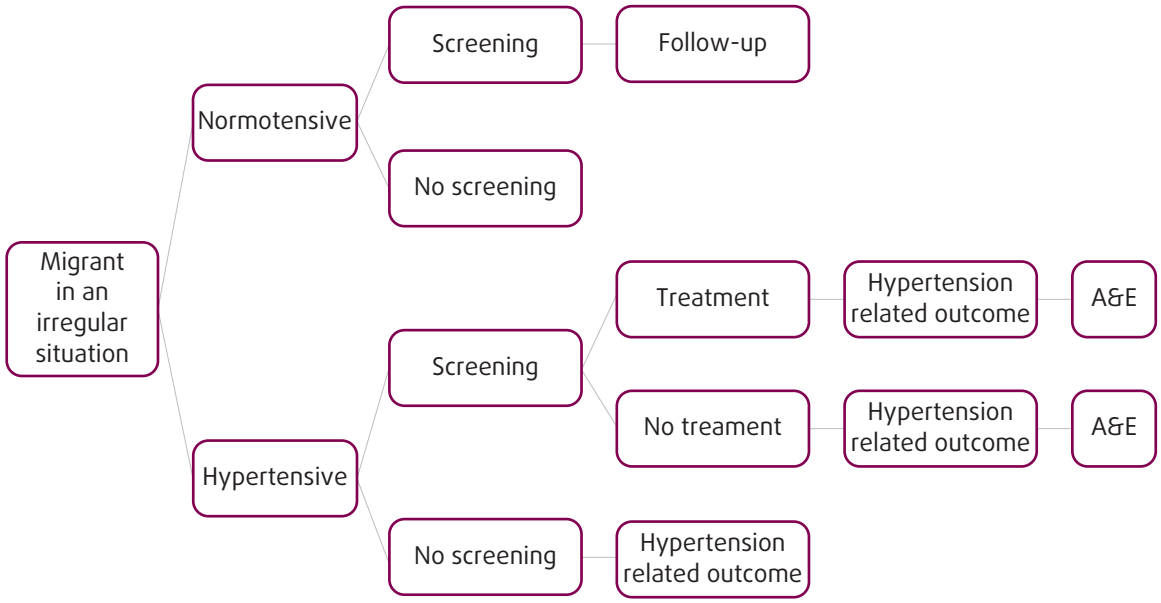
Figure 2 provides a detailed outline of the conceptual framework used for the economic analysis of hypertension. It outlines the pathway for migrants in an irregular situation with and without regular access to healthcare. The economic analysis compares the total costs incurred under the no-access assumption with those incurred under the regular-access assumption.

The conceptual framework for both these assumptions is the same, i.e. the *possibilities* of receiving or not receiving treatment are theoretically similar along the care pathway. What does change between the access and no access models is the *probability* of receiving care. The pathway presented in Figure 1 can be read as follows:

- at the beginning of the pathway, a patient is classified as being normotensive or hypertensive. This determines their risk level;[55]
- both normotensive and hypertensive patients are either screened for hypertension or not screened. As screening takes place in a primary care setting, migrants in an irregular situation with no access to healthcare are less likely to be screened than those with regular access. In the model, the likelihood of migrants with no access being screened has been assumed to be zero, although in rare cases a migrant in an irregular situation may still access screening through other healthcare avenues;
- if a normotensive patient undergoes screening, regular follow-ups (five yearly) are required to monitor

53 Mancia, G. *et al.* (2013).
54 WHO (2013).
55 For hypertension classifications, see Mancia, G. *et al.* (2013).

Figure 2: Hypertension conceptual framework for both healthcare scenarios



Note: A&E: accident and emergency sector

Source: FRA, 2015

the likelihood of becoming hypertensive.[56] A hypertensive patient receives treatment to manage the hypertension and decrease the risk of hypertension-related outcomes;

- if a normotensive patient does not undertake screening, no monitoring occurs. Treatment is not provided for an unscreened hypertensive patient, thus the risk of hypertension-related outcomes increases;
- hypertension-related outcomes generate costs for the accident and emergency sector (A&E).

2.2. Level of access to healthcare

For the hypertension model, the following scenarios were considered in the base case analysis:

- 100 % of migrants in an irregular situation have regular access to healthcare.
- 70 % of migrants in an irregular situation have regular access to healthcare.

These scenarios were compared with a no-access assumption, e.g. 0 % of migrants in an irregular situation have access to regular healthcare.

The 70 % estimate was used to reflect the fact that, even if migrants in an irregular situation are entitled to access preventive care, in practice not everyone will be screened for hypertension, as this requires a person to engage with healthcare services. In accordance with the normative interpretation of the ESC/ESH guidelines, the model assumes this is done during a regular visit to a primary care physician. However, not everyone visits a doctor on a regular basis. According to the most recent Eurostat data available (2003), 89.7 % of the population in Germany has visited a medical professional (generalist or specialist) in the last 12 months, compared to 63.7 % in Greece.[57] Experts at the workshop held in June 2013 at FRA agreed to use 70 % as a proxy estimate.

2.3. Hypertensive population in the economic model

The cohort considered in the economic model includes patients from 35 to 75 years old and above. This age

56 Evidence is lacking to recommend an optimal interval for screening adults for hypertension. ESH/ESC guidelines (Mancia, G. *et al.* (2013)) and US Preventive Services Task Force (USPSTF) recommendations (United States, U.S. Preventive Services Task Force (2007)) suggest annual check-ups for 'white-coat' hypertension. The USPSTF recommends screening every two years in persons with blood pressure less than 120/80 mm Hg (normotensive). The UK National Institute for Clinical Excellence (United Kingdom, NICE 2011) recommends five-year follow-ups for normotensive patients. The five-year interval is therefore adopted as a conservative cost-estimate.

57 Eurostat (2005), p. 85.

group was chosen because the earliest manifestations of hypertension usually take place around the age of 35, even though it is possible for individuals to be pre-hypertensive before this age.

However, as patients get older, the relative risk (RR) of experiencing a stroke, for example, increases. This age-dependent effect also applies to the number of drugs required to treat hypertension. As such, the hypertension model incorporates age-dependent RRs and age-dependent treatment options.

The model assumes that once a patient is diagnosed with hypertension, she or he will receive care until death. This means that hypertensive patients keep taking hypertension drugs and go to regular primary care physician checks until they are 80 (the average life expectancy considered in the model). This is an overestimation of hypertension management costs – and thus of the cost of providing access to healthcare to migrants with hypertension in an irregular situation – as some patients (especially younger ones) might be able to resolve their hypertension with lifestyle alterations and/or might need drugs for shorter periods of time. FRA has adopted such a conservative approach throughout this analysis, to ensure robust conclusions. This implies that if the model finds access to preventive care to be cost-saving, even when these costs are quite high, the actual cost-savings could be even greater. Other scenarios are explored in sensitivity analysis.

The health status of the cohort is important for the model. Cardiovascular risk factors such as smoking, high cholesterol and diabetes influence the calculation of relative risk (RR) used to model the probabilities of experiencing an acute episode of stroke and MI with and without treatment. For this model, relative risk calculations from a previous study were used,[58] based on data on risk factors obtained from the Survey of England 2006. These proxy data are likely to reflect a conservative estimate of relative risk in the irregular migrant population, as they are based on the prevalence of risk factors in a general UK population, Lower socioeconomic groups such as migrants in an irregular situation, however, tend to manifest a higher prevalence of smoking, cholesterol and diabetes.[59] Table 5 presents the model's baseline proxy data.

Table 5: Cardiovascular risk factors by age and gender used as proxy in the hypertension model

	35–44 age group		45–54 age group		55–64 age group		65–74 age group		75 years and above	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Age [a]	40	40	50	50	60	60	70	70	75	75
Total cholesterol [b]	5.6 (0.04)	5.2 (0.03)	5.7 (0.05)	5.7 (0.04)	5.6 (0.04)	6.1 (0.04)	5.2 (0.06)	5.9 (0.05)	4.9 (0.07)	5.6 (0.07)
HDL cholesterol [c]	1.3 (0.01)	1.6 (0.01)	1.4 (0.02)	1.7 (0.02)	1.4 (0.02)	1.7 (0.02)	1.3 (0.02)	1.6 (0.02)	1.3 (0.02)	1.7 (0.02)
Smoker [d]	28 % (1178)	23 % (1490)	24 % (1046)	24 % (1278)	19 % (1123)	20 % (1269)	14 % (852)	13 % (933)	9 % (600)	8 % (895)
Diabetes [e]	2.4 % (1183)	1.2 % (1494)	6.0 % (1050)	3.6 % (1279)	8.5 % (1126)	6.0 % (1268)	15.7 % (437)	10.4 % (470)	13.5 % (317)	10.6 % (470)
LVH [f]	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %	0 %

Notes: a) Mid-point of range (except 75+ as risk tables are technically not valid over 75 years will conservatively use an age of 75 for this group).
b) HSE 2006 Table 10.3. Total cholesterol, by age and sex. Mean (standard error) (including those taking lipid lowering drugs) (mmol/l).
c) High-density lipoprotein (HDL) is one of the five major groups of lipoproteins. HSE 2006 Table 10.8 HDL- cholesterol, by age and sex. Mean (standard error) (including those taking lipid lowering drugs) (mmol/l).
d) HSE 2006 Table 8.1 Cigarette smoking status, by age and sex. Current cigarette smoker. Proportion (unweighted n number).
e) HSE 2006 Table 4.1 Prevalence of doctor - diagnosed diabetes (Type 1 and 2), by age and sex. Types 1 and 2 combined. Proportion (unweighted n number).
f) Left ventricular hypertrophy (LVH), a thickening of the myocardium muscle of the left ventricle of the heart, is not reported in HSE 2006. Assumed 0 % for risk calculations.

Source: Health Survey for England (HSE) (2006), cited in United Kingdom, NICE (2011)

58 United Kingdom, NICE (2011).
59 See, for example, Gaudamaris, R. de (2002).

Finally, the model accounts for the differences in risks between men and women (see Table 5). In the absence of reliable data concerning the gender distribution of the irregular migrant population, the model uses the gender distribution of the host state. Statistics on apprehension of irregular migrants were not used to estimate the gender distribution among migrants in an irregular situation, as they underestimate the number of migrant women in an irregular situation – the risk of detection is lower for migrants employed in private households (mainly women) than for those working on construction sites (mainly men). If more accurate information on migrants in an irregular situation becomes available, the calculations can be adjusted to reflect changes in gender composition.

2.4. Data used to populate the model

The model is designed to be easily populated with data identifying the probability of having a stroke or developing MI, and the associated costs. The cost data may vary by country, as may the probabilities, depending on the irregular migrant population composition and characteristics. This is further illustrated in Annex 1.

Because the model is static, rather than dynamic, it does not recognise a stroke patient's increased likelihood of experiencing a second stroke.

The probabilities of developing stroke and MI used in this model are based on the Framingham Study, which uses data from a cohort of men and women from the town of Framingham, in Massachusetts in the US.[60] At FRA's expert workshop, participants suggested exploring the possibility of using more EU data sources for estimating the probabilities of stroke or MI.[61] To derive new risk ratios and to calculate new probabilities requires primary data on risk factors relative to the development of hypertension by the irregular migrant population. Factors to take into account include smoking, diabetes and high cholesterol. Using EU data for relative risks (RRs) calculations for cardiac events would, theoretically, increase the reliability and validity of the model. In practice, however, since accurate data on the baseline risk factors within the population of migrants in an irregular situation are not available, the model would be replacing one proxy estimate with another. Instead, the impact of changing the probability of stroke and MI was modelled in the sensitivity analysis.

2.4.1. Cost of screening and managing hypertension

According to the European Society of Hypertension (ESH) and the European Society of Cardiology (ESC) guidelines, screening for hypertension includes:

- Repeated blood pressure (BP) measurements
- Medical history
- Physical examination
- Laboratory and instrumental investigation

The costs of screening and managing a hypertensive patient are based on the assumption that medical history and physical examination are part of the primary care physician appointment. The model also assumes that the clinical procedure for measuring blood pressure follows the standard measuring method (versus, for example, ambulatory blood pressure measurement). For the three EU Member States to which the model is applied, such costs – validated by experts – are presented in Table A6 in Annex 1.

2.4.2. Cost of screening and follow-up for a normotensive patient

For a normotensive patient, the only costs incurred are the initial screening costs and the follow-up costs every five years. The model is based on this assumption.

2.4.3. Cost of treating hypertension

The ESH and ESC guidelines provide a range of options and strategies for the treatment of hypertension. However, they do not include the standard combination of drugs usually prescribed to the average patient. For this reason, the NICE (2011) costing strategy is used as source data for the costs associated with the treatment of hypertension.

The costs of hypertension treatment is calculated on the basis of baseline population data on patients within a 10-year age band, also taking gender into account. The average antihypertensive drug costs are an average of people on one, two or three (or more) drugs.[62] For each age band, typical drug classes A (ACEi/ARB), C (CCB) and D (diuretic) were assigned respectively to the one, two or three drugs categories, based on the guideline recommended treatment algorithm. Country-specific cost data for each drug could not be collected for this research, despite reaching out to experts. Instead, data for optimal doses and associated costs for each drug class were based on British National Formulary

60 The Framingham Study.
61 For example, Conroy, R. M. *et al.* (2002).
62 Craig, R. and Mindell, J. (2008), pp. 1–9.

costs.[63] These results show the most commonly used drug in each class and the optimal doses provided by Clinical Guideline Development Group members: ramipril 10mg (ACEi /RB), amlodipine 10mg (CCB), bendroflumethiazide 2.5mg (diuretic). Country-specific costs were estimated by applying PPP methodologies. Ultimately, differences in drug costs across the countries would not have a significant impact on the final economic results. This is because the results are robust enough that these minimal effects on cost would not change the results to a negative outcome (see sensitivity analysis, which tested the model for lower and higher estimated costs of stroke and MI). These annual costs are presented in Annex 1 (Table A8) by age category. As explained before, the annual cost of treating hypertension is age-dependant; hence, the sensitivity analysis performed on the age-distributed population showed an impact on treatment costs.

2.4.4. Cost of stroke and MI

The study[64] used as source data in this research draws on two previous studies to estimate the costs of stroke and MI. The original studies presented initial acute care costs associated with the hospital stay, and ongoing costs related to the continued management of health and social care services needs. For the purposes of this research, only the costs associated with the hospital stay have been extracted, for the first three months. This includes initial emergency care costs and other hospital costs associated with follow-up appointments.

A study by Youman *et al.*[65] calculated the costs associated with stroke. These costs relate to:

- hospital (e.g. bed-day costs);
- primary care (day-to-day healthcare, e.g. visiting a general practitioner);
- healthcare contacts – related to on-going care;
- utilisation of social services – related to on-going care.

Costs were also weighted by the severity of the event (mild, moderate or severe). The costs of healthcare contacts and social services used in the original research were excluded from this model, as they relate to ongoing care.

The original study by Palmer *et al.*[66], which was used to obtain the total cost estimates for MI, included:

- cardiac ward and non-cardiac ward hospital stays;
- angiographies undertaken;
- percutaneous coronary interventions;
- coronary artery bypass graft interventions.

Table A11 in Annex 1 shows the cost estimates for managing an acute episode of stroke and MI in the three EU Member States in which the model is tested.

2.5. Adopting a conservative approach

The economic model assumes that all screened hypertensive patients receive hypertension treatment until death. This is a conservative estimate because it could lead to an overestimation of the costs of providing access to healthcare. It might be the case that lifestyle changes alone are sufficient to manage a hypertensive patient (especially a younger one) and/or that the patient does not need drugs for the remainder of his/her life.

Using the ESH and ESC guidelines to develop the conceptual model assumes that care is delivered as recommended. This may also result in an overestimation of the costs of screening and managing hypertension, as in reality this may vary by country. Adopting a normative approach for developing assumptions about how hypertension is managed means there is a risk that the costs associated with managing the condition across different countries is lower (in Greece, where the out-of pocket expenses are relatively higher, patients might not follow all the recommendations and visit doctors less). Again, this is a conservative estimate as it potentially skews the final cost-savings downwards.

63 Joint Formulary Committee (2010), British National Formulary, 60th edition. General prices have been calculated from the net cost used in pricing the United Kingdom NHS prescriptions. All costs were updated to reflect 2013 costs.

64 United Kingdom, NICE (2011).

65 Youman, P. *et al.* (2003), pp. 43–50. This study uses data from an existing study performed at a standard acute-care facility in a suburban district in the United Kingdom, which compared the efficacy of stroke unit with stroke team or domiciliary care in a single-blind, randomised, controlled trial including 457 acute-stroke patients. Patients were recruited from a population-based stroke register and were included in the study at the time of presentation, no later than 72 hours after stroke onset. Patients were excluded if they only had a mild stroke, a very severe stroke, or if they were institutionalised or had severe disability prior to their stroke. The study collected the following per-patient data from the clinical study database: demographic and risk factors for stroke on admission; total resource use for stroke over one year (divided into hospital and other health services, social services and informal care resources); setting to which the patient was discharged (home or an institution, or dead) and setting of the patient one year after the stroke; and stroke subtype and disability. Costs were also calculated according to the severity of the stroke.

66 Palmer, S. R. *et al.* (2002). This study uses data from an observational cohort registry of 1,046 patients admitted to 56 British hospitals with acute coronary syndromes between 1998–9. The model is probabilistic and estimates health outcomes in terms of quality adjusted life years (QALYs) over a lifetime. Long-term (post-six month) resource costs and health outcomes are estimated using data from the Nottingham Heart Attack Register.

Based on the two scenarios, the 70 % access estimate is likely the most realistic. As mentioned earlier, even if 100 % access is granted, not everyone will visit the primary care physician or comply with treatment. This is particularly true for the population of migrants in an irregular situation where a simple visit to the doctor might cause fear and distress. This scenario only refers to the likely overall cost-savings to the country's health sector, as it has no impact on the cost-savings generated per patient.

2.6. Model limitations

The economic model presented is static, meaning it does not consider recurrent events such as repeated stroke and MIs. To avoid complex calculations, the benefits of providing care in one Member State and avoiding a potential stroke in a different Member State to which the migrant may move are also not considered. This makes cross-country cost and benefit comparisons of irregular mobile migrant populations over time one of the major limitations of the model, a limitation further research could improve.

However, efforts were made to overcome this issue. The relative risk (RR) estimates and treatment options used were age-dependent. Therefore, the costs associated with stroke, MI and treating hypertension were also age-dependent. Because the model is static, the persons included in it do not age; therefore, the increase in relative risk and treatment costs associated with ageing (hence the increase in emergency costs linked to higher a risk of event) is not captured. Late presenters, who may be sicker than early presenters and therefore incur potentially higher costs for treatment and care, are also not necessarily included in the model. Although age cohorts (and their probability of being hypertensive) are accounted for, the treatment costs are the same whether a patient is an early or late presenter. The model is also limited by the fact that irregular migrant populations tend to be mostly younger men.

To solve some of these issues, the baseline population was allowed to age throughout the model to capture the increase of event risk (hence the increase in costs associated with managing stroke and MI) and treatment costs. One limitation of this approach is that the same life expectancy was assumed for everyone (80 years old[67]), when in fact hypertensive patients might have a shorter life expectancy.

A further limitation is that not all migrants in an irregular situation may actually seek medical attention, even in emergency cases. Not all migrants who suffer a stroke or MI might seek emergency care, and some may not survive at all. This factor is not taken into account for, particularly considering the lack of data. The model is limited to the basic theoretical assumption that either access to preventive care and screening is provided or that it is not, and that whenever a hypertension-related event occurs, emergency care is sought.

2.7. Model results

The model shows that providing access to healthcare services for hypertensive migrants in an irregular situation is cost-saving, regardless of the time and age factors. As described at the end of this report, this conclusion applies to Germany, Greece and Sweden. Additionally, the sensitivity analysis shows these conclusions to be robust – i.e. they hold under different scenarios and assumptions.

67 Average life expectancy now exceeds 79 years across OECD countries. See OECD (2011), p. 79.

3 Economic model for prenatal care

3.1. Model structure

The model analyses the provision or non-provision of prenatal care. It compares the costs of providing prenatal care with the costs of treating the possible negative outcomes that result from lack of prenatal care, namely low birth weight (LBW), over a period of one year after birth.

Prenatal care makes it possible to signal and better address a range of negative maternal and infant conditions, including placenta praevia, LBW, lower Apgar scores, respiratory distress syndrome, intraventricular haemorrhage, retinopathy of prematurity, broncho-pulmonary dysplasia, and in extreme cases prevent death.[68]

However, most research in this area focuses exclusively on the potential consequences of no access to prenatal care for neonatal outcomes: prematurity, low birth weight and neonatal mortality.[69] Of these, the easiest to quantify the incidence and associated costs of is low birth weight. Because it is common practice to weigh a baby at birth, there are globally accepted standards of low birth weight,[70] as well as data on the care costs of LBW babies. While neonatal mortality is also easy to quantify, incidence is low, even in socially-excluded communities, such as migrants in an irregular situation. Therefore, to include this outcome would not provide a reliable indication of the economic impact of not having access to prenatal care. In contrast, some of the conditions affecting the mother that can be prevented by prenatal care have little impact on the costs borne to the health sector, when compared to the costs of caring for a child born with low birth weight.[71] By not taking into account negative health outcomes for the mother, the model may also underestimate the real cost benefit of the provision of prenatal care.

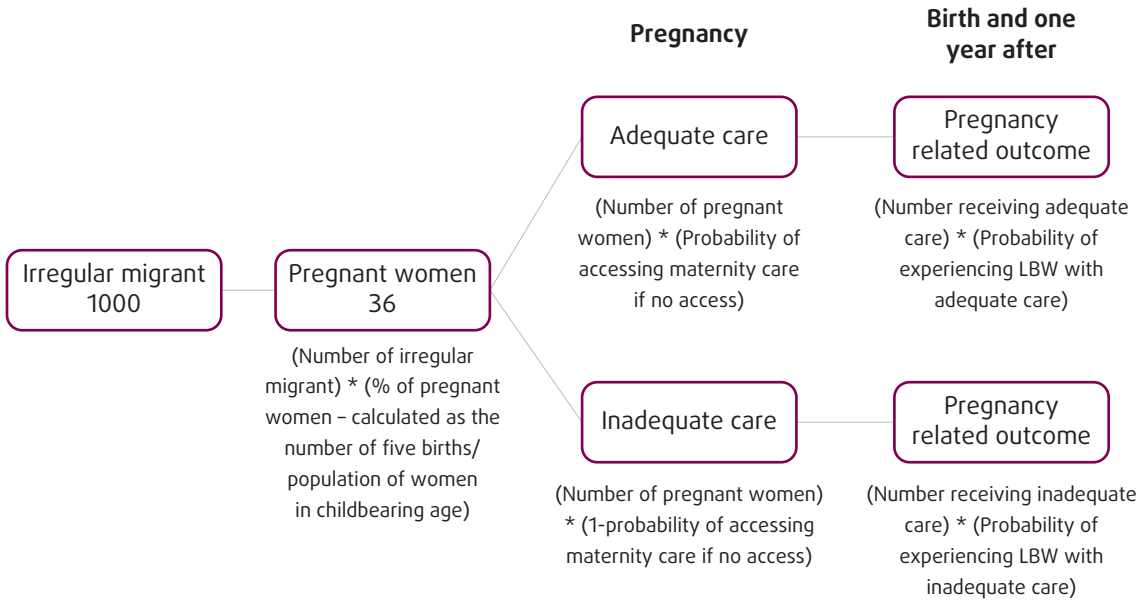
The model is based on the assumption that no access to prenatal care increases the risk of a child being born with low weight. LBW is almost five times more likely to occur in cases where prenatal care was not received.[72] This probability can be controlled in the sensitivity analysis to test the strength of the model when these conditions change.[73]

Lifestyle and socio-economic factors also affect the likelihood of LBW. The most significant, modifiable risk factor associated with LBW is thought to be maternal smoking.[74] However, genetic predispositions to giving birth to unhealthy babies and the number of previous pregnancies, amongst other factors, might also contribute to LBW.[75]

Just as the cause of LBW is not always clear, neither is its relationship to access to prenatal care. Prenatal care might help prevent LBW due to a range of factors, including access to professional advice to help stop smoking and to start taking vitamins and other dietary supplements, ultrasounds showing anomalies, prenatal monitoring to plan delivery, early detection of potential future complications or health risks, etc. As a result, it is difficult to isolate which component of prenatal care can help avoid/manage LBW. However, the point is not so much which component of prenatal care helps prevent LBW, as the simple fact that it helps prevent it.[76]

68 Herbst, M. A. *et al.* (2003).
69 See, for example, Gissler, M. and Hemminki, E. (1994); Vintzileos, A.M, *et al.* (2002); Chen, X. K. *et al.* (2007).
70 WHO (2013c) defines low birth weight as under 2500 grams for a newborn.
71 United Kingdom, NICE (2008).
72 Heaman, M. I. *et al.* (2008).
73 See sensitivity analysis concerning prenatal care in Annex 2.
74 Chiolero, A. *et al.* (2005).
75 Almond, D. *et al.* (2004), pp. 1031–1083.
76 Sable, M. R. and Herman, A. A. (1997).

Figure 3: Prenatal care conceptual framework



Source: FRA, 2015

It should also be acknowledged that LBW is not the only outcome associated with lack of prenatal care, and thus that no mono-causal relationships exist between access to prenatal care and LBW prevention. Prenatal care may also help to reduce negative maternal outcomes. However, using LBW as an outcome allows the model to draw on the most robust data sources (both incidence and associated cost) available. Hence, LBW was the selected outcome for this economic analysis.

Figure 3 provides a detailed outline of the conceptual framework used for the economic analysis of prenatal care. The economic analysis compared the total costs incurred under the 100 % access pathway (i.e. all pregnant women in an irregular situation receive prenatal care) with those incurred under the no access pathway. The conceptual framework for both scenarios is the same, i.e. the possibilities of receiving or not receiving care are theoretically similar. What does change, however, is the probability of receiving care.

The pathway presented in the figure below can be read as follows:

- at the beginning of the care pathway, a pregnant patient can have access to prenatal care or not;
- if the prenatal care is provided, it includes prenatal check-ups, blood tests and urine tests, and ultrasounds;
- if prenatal care is not provided, it is assumed the patient only accesses healthcare at the point of delivery;
- regardless of prenatal care being provided or not, the pathway leads to a pregnancy-related outcome. For example, for those with access to care, it can be expected that a healthy baby with a low chance of LBW will be delivered. Comparatively, those without access are more likely to deliver a baby with LBW;
- finally, there is a cost associated with a pregnancy-related outcome (LBW).

3.2. Level of access to prenatal care

Contrary to the hypertension model, for the prenatal care model, only one scenario was considered in the base case across different countries:

- 100 % of migrants in an irregular situation have regular access to healthcare.

This was compared with no access, i.e. 0 % of migrants in an irregular situation have access to regular healthcare. This is different from the economic model constructed for hypertension, which assumes 70 % access. Expert advice received at a workshop at FRA in June 2013 indicated that the model should assume that all pregnant women will access prenatal care if given the opportunity. Other levels of access scenarios were considered in the sensitivity analysis in order to reflect evidence showing that in some countries also when available, prenatal care might not always be accessed by migrant women.[77]

77 See, for example, Okoroh, E. M. *et al.* (2012); Wolff, H. *et al.* (2008); Tomasoni, L. R. *et al.* (2010).

3.3. Prenatal population in the economic model

The population considered in the economic model are women between the age of 15 and 55. This is the European average age distribution of mothers with live births.[78]

3.4. Data used to populate the model

3.4.1. Probability of LBW

The data used to calculate the probability of LBW in the model came from Heaman *et al.* (2008)[79] which looks at two indices of prenatal care used to determine the relationship between inadequate prenatal care and LBW. Adequate care was defined according to the Adequacy of Prenatal Care Utilization (APNCU) index, which is composed of two elements: the month prenatal care was initiated and the number of primary care physician visits from initiation until delivery. To be considered 'adequate', care must be initiated in the fourth month of pregnancy, and 80-100 %[80] of expected visits must be undertaken.

The probabilities of LBW used in the economic model are provided in Table 6.

3.4.2. Cost of prenatal care

The cost data used by NICE informed the estimated costs of prenatal care for migrants in an irregular situation. These costs may also be adjusted to fit the context and guidelines set forth in a specific country. They are derived from the costs of:

- appointments with clinical staff (primary care physician or midwife according to the country clinical practice);
- having an interpreter for each appointment;
- urine tests;
- blood tests (Cost of haematology, biochemistry and phlebotomy);
- standard prenatal ultrasounds.

It is expected that, on average, a certain amount of prenatal care resources are needed to properly manage a standard (i.e. uncomplicated) pregnancy. Based on expert consultation, the model excludes the quantification of the risk of complicated pregnancies under normal care, due to the high number of confounding factors associated with complicated pregnancies. Furthermore, there is not a clear causal link between prenatal care and complicated pregnancies. However, not considering the most complicated cases risks underestimating the number of resources utilised during prenatal care. A sensitivity analysis, however, was undertaken to account for this risk by increasing the costs of prenatal care.

Standard delivery costs were also excluded from the model. This is because there are delivery costs associated with the baby's birth regardless of whether the outcome is LBW or not. Costs incurred regardless of outcome are not included in this model, which only calculates the marginal costs associated with a LBW outcome. The conservative approach taken when developing the model did therefore not consider the

Table 6: Probability of LBW with and without care

Parameter	Value
Probability of experiencing LBW with adequate care	3.2 %
Probability of experiencing LBW with inadequate care	15.0 %

Source: Heaman, M. I. et al. (2008)

78 Live births by mother's age at last birthday and legal marital status, Eurostat (2013c).
79 This study used a logistic regression analysis to determine the association between inadequate prenatal care and LBW. Sample size consisted of 80,989 births. Data was collected from 1991 to 2000.
80 In some instances, women went to more appointments than expected.

increased likelihood of a caesarean section or other complications in case of LBW.

3.4.3. Cost of low birth weight

LBW cost was estimated using the 2001 Nation-wide Inpatient Sample (NIS) dataset, which included hospital data on the following items:

- hospital discharges
- hospital admissions at delivery
- hospital transfers
- hospital readmissions
- length of stay

Infant hospitalisations were aggregated according to different International Classification of Diseases (IDC) definitions.[81] LBW babies were considered according to three categories: extreme immaturity (under 1000 g), other pre-term causes (under 2500 g) and slow growth/malnutrition (under 2500 g).

The mean length of stay in hospital during birth and the year after admission was 9.4 days (+/-0.8 days) for the slow birth/malnutrition category and 42.2 days (+/-3.4 days)[82] for the extreme immaturity category.

3.5. Adopting a conservative approach

As with hypertension, it is expected that avoiding LBW babies generates benefits beyond the specific healthcare cost-savings considered in this model. LBW, especially for babies in the lower weight categories, can have lifetime consequences, such as cerebral palsy, vision loss and, for the less extreme cases, it can hinder performance at school.[83] LBW babies are at greater risk of developing cardiovascular and metabolic health problems later in life.[84] These outcomes have a serious impact on the quality of life of the infant. Both the negative health outcomes and associated societal costs (e.g. productivity losses associated with raising a child with a disability) should be considered when evaluating the benefits of preventing LBW. Including these outcomes in the economic analysis conducted in this report would only increase the cost-savings associated with preventing an acute event requiring emergency treatment, therefore increasing the overall cost-savings.

Furthermore, the healthcare costs incurred by the mother are not included in this analysis due to the lack of robust data. However, this was indirectly taken into account in the sensitivity analysis when the cost of LBW was varied upwards, leading to higher cost-savings associated with providing care to women. The value of this parameter is a proxy estimate for the potential costs for the mother.

3.6. Limitations of the analysis

Contrary to hypertension, for prenatal care there are no European guidelines available on standard treatments and only German prenatal guidelines were found. Therefore, national estimates were used to determine the frequency with which prenatal resources are used. These frequencies were based on expert opinion. The sensitivity analysis shows that the parameters used have a considerable impact on the model's final outcomes.

The most relevant weakness of this analysis relates to the lack of robust data to test the model in a comparable manner in the three selected EU Member States. Costs and benefits of providing care were estimated using very different approaches and sources (e.g. PPP adjustment of non-country specific data, expert opinion, etc.), which is likely to have biased the results (both upwards and downwards). In Annex 2, some scenarios show that providing care in one country is highly cost effective (Sweden), but generates less cost-savings to the health system elsewhere (Greece). However, the overall findings of the model and the evidence provided seem robust enough to support the general conclusion that the provision of regular access to care is still, in fact, cost-saving compared to emergency-only access. Furthermore, the models allow for the adjustment of cost data in the sensitivity analysis. Even when several parameters are changed, testing the model under varying costs still tends to show that providing access to regular preventive care is economically preferable to more expensive emergency care treatment.

3.7. Results of the model

The model shows that providing access to prenatal care services to migrants in an irregular situation saves costs in Germany, Greece and Sweden, with the first two Member States presenting lower cost-savings. The sensitivity analysis shows that these results are generally robust. Annex 2 provides tables and a detailed explanation of the findings, sources of data and sensitivity analysis.

81 The International Classification of Diseases (ICD) is used to classify diseases and other health problems recorded in various health and vital records, including death certificates and health records. The ICD-10 was endorsed by the 43rd World Health Assembly and came into use in WHO Member States as from 1994.
82 This is a 95 % confidence interval.
83 VICS (2012).
84 Barker, D. J. (1991).

Results and conclusions

This report shows that providing regular preventive care, as opposed to providing only emergency care, is cost-saving for healthcare systems. Even when using a simple model to estimate costs, the implications are clear: treating a condition only when it becomes an emergency not only endangers the health of a patient, but also results in a greater economic burden to healthcare systems.

Hypertension model

The model for hypertension in three EU Member States suggests that providing access to healthcare services to hypertensive migrants in an irregular situation is cost-saving, regardless of the time horizon and the age group adopted in the analysis. The sensitivity analysis shows these conclusions to be robust – i.e. they hold under different scenarios and assumptions. Annex 1 provides detailed tables and an explanation of the findings, sources of data and sensitivity analysis.

To illustrate the finding, assuming that all migrants in an irregular situation make regular use of preventive healthcare (100 % access model), after one year this would result in cost-savings of around 9 % compared to no access to healthcare. If emergency care only was provided in all three countries, the costs in the first year alone amounted to €83 per person in Germany, €66 per person in Greece and €84 per person in Sweden. In the tables and figures included in Annex 1, these findings are presented per 1,000 individuals. The cost-savings can be estimated for the entire population of migrants in an irregular situation by multiplying the cost per person by the estimated migrant population.[85]

When benefits are only considered for one year, providing regular access to healthcare for hypertensive migrants in an irregular situation is less expensive than treating extra acute health events such as stroke and MI, which can result from a lack of preventive care. This means that the marginal costs associated with stroke and MI for individuals without regular access to healthcare are higher than the costs of providing regular access.

Furthermore, providing regular access to care for hypertensive patients also contributes to the prevention of future strokes and MI. From the results of the model presented in this paper, the provision of care for hypertensive patients in Germany would prevent 309 strokes and 223 MIs for every 1,000 migrants over their lifetime, in Greece 321 strokes and 232 MIs, and in Sweden 233 strokes and 168 MIs.

The hypertension model was also applied to other time periods. When the costs were calculated for a period of five years and then over a lifetime, the cost-savings of providing regular access to care over emergency treatment increased. Over a period of five years, the cost-savings increased between 12 % and 13 %. The cost-savings over a lifetime were even higher, about 16 %.

To review the robustness of the model, the sensitivity analysis also tested the model under 70 % access. This accounts for the individuals who in theory have access to healthcare and hypertension screening but do not use it regularly. The costs were then calculated over a period of one year, five years and a lifetime for a cohort of 1,000 individuals. As with the 100 % access model, the provision of regular access to healthcare is cost-saving when compared to only providing healthcare in an emergency situation. However, the cost-savings associated with providing regular access to healthcare are less than in the 100 % access model across all three countries. After one year, cost-savings amounted to €58 per person in Germany, approximately €46 in Greece and €59 in Sweden. On average, the number of strokes and MIs avoided are comparatively fewer than in the 100 % access model. For example, with the 100 % access model 13 strokes are avoided every year in Germany and Greece and 12 in Sweden, while with the 70 % access model only nine strokes are avoided every year in each of the three countries.

Prenatal care model

The model for prenatal care tests whether the provision of regular prenatal care for migrants in an irregular situation is cost-effective compared to the provision of emergency-only care. The results show that providing regular care is indeed cost-effective. The sensitivity analysis shows that these results are generally robust. Annex 2 provides tables and a detailed explanation of the findings, sources of data and sensitivity analysis.

The model compares the total costs incurred between a situation in which 100% of pregnant migrant women in an irregular situation access prenatal care, to one in which none of them do. After two years (including the prenatal period, in which care is either received or not,

85 The estimated population of migrants in an irregular situation are based on only very rough estimates, as exact numbers cannot be determined in most countries. Because there is a lack of data on the exact number of migrants in the population covered by the model, it is best presented in terms of findings per 1,000 individuals (which can then be calculated per person).

as well as the year after birth, during which additional costs may arise as a result of treating LBW) in Germany, Greece and Sweden, it appears that providing prenatal care is cost–effective, compared to the costs of managing the additional cases of LBW associated with the non-provision of prenatal care. This means that the marginal costs associated with LBW babies whose mothers do not receive prenatal care are higher than the costs of providing regular access to healthcare to all migrant mothers in an irregular situation.

This model's findings suggest that a situation in which 100% of pregnant migrant women in an irregular situation access prenatal care may generate savings of up to 48 % in Germany and Greece and up to 69 % in Sweden (this amounts to about €56, €52 and €177 per woman, respectively) over two years. The provision of prenatal care may actually be half as expensive as treating LBW as a consequence of not providing access to care during pregnancy. In addition, LBW cases can also be prevented through the provision of access to prenatal care, ranging from four cases per 1,000 women in Germany, five cases in Greece and six in Sweden.

There are several important limitations of the model to keep in mind when interpreting the results. For one, the data used for prenatal care have to be interpreted with caution due to the lack of available data on pregnancy rates for migrants in an irregular situation, prevalence rates and costs of prenatal care tests. As such, several costs have been estimated using proxy data and may potentially contribute to some bias in the model. It should also be noted that the time limitations of the model do not allow for potential future complications of LBW on the child's health. As such, their related cost implications are not factored into the model's outputs.

Conclusions

Healthcare policies must respect the requirements which derive from international and European human rights law. This includes the specific provisions incorporated in EU law for migrants in an irregular situation which have been extensively analysed in previous FRA reports. They should furthermore be guided by public health considerations, not only by cost considerations.

The economic model presented in this paper suggests that providing access to regular preventive healthcare for migrants in an irregular situation would not only contribute to the fulfilment of the right to enjoy the highest attainable standard of physical and mental health set forth in the International Covenant on Economic, Social and Cultural Rights, but would also be economically sound.

Although the savings margin may not always be extremely high, the model is static, which leaves out many external and wider social benefits and costs that point to higher likely cost-savings. Whereas this analysis focuses only on healthcare cost-savings, the evidence suggests that avoiding conditions associated with hypertension and lack of prenatal care generates wider benefits. As detailed in the previous sections, the consequences of a stroke and a low birth are potentially long-term, impacting on both the individual and society. Even though these wider benefits are not included in the present economic analysis, a very strong case can be made to take them into consideration when evaluating the benefits of preventative measures, such as providing access to hypertension treatment and prenatal care.

The results of testing the economic model are a conservative but powerful indication that governments would save money by providing access to primary healthcare to migrants in an irregular situation in the case of hypertension and prenatal care.

More research would be needed on the financial implications of providing early treatment for conditions other than hypertension and prenatal care and on the applicability of the results to other uninsured groups of the population.

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Annex 1: Applying the hypertension model to three EU Member States

This annex applies the economic model for hypertension presented in Chapter 2 to three Member States: Germany, Greece and Sweden. This test examines whether providing regular healthcare to migrants in an irregular situation is cost-effective or not when different country-specific data is entered. The variables were all adjusted according to country context and the composition of irregular migrant populations.

This annex presents:

- the cost-savings generated by providing access to care. This is the incremental monetary benefit (which might be positive or negative) of providing regular access to care compared with no access to care. Costs are presented as per a 1,000 person population;
- the effectiveness generated by providing access to care. This is the incremental gain (which might be positive or negative) in terms of number of events, for example, how many strokes and/or MIs were avoided by providing access to care compared with no access to care at all.

Data used to populate the model

Age and gender data

Data reflecting the age distribution of the irregular migrant population in each country was not found. Therefore, for the base case scenario, the age distribution of the general population in each country was used as a proxy, as shown in Table A1. Other scenarios, i.e. either higher numbers of younger or older migrants in an irregular situation relative to the general population, were considered in the sensitivity analysis to assess the impact of different age distributions on the final results.

Table A2 presents the gender distribution used throughout the economic model. In the absence of reliable data on the gender distribution of migrants in an irregular situation within the three countries, the average values for the gender distribution of the populations in the three hosting countries were taken as a proxy estimate to be used throughout the economic model (see Section 2.3).[86] The proportion of men and women is very similar across the countries.

Table A1: Age distribution for the total population aged 35 and above for the hypertension model (%)

Germany		Greece		Sweden	
Age group	Percentage of general population	Age group	Percentage of general population	Age group	Percentage of general population
35–44	22	35–44	26	35–44	24
45–54	26	45–54	23	45–54	23
55–64	19	55–64	20	55–64	22
65–74	18	65–74	16	65–74	17
75+	15	75+	15	75+	15
Total	100	Total	100	Total	100

Source: Eurostat (2013b)

Table A2: Gender distribution in hosting countries (%)

Men	Women
49.32	50.68

Source: Germany, Federal Office of Statistics (DeStatis Statistiches Bundesamt) *(2013); Greece, Hellenic Statistics Authority (ELSTAT) (2013); Sweden, Statistics Sweden (2010)*

86 The gender distribution (male/female) in Germany is 49.13 %/50.87 %, 49.03 %/50.97 % in Greece and 49.81 %/50.19 % in Sweden.

Prevalence of hypertension

Data on the prevalence of hypertension is needed to calculate the relative risk of developing stroke and MI, and the associated costs. The prevalence of hypertension in the irregular migrant population in Germany, Greece and Sweden was estimated by using the five main nationalities of migrants in an irregular situation identified by the Eurostat apprehension statistics[87]. The prevalence of hypertension in these nationalities was then mapped using the the most recent WHO statistics[88]. These are presented in Table A3, A4 and A5 for Germany, Greece and Sweden respectively.

Table A3: Prevalence of hypertension among the first five nationalities of migrants in an irregular situation apprehended by authorities, Germany

Country of Origin	Apprehensions (Total number in 2013)	Apprehensions (Percentage)	Prevalence of hypertension both sexes
Russia	7,240	23.86 %	8.22 %
Syria	7,115	23.45 %	7.18 %
Afghanistan	5,905	19.46 %	5.38 %
Turkey	5,100	16.81 %	4.12 %
Serbia	4,980	16.41 %	6.25 %

Source: Eurostat (2013d); WHO (2008a)

Table A4: Prevalence of hypertension among the first five nationalities of apprehended migrants, Greece

Country of Origin	Apprehensions (Total number in 2013)	Apprehensions (Percentage)	Prevalence of hypertension both sexes
Albania	15,555	44.00 %	15.58 %
Syria	8,220	23.2 %	7.14 %
Afghanistan	5,830	16.49 %	4.55 %
Pakistan	4,150	11.74 %	3.33 %
Bangladesh	1,595	4.51 %	1.25 %

Source: Eurostat (2013d); WHO (2008a)

Table A5: Prevalence of hypertension among the first five nationalities of apprehended migrants, Sweden

Country of Origin	Apprehensions (Total number in 2013)	Percentage	Prevalence of hypertension both sexes
Syria	5,170	37.17 %	11.41 %
Stateless*	2,790	20.06 %	4.93 %
Somalia	2,120	15.24 %	5.76 %
Eritrea	2,055	14.77 %	4.46 %
Afghanistan	1,775	12.76 %	3.52 %

Source: Eurostat (2013d); WHO (2008a)

87 Eurostat (2013d).

88 WHO (2013). The WHO provides statistics on age-standardised 'prevalence of raised blood pressure' among adults who are over 25 years for men, women and both sexes for the year 2008. The prevalence of hypertension changes with age (with higher age groups at higher risk) and so ideally we would use the prevalence values by age range. However, as the 2008 WHO statistics on hypertension prevalence do not provide a more detailed breakdown of age categories, we used the age-standardised prevalence of hypertension for individuals above 25 years.

Table A6: Estimated average prevalence of hypertension in migrants in an irregular situation per country (%)

Country	Estimated prevalence of hypertension for both sexes
Germany	31.15
Greece	31.85
Sweden	30.01

Source: Eurostat (2013d); WHO (2008a) statistics

Table A7: Probability of stroke and MI with and without treatment, weighted by age and by gender (%)

Country	Probability of having a stroke if hypertensive and receiving treatment	Probability of having an MI if hypertensive and receiving treatment	Probability of having a stroke if hypertensive and *not* receiving treatment	Probability of having an MI if hypertensive and *not* receiving treatment
Germany	2.73	2.02	4.43	3.00
Greece	2.70	1.99	2.36	2.95
Sweden	2.73	2.02	4.44	2.99

Source: NICE (2011)

An average hypertension prevalence for the irregular migrant population in each of the three EU Members States is presented in Table A6.

The risk of hypertension among migrants in an irregular situation could have been overestimated. It might be the case that migrants in an irregular situation are healthier than the average population of their countries of origin. This is known as the 'healthy immigrant effect', which is based on the belief of immigrant self-selection (migrants tend to be healthier and wealthier than non-migrants).[89] Using the average hypertension prevalence of the countries of origin might result in overestimating the number of cases of hypertension and the costs associated with these. Other evidence points to the fact that during the first decade after arrival, immigrants report higher levels of health compared to the population in the country of immigration. However, as the time since their arrival passes, reported subjective health decreases; immigrants' health becomes the same as that of persons of the country of immigration in a comparable situation, or even decreases.[90] In this case, the results of the model might underestimate the number of cases of hypertension and the costs associated with these. A sensitivity analysis was performed on the prevalence of hypertension for all three countries. The results are presented in Section 3 of this Annex.

Finally, Table A7 presents the probabilities of experiencing a stroke/MI for a hypertensive patient with and without treatment. These figures were calculated using probabilities developed in a previous study,[91] which were weighted by the age distribution and gender among the population of the three EU Member States to which the model is applied (reported in Table A1 and A2).

Cost of screening and follow-up

For a normotensive patient, the only costs incurred are the initial screening costs and the follow-up costs every five years. Costs are calculated based on NICE (2011) guidelines reporting the 2010 costs, which were adjusted with PPPs to reflect costs against 2013 prices across the three Member States.These are presented in Table A8. Table A9 presents the costs of screening and follow-up for normotensive patients.

The cost of treating hypertension

Table A10 reflects the annual cost of treating hypertension, which was calculated based on NICE guidelines. It refers to the costs of PPP adjusted drugs/medicines for treatment.

Costs of stroke and MI

Table A11 provides the initial costs of treating stroke and MI in the three EU Member States. They are calculated based on NICE (2011) guidelines, which presented the costs for 2010. These costs were adjusted with PPPs to reflect costs against 2013 prices across the three Member States. The costs include treating and managing the initial acute costs of stroke and MI.

89 Domnich, A. *et al.* (2012).
90 Constant, A. *et al.* (2014), pp. 33–34.
91 United Kingdom, NICE (2011).

Table A8: Costs of screening and managing hypertension

Resource	Fre-quency	Germany 2013, in €	Greece 2013, in €	Sweden 2013, in €	Description	Period of time
Cost of initial screening	1	38	30	41	This includes the initial clinical blood pressure (BP) reading made during a primary care physician consultation – assumed length of the consultation is 12 minutes. The patient is either categorised as normotensive or suspected to be hypertensive.	Once for hypertensive patients
Cost of diagnosis confirmation	1	51	41	55	For confirmation of diagnosis, two further sets of readings are undertaken at monthly intervals.	Taken at monthly intervals after first reading - two months after the initial screening
Cost of managing hypertension	1	38	30	41	Consultation with a doctor (length 12 minutes) to check the effects of treatment on BP.	Three months after initiation of treatment and yearly afterwards
Laboratory investigation	1	189	153	204	This includes a blood test (phlebotomy and biochemistry), a standard echocardiogram and a standard electrocardiogram.	Yearly

Note: In the absence of specific unit cost data for each country, costs were calculated using UK unit cost data, adjusted using PPP methodology to reflect country specific costs and subsequently validated by experts during the June 2013 workshop.

Source: ESC Guidelines (2013); NICE (2011); expert opinion

Table A9: Cost of screening and follow-up for normotensive patients

Resource	Frequency	Germany 2013, in €	Greece 2013, in €	Sweden 2013, in €	Description	Period of time
Cost of initial screening	1	38	30	41	This includes the initial clinical blood pressure reading made during a primary care physician consultation – assumed length of the consultation is 12 minutes. The patient is categorised as either normotensive or suspected to be hypertensive.	Yearly
Cost of follow-up	1	38	30	41	As above: Initial clinical blood pressure reading made on a primary care physician consultation – assumed length of the consultation is 12 minutes. The patient is categorised as normotensive or suspected to be hypertensive.	Every five years after initial assessment

Note: In the absence of specific unit cost data for each country, costs were calculated using UK unit cost data, adjusted using PPP methodology to reflect country specific costs and subsequently validated by experts during the June 2013 workshop.

Source: ESC Guidelines (2013), NICE (2011)

Table A10: Annual cost of treating hypertension (in €)

Age group	Germany 2013	Greece 2013	Sweden 2013
35–44	40	32	43
45–54	40	32	43
55–64	40	32	43
65–74	42	34	46
75+	44	36	48
Age-weighted total	41	33	44

Source: NICE (2011), adjusted for PPP

Table A11: Initial acute care cost of stroke and MI

Outcome	Duration	Germany 2013, in €	Greece 2013, in €	Sweden 2013, in €
Stroke (average weighted cost by severity)	Three months	12,922	10,475	13,931
MI	Three months	6,430	5,212	6,932

Source: NICE (2011)

Model results

As the following calculations show for Germany, Greece and Sweden, providing access to healthcare services for hypertensive migrants in an irregular situation is cost-saving, regardless of time horizon or age group adopted in the analysis. The sensitivity analysis shows these conclusions to be robust – i.e. they hold under different scenarios and assumptions.

Model results – 100 % access scenario

Tables A12, A13 and A14 present the cost-savings when all migrants in an irregular situation access healthcare (100 % model) compared to nobody. The results are presented for one year, five years and lifetime horizons for a cohort of 1,000 people. Table A15 presents the number of strokes and MIs avoided in the 100 % access scenario compared to no access. The results are presented for one year, five years and lifetime horizons, also for a cohort of 1,000 people.

As we can observe from the three tables, when 100 % of migrants in an irregular situation access healthcare this leads to cost-saving, regardless of the timeframe adopted. When benefits are evaluated for only one year, providing regular access to healthcare for hypertensive migrants in an irregular situation is less expensive than treating the extra acute events (stroke and MI) associated with hypertension. This means that the marginal

Table A12: One-year cost-savings in the 100 % access scenario per 1,000 patients (in €)

		Germany		Greece		Sweden	
		Irregular resident 100 % access	Irregular resident no access	Irregular resident 100 % access	Irregular resident no access	Irregular resident 100 % access	Irregular resident no access
1 year	Hypertension screening and managing costs	124,095	0	102,168	0	130,374	0
	Hypertension treatment costs	12,226	0	10,132	0	12,694	0
	Healthcare costs associated with stroke and MI	686,183	905,221	560,785	739,176	712,559	939,478
	Total cost	822,504	905,221	673,086	739,176	855,627	939,478
	Difference (costs saved)	82,717		66,091		83,852	

Source: FRA, 2015

costs associated with unprevented stroke and MI are higher than the costs of providing regular access to care. We can also note that cost-savings increase with wider time frames. The cost-savings of one year are around 9 %, compared to 13 % after five years and 16 % over a lifetime.

Results show that the provision of healthcare in Germany would save €83 per person in the first year. For the same time frame, the cost-savings in Greece would be €66 per person and €84 per person in Sweden.

Furthermore, providing access to care for hypertensive patients in Germany can help prevent 344 strokes and 239 MIs for 1,000 people over a lifetime, 355 strokes and 222 MIs in Greece and 331 strokes and 220 MIs in Sweden.

Table A13: Five-year cost-savings in the 100 % access scenario per 1,000 patients (in €)

		Germany		Greece		Sweden	
		Irregular resident 100 % access	Irregular resident no access	Irregular resident 100 % access	Irregular resident no access	Irregular resident 100 % access	Irregular resident no access
5 years	Hypertension screening and managing costs	404,842	0	334,278.59	0	423,169.64	0
	Hypertension treatment costs	49,582	0	40,711	0	51,389	0
	Health care costs associated with stroke and MI	2,530,972	3,433,402	2,026,190	2,753,508	2,620,183	3,553,382
	Total cost	2,985,396	3,433,402	2,401,179	2,753,508	3,094,742	3,553,382
	Difference (costs saved)	448,007		352,329		458,640	

Source: FRA, 2015

Table A14: Lifetime cost-savings in the 100 % access scenario per 1,000 patients (in €)

		Germany		Greece		Sweden	
		Irregular resident 100 % access	Irregular resident no access	Irregular resident 100 % access	Irregular resident no access	Irregular resident 100 % access	Irregular resident no access
Lifetime	Hypertension screening and managing costs	974,258	0	811,804	0	1,013,934	0
	Hypertension treatment costs	169,755	0	141,347	0	176,058	0
	Healthcare costs associated with stroke and MI	9,916,144	13,252,686	8,128,745	10,881,002	10,273,973	13,727,663
	Total cost	11,060,157	13,252,686	9,081,896	10,881,002	11,463,965	13,727,663
	Difference (costs saved)	2,192,529		1,799,106		2,263,698	

Source: FRA, 2015

Table A15: Events avoided in the 100 % access scenario per 1,000 patients

		Germany	Greece	Sweden
		100 % access vs. no access	100 % access vs. no access	100 % access vs. no access
1 year	Strokes avoided	13	13	12
	MIs avoided	10	9	9
5 years	Strokes avoided	57	57	55
	MIs avoided	42	38	40
Lifetime	Strokes avoided	344	355	331
	MIs avoided	239	222	230

Source: FRA, 2015

Model results – 70 % access scenario

Tables A16 to A19 present the costs saved when 70 % of migrants in an irregular situation access healthcare services, compared to when none of them do. The results are presented for one year, five years and lifetime horizons for a cohort of 1,000 people.

Comparing these results with those for 100 % access scenario shows lower cost-savings in general. Table A16 shows that as the overall level of access decreases, so do the overall cost-savings for the German, Greek and Swedish healthcare systems. It should be noted that this result is based on the base case scenario and is scaled to a different proportion of the overall population. As such, the cost-savings per person remain the same as when 100 % of access is provided.

Table A16: One-year cost-savings in the 70 % access scenario per 1,000 patients (in €)

		Germany		Greece		Sweden	
		Irregular resident 70 % access	Irregular resident no access	Irregular resident 70 % access	Irregular resident no access	Irregular resident 70 % access	Irregular resident no access
1 year	Hypertension screening and managing costs	86,867	0	71,518	0	91,262	0
	Hypertension treatment costs	8,558	0	7,092	0	8,886	0
	Healthcare costs associated with stroke and MI	751,894	905,221	614,303	739,176	780,635	939,478
	Total cost	847,319	905,221	692,913	739,176	880,782	939,478
	Difference (costs saved)	57,902		46,263		58,696	

Source: FRA, 2015

Table A17: Five-year cost-savings in the 70 % access scenario per 1,000 patients (in €)

		Germany		Greece		Sweden	
		Irregular resident 70 % access	Irregular resident no access	Irregular resident 70 % access	Irregular resident no access	Irregular resident 70 % access	Irregular resident no access
5 years	Hypertension screening and managing costs	278,910.57	0	230,412.47	0	291,325.33	0
	Hypertension treatment costs	34,705	0	28,497	0	35,972	0
	Healthcare costs associated with stroke and MI	2,801,539	3,433,204	2,244,385	2,753,508	2,900,143	3,553,382
	Total cost	3,115,155	3,433,204	2,503,295	2,753,508	3,227,440	3,553,382
	Difference (costs saved)	318,049		250,213		325,942	

Source: FRA, 2015

Table A18: Lifetime cost-savings in the 70 % access scenario per 1,000 patients (in €)

		Germany		Greece		Sweden	
		Irregular resident 70 % access	Irregular resident no access	Irregular resident 70 % access	Irregular resident no access	Irregular resident 70 % access	Irregular resident no access
Lifetime	Hypertension screening and managing costs	974,258	0	811,804	0	1,013,934	0
	Hypertension treatment costs	118,828	0	98,943	0	123,240	0
	Healthcare costs associated with stroke and MI	10,917,106	13,252,686	8,954,422	10,881,002	11,310,080	13,727,663
	Total cost	12,010,193	13,252,686	9,865,169	10,881,002	12,447,255	13,727,663
	Difference (costs saved)	1,242,493		1,015,833		1,280,408	

Source: FRA, 2015

Table A19: Events avoided in the 70 % access scenario per 1,000 patients

		Germany	Greece	Sweden
		70 % access vs. no access	70 % access vs. no access	70 % access vs. no access
1 year	Strokes avoided	9	9	9
	MIs avoided	7	6	6
5 years	Strokes avoided	40	40	39
	MIs avoided	29	26	28
Lifetime	Strokes avoided	241	155	232
	MIs avoided	167	107	161

Source: FRA, 2015

Sensitivity analysis

Inevitably, the parameters required to model the access to healthcare for the hypertensive population were subject to uncertainty. To address this issue, a sensitivity analysis was performed. This analysis is a useful tool to help quantify confidence in an economic model's conclusions. By allowing key model parameters to vary within a specific range, the impact on the final economic output can be analysed.

In the case of hypertension, the following sensitivity analysis was undertaken to assess the impact of varying parameters in the final model outputs:

- prevalence of hypertension (assuming both higher and lower prevalence of hypertension in the population of migrants in an irregular situation);
- age distribution (assuming both younger and older demographic profiles of the population of migrants in an irregular situation);
- cost of stroke and MI (including lower and higher estimated costs);
- probability of stroke and MI (estimating lower probabilities).

These scenarios were agreed with the expert panel during the workshop at FRA in June 2013. In each scenario, all other factors were kept the same, i.e. when modelling varied prevalence rates, all other parameters in the model (age distribution, costs of treatment, etc.) remained constant.

Prevalence of hypertension

As described earlier in this annex, the prevalence of hypertension in the irregular migrant population was estimated according to nationality, as identified by the statistics of migrants apprehended in Germany, Greece and Sweden.

As stated earlier, it could be that migrants in an irregular situation travelling to Germany, Greece and Sweden are healthier than the average population of their countries of origin (the 'healthy immigrant effect'[92]), which could lead to overestimating the prevalence of hypertension amongst these migrants. However, this might be true only for recent migrants, as poor working and living conditions in the host country might worsen their health status over time.

Figure A1 shows the impact of variable prevalence rates on the costs incurred by the healthcare sector. As the prevalence of hypertension decreases in Germany, Greece and Sweden, so do the cost-savings. If less than 10 % of migrants in an irregular situation aged 35 years and above in any of the three Member States suffers from hypertension, then providing access to care to migrants in an irregular situation would no longer save costs in the one year category. When adopting a five-year or lifetime outlook, however, providing access to care remains cost-saving.

The prevalence estimates used in the base case analysis are 31.15 % for Germany, 31.85 % for Greece and 30.01 % for Sweden. Estimating that less than 10 % of migrants in an irregular situation aged 35 years and above suffer from hypertension seems unlikely, even if the 'healthy immigrant effect' applies. Thus, the conclusion of the economic analysis (providing access to care to hypertensive patients is cost-saving) shows robustness when the prevalence of hypertension in these EU Member States is varied.

Age distribution

As previously mentioned, the patient's age is a very relevant determinant for managing hypertension. As patients get older, the relative risk (RR) of experiencing a stroke, for example, increases. Age is also relevant for the number of drugs required to treat hypertension.

Therefore, the baseline age distribution of the populations had a major impact on the final economic results. Three scenarios were considered in the sensitivity analysis, to assess the impact of different age distributions on the final results:

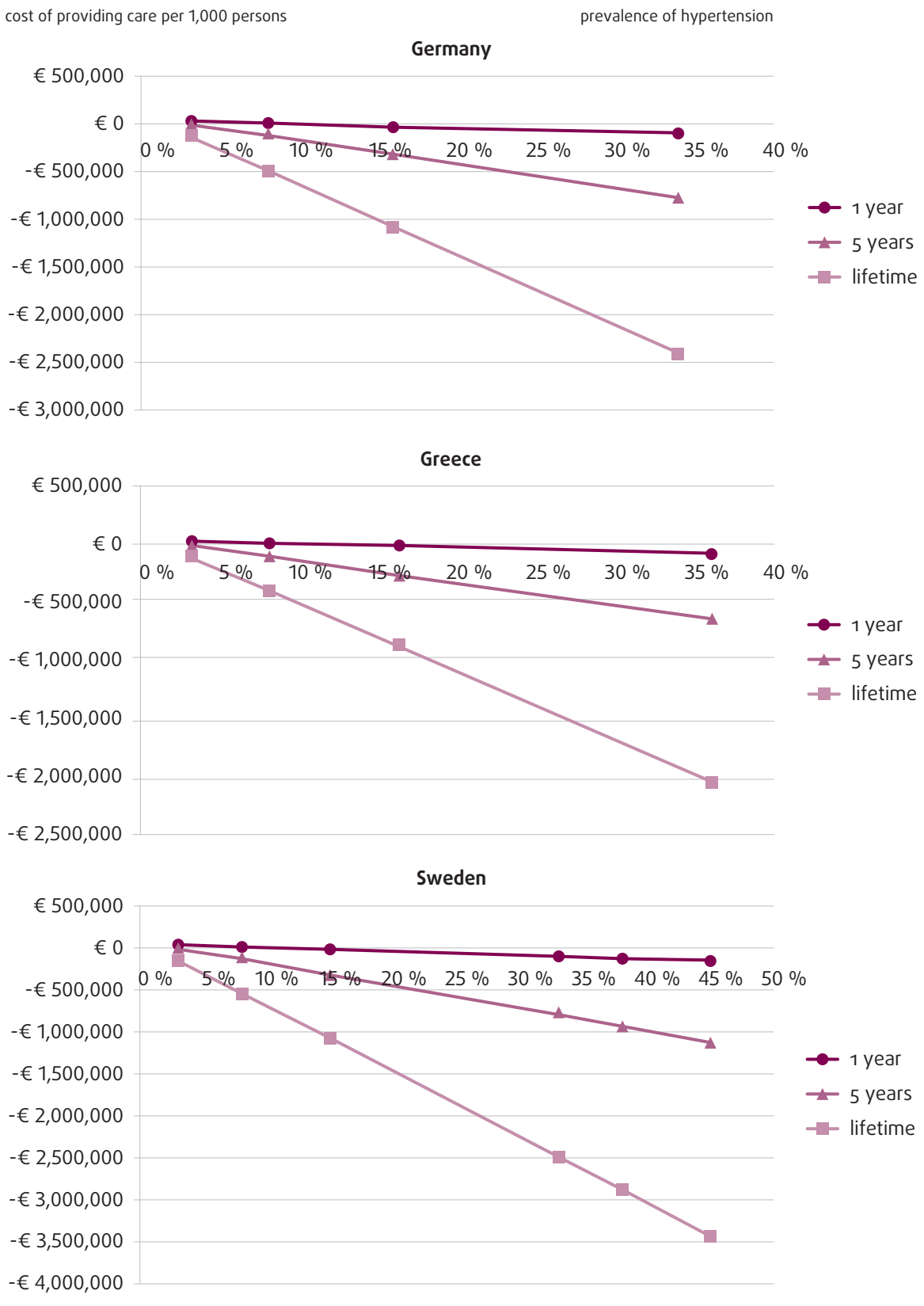
- Scenario 1: Everyone is within the first age range (35–44 years old)
- Scenario 2: Everyone is within the second age range (45–55 years old)
- Scenario 3: Everyone is within the third age range (55–64 years old)

Because hypertension is not as prevalent in younger generations, the minimum age considered was 35. On the other end of the spectrum, 64 was chosen as the maximum age, based on average age of migrant populations and other demographic data. Interestingly, Figure A2 shows that changing the age distribution in the population has little or no impact on the overall results. Regardless of whether a lifetime perspective or different age ranges are considered, providing regular access to care for hypertensive patients is cost-saving when compared to providing no access at all.

The only exception is Scenario 1, where the one year results for Germany and Sweden cost

92 Domnich, A. *et al.* (2012).

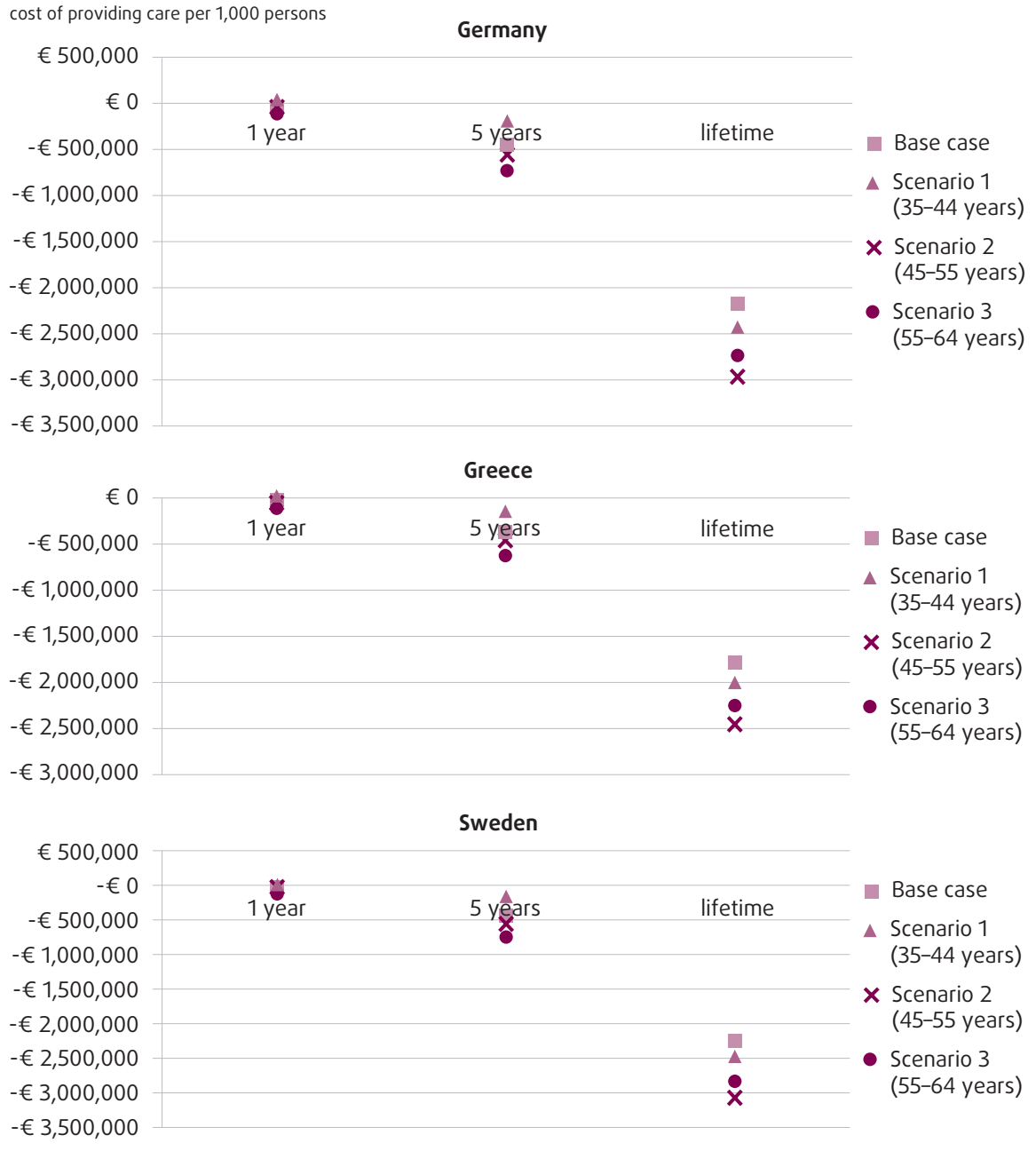
Figure A1: Estimated absolute differences in costs between the access to healthcare scenario and the no access scenario, by prevalence of hypertension and length of treatment in Germany, Greece and Sweden



Source: FRA, 2015

between €1,000 and €2,000 per 1,000 people. This means that if everyone fell within the 35–44 age range, the German and Swedish health sectors would incur costs during the first year that they provided access to care to hypertensive patients. This is no longer the case when a five-year or lifetime perspective is adopted, as providing access to care then becomes cost-saving in these countries for this specific age range.

Figure A2: Estimated absolute differences in healthcare costs for access to healthcare scenario compared to no access scenario, by duration of treatment and age groups in Germany, Greece and Sweden



Source: FRA, 2015

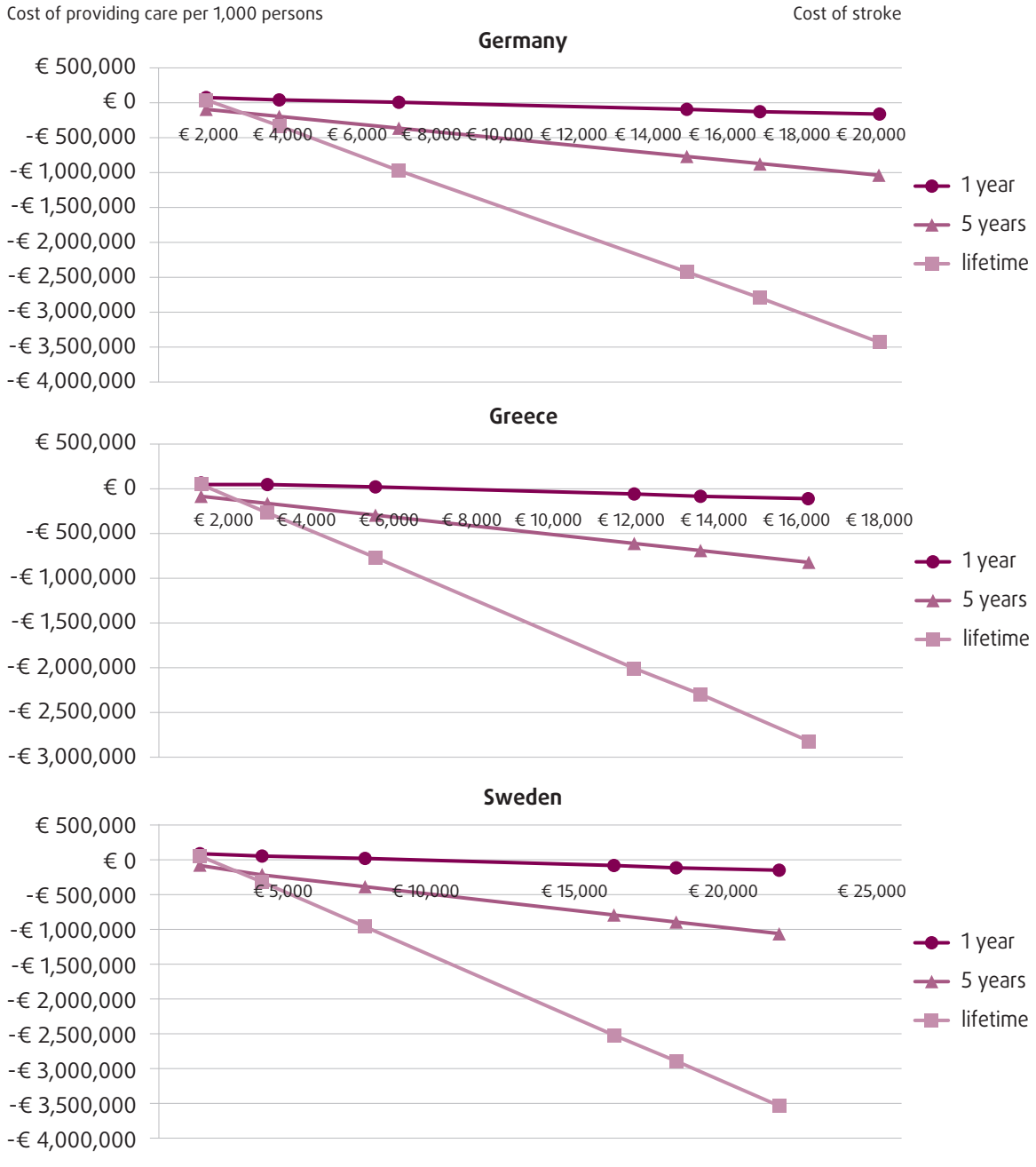
Cost of stroke and MI

In the sensitivity analysis, the costs of stroke and MI per patient varied across a range of values. This included decreasing the cost of the events by 90 % (e.g. from €12,922 to €1,292 in the case of stroke in Germany) and increasing the cost of the events by 50 % more than the base case scenario (e.g. from €12,922 to €19,383 in the case of a stroke in Germany).

As expected, Figure A3 and Figure A4 show that as the unit costs of the events increase, so do the cost-savings associated with providing access to healthcare to migrants in an irregular situation. The higher the cost associated with treating a stroke or a MI event, the larger the cost-savings associated with providing access to healthcare and timely treatment for hypertension.

Results obtained for Germany, Greece and Sweden show that even when the costs associated with stroke were decreased by 50 %, providing access to healthcare is still cost-saving in these countries from the first year. For example, in Sweden, decreasing the unit cost of a stroke by 50 % results in cost-savings of around €944 per 1,000 people for the first year, €385,000 for five years and €984,515 over a lifetime. Providing access to timely treatment for hypertension in the first year is only more expensive than providing emergency treatment alone when the unit cost of a stroke is reduced by between 47 % and 48 %. This,

Figure A3: Differences in absolute costs of access to healthcare scenario compared to no access scenario for stroke by costs of stroke duration of treatment in Germany, Greece and Sweden

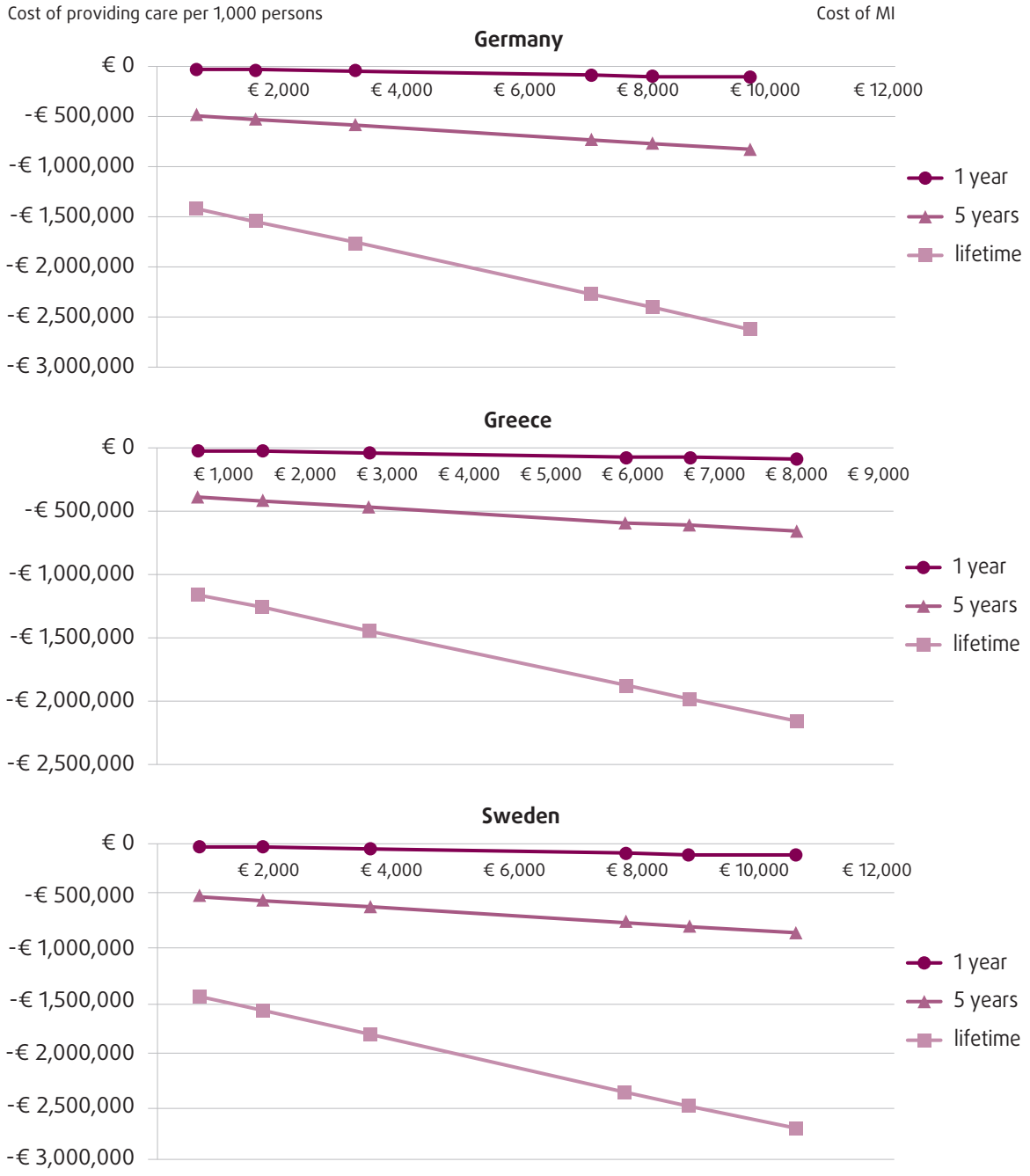


Source: FRA, 2015

however, is an unlikely scenario. When hypertension prevalence is between 47 % and 48 % in the five-year and lifetime time horizons, providing access to care is cost-saving.

Therefore, even when the cost of stroke and MI change, the base case results still apply. This means that providing access and timely treatment to hypertensive patients still cost-saves, even when the costs of events (stroke and MI) are varied.

Figure A4: Differences in absolute costs of access to healthcare scenario compared to no access scenario for MI by costs of MI and duration of treatment in Germany, Greece and Sweden



Source: FRA, 2015

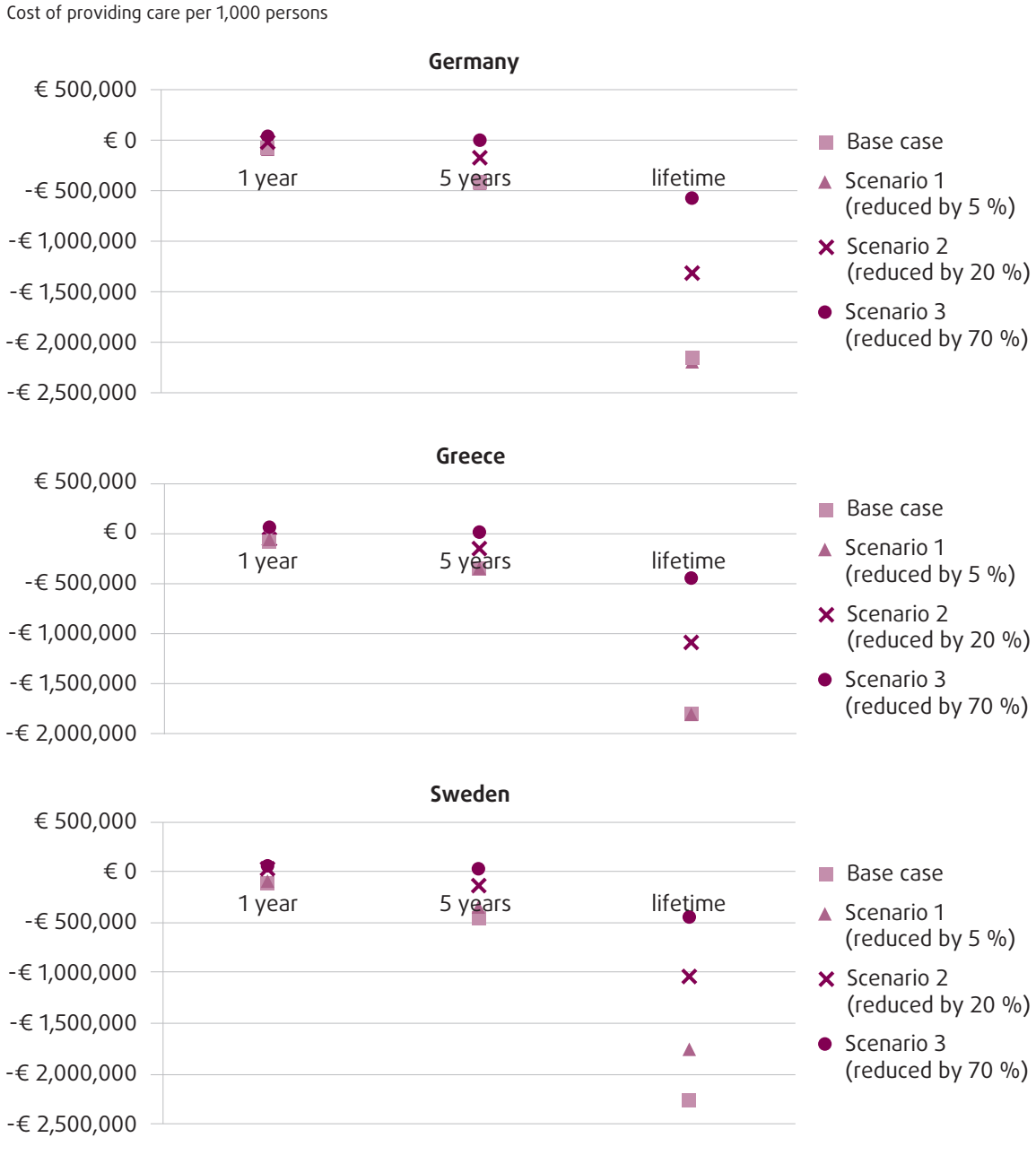
Probability of stroke and MI

The probability of experiencing a stroke or an MI as a result of not treating hypertension is important for the present analysis. This represents the base case risk of experiencing the outcome without care (if hypertension is not treated, the risk outcome is experiencing a stroke or MI). This potential outcome is what drives the analysis of the costs associated with not providing care to hypertensive migrants in an irregular situation.

The risk of experiencing both events is age-dependent. The following scenarios were considered for both stroke and MI:

- Scenario 1: The probability of experiencing a stroke/MI without treatment is reduced by 5 %
- Scenario 2: The probability of experiencing a stroke/MI without treatment is reduced by 20 %
- Scenario 3: The probability of experiencing a stroke/MI without treatment is reduced by 70 %

Figure A5: Differences in absolute costs of access to healthcare scenario compared to no access scenario for stroke by probability of stroke and duration of treatment in Germany, Greece and Sweden

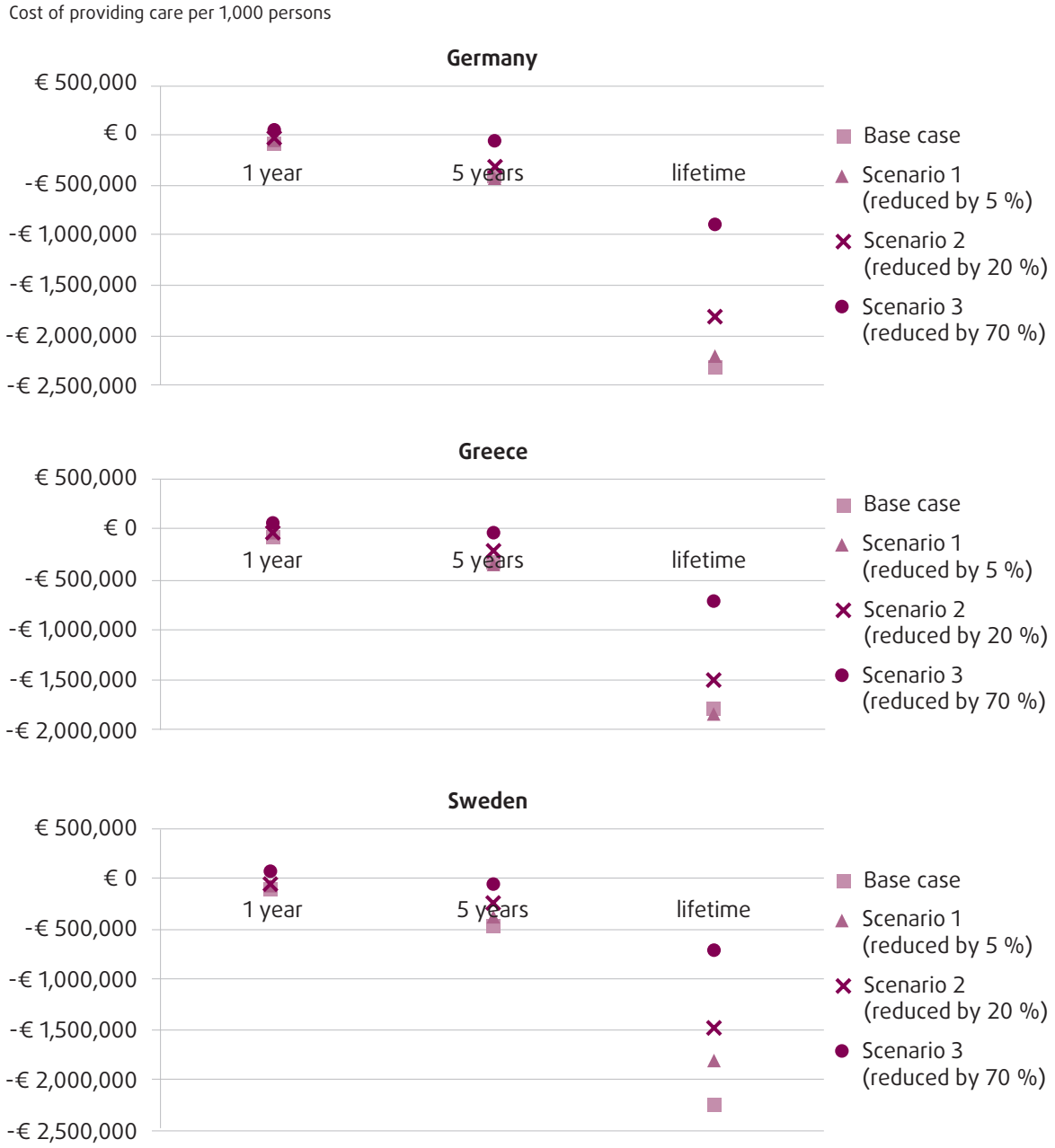


Source: FRA, 2015

Figure A5 and Figure A6 show that Scenario 3 holds the least beneficial in terms of cost-savings as it would be expected. Still, even when the probability of experiencing a stroke or an MI without treatment is reduced by 70 %, providing access to healthcare to hypertensive patients is still cost-saving when a lifetime perspective is adopted.

Scenarios 1 and 2 show that providing access to healthcare for migrants in an irregular situation saves costs, even when a one-year time frame is adopted. Therefore, even when the probability of experiencing stroke and MI without treatment changes, the base case results still apply.

Figure A6: Differences in absolute costs of access to healthcare scenario compared to no access scenario for MI by probability of MI and duration of treatment in Germany, Greece and Sweden



Source: FRA, 2015

Annex 2: Applying the prenatal care model to three EU Member States

This annex applies the economic model for prenatal care presented in Chapter 3 to three Member States: Germany, Greece and Sweden. This test determines whether providing regular healthcare to migrants in an irregular situation is cost-effective or not when different country-specific data is entered.

The conceptual model developed for this research reflects prenatal care guidelines as described in Germany.[93] Clinical guidelines do not exist for Greece, while the Swedish document was not available electronically.[94] The conceptual model was revised and validated for Greece and Sweden during a workshop of healthcare professionals and health economists at FRA in June 2013.

The economic analysis compared the total costs incurred under the 100 % access pathway (i.e. all pregnant migrant women in an irregular situation receive prenatal care) with the no access pathway.

Data used to populate the model

In the absence of specific data on pregnancy rates for migrants in an irregular situation, they were assumed to be the same as the rates of pregnant women in the hosting country. The probability of migrant women in an irregular situation between the ages of 15 and 55 being pregnant was thus assumed to be the same as for a regular resident in Germany, Greece and Sweden.

The method employed for estimating the prevalence of hypertension could not be used to map pregnancy rates, because the data were not robust enough. More specific data on pregnancy rates for the migrants' countries of origin, though available through different sources,[95] were not always clearly defined.

Using the pregnancy rates of the hosting countries is an estimate, which might have resulted in either an over or underestimation of the number of pregnancies among migrants in an irregular situation. This assumption was tested in the sensitivity analysis. Literature on the higher birth rates of migrants compared to host countries suggests that the model could have underestimated the birth rate.[96]

Table A20 shows the probability of pregnancy for the three EU Member States. This was calculated using Eurostat data by dividing the number of live births in 2011 by the number of females at childbearing age in 2011 (most recent year with available data in Eurostat dataset, 2013).[97]

Cost of prenatal care

The estimated costs of prenatal care have been informed by the cost data used by NICE, the German national-level guidelines for prenatal care, and input provided by healthcare professionals and health economists during the June 2013 workshop. The costs are derived from the costs of:

- appointments with clinical staff (primary care physician or midwife according to the country clinical practice);
- having an interpreter for each appointment (note that interpreters are routinely provided only by Sweden);[98]
- urine tests (except for Greece where these are not part of usual prenatal care);

Table A20: Probability of pregnancy (%)

Country	Value
Germany	3.65
Greece	4.12
Sweden	5.25

Source: Eurostat (2013c)

93 Germany, Federal Committee of Physicians and Sickness Funds (2013).
94 Sweden, Welfare (*Socialstyrelsen*) (1996).
95 World Bank; Eurostat (2013b); Eurostat (2013c).
96 See, for example, Sobotka, T. (2008).
97 Eurostat (2013c); Eurostat (2013b).
98 At the June workshop the possibility of provision of interpreters in Germany was discussed, however, the research team was not able to find evidence to confirm this.

- blood tests (cost of haematology, biochemistry and phlebotomy);
- standard prenatal ultrasounds.

The frequency of use of each resource listed above changes across Member States. Based on expert opinions provided in the 2013 workshop, Tables A21 to A23 present the costs for a 'normal' (i.e. not complicated) pregnancy. The frequency of resources presented for Germany are based on national data[99] and on German prenatal care guidelines, in the absence of European guidelines for pre-natal care.

Table A21: Cost of prenatal care in Germany

Resource	Frequency	Unit cost 2013, in €	Total cost 2013, in €	Description	Source
Appointment with primary care physician	10	72	716	The unit cost covers a 20-minute consultation with a primary care physician, excluding direct care staff costs	PSSRU 2012
Dipstick urine test	10	2.6	26	Cost of a dipstick urine test	Sekhar *et al.*, 2010
Blood test	2	9	18	Cost of haematology, biochemistry and phlebotomy per sample	NHS reference costs 2011–2012
Ultrasound	3	72	216	Standard prenatal ultrasound	NHS reference costs 2011–2012
Total costs			976		

Note: The costs were calculated using UK unit cost data and adjusted using PPP methodology to reflect country-specific costs. The research team has not been able to source specific unit cost data for each country. In Germany there are uniform valuation standards for medical treatment according to the "Einheitlicher Bewertungsmaßstab (EBM) Arztgruppen-Frauenarzt" and hospital compensation system (available at www.g-drg.de/cms/). However, cost calculations are based on allocation of points outline adjusted by region. Because of the complexity of these cost formulas, unit costs for this study were not obtained for Germany. Experts validated the proxy figures above during the June 2013 workshop.

Source: FRA, 2015

Table A22: Cost of prenatal care in Greece

Resource	Frequency	Unit cost 2013, in €	Total cost 2013, in €	Description	Source
Appointment with primary care physician	10	58	580	The unit cost covers a 20-minute consultation with a primary care physician, excluding direct care staff costs	PSSRU 2012
Dipstick urine test	10	2.6	26	Cost of a dipstick urine test	Sekhar *et al.*, 2010
Blood test	2	7	15	Cost of haematology, biochemistry and phlebotomy per sample	NHS reference costs 2011–2012
Ultrasound	3	58	175	Standard prenatal ultrasound	NHS reference costs 2011–2012
Total costs			796		

Note: The costs were calculated using UK unit cost data and adjusted using PPP methodology to reflect country-specific costs. The research team has not been able to source specific unit cost data for each country.

Source: FRA, 2015

99 The frequency of each resource is based on data from AngloINFO Germany (2013).

Table A23: Cost of prenatal care in Sweden

Resource	Frequency	Unit cost 2013, in €	Total cost 2013, in €	Description	Source
Appointment with midwife	4	34	138	The unit cost covers a 20-minute consultation with a midwife	PSSRU 2012
Interpreter	4	13	52	The unit cost covers half an hour with an interpreter. For the total cost estimate, we assume only 20 % of patients will need an interpreter.	UK Border Agency, 2013
Dipstick urine test	4	2.6	11	Cost of a dipstick urine test	Sekhar *et al.*, 2010
Blood test	2	10	20	Cost of haematology, biochemistry and phlebotomy per sample	NHS reference costs 2011–2012
Ultrasound	2	112	224	Standard prenatal ultrasound	Swedish National DRG, 2011
Total			444		

Note: The costs were calculated using UK unit cost data and adjusted using PPP methodology to reflect country-specific costs. Ultrasound costs were provided by experts. The research team has not been able to source specific unit cost data for each country. Prenatal care costs are lower in Sweden because fewer prenatal care resources are used, despite the higher unit costs in this country.

Source: FRA, 2015

Cost of low birth weight

The cost of low birth weight (LBW) in Germany and Greece is derived from a US costing study by Russell, R. B. *et al* (2007), which assesses the national hospital costs for infant admissions associated with preterm and LBW babies during their first year of life.[100] For Sweden, the cost data for LBW was provided by Swedish expert opinion and the Swedish National Diagnostic-Related Groups (DRG) data for 2010 (Table A25).

The cost of LBW was provided for each of the considered categories. A weighted average of the cost across all categories is provided. The cost was weighted by the number of babies in each category.

Table A24: Cost of LBW for Germany and Greece (per child, in €)

Outcome	Germany 2013	Greece 2013
Extreme immaturity (under 1,000 g)	70,674	57,289
Other preterm causes (under 2,500 g)	17,875	14,490
Slow growth/malnutrition (under 2,500 g)	10,206	8,273
Weighted total	22,451	18,199

Source: Russell, R. B. et al. *(2007)*

Table A25: Cost of LBW for Sweden (in €)

Outcome	Sweden 2013
Low birth weight <1,000 g	60,445
Low birth weight 1,000–1,499 g	39,918
Low birth weight 1,500–1,999 g	20,522
Low birth weight 2,000–2,499 g	13,721
Weighted total	33,652

Source: Swedish National Diagnostic-Related Groups (2011)

100 Russell, R. B. *et al.* (2007). This study used 2001 NIS data on 384,200 preterm/LBW babies and 1,929,800 uncomplicated newborns. NIS dataset was created within the Healthcare Cost and Utilization Project (HCUP) in the USA and includes a 20 % sample of US community hospitals.

Model results

Providing access to prenatal care services for migrants in an irregular situation seems to be cost-saving in Germany, Greece and Sweden, though the first two Member States present lower cost-savings. A sensitivity analysis shows these results are generally robust.

Despite this, in the prenatal care model, the costs and benefits of providing care were estimated using different approaches and sources than for the hypertension model (PPP adjustment of non-country specific data, expert opinion, etc.), which is likely to have introduced bias in the results. Therefore, the results of the prenatal care model should be interpreted with caution.

Table A26 presents the cost-savings of providing access to prenatal care to women in an irregular situation – assuming that all of them make us or this opportunity (100 % access scenario) – compared with no access to prenatal care. The results are presented for a two-year time frame (from the year when the woman receives care up until birth and the year after the baby is born) and are for a cohort of 1,000 women.

Table A27 presents the number of LBW cases avoided by providing access to prenatal care to migrant women in an irregular situation (100 % access scenario) compared with no access. The results are presented for a two-year time frame and are for a cohort of 1,000 woman.

Providing migrants in an irregular situation to healthcare is thus cost-saving for all three EU Member States. If they provide regular access to prenatal care over the course of two years, it will be less expensive than managing the extra cases of LBW resulting from not providing this care. This means that the marginal costs associated with LBW babies whose mothers do not receive prenatal care are higher than the costs of providing regular access to healthcare to all migrant mothers in an irregular situation. Providing 100 % access to prenatal care in Germany, Greece and Sweden generates savings of €56, €52 and €177 per woman, respectively, over two years.

It should be emphasised that these results are for a period of two years, which implies that the model does not capture all the potential complications of LBW that can take place in the future life of the child.

In general, the estimated number of LBW cases avoided is not particularly high for any of the countries; six avoided cases per 1,000 pregnant women in Sweden was the highest. This is because of the relatively weak association between prenatal care and LBW (despite it being the most robust outcome to model) and the low number of births.

The prenatal care results are based on a number of assumptions and are subject to limitations, hence they should be treated with caution.

Table A26: Two-year cost-savings in the 100 % access scenario per 1,000 population (in €)

	Germany		Greece		Sweden	
	Irregular resident 100 % access	Irregular resident no access	Irregular resident 100 % access	Irregular resident no access	Irregular resident 100 % access	Irregular resident no access
Prenatal care cost	35,038	0	32,627	0	23,380	0
Cost of LBW	24,801	116,257	22,952	107,588	54,470	255,328
Total cost	59,840	116,257	55,579	107,588	77,850	255,328
Difference	-	-56,417	-	-52,009	-	-177,478

Source: FRA, 2015

Table A27: Number of LBW cases avoided in the 100 % access scenario per year, per 1,000 population

	Germany	Greece	Sweden
	100 % vs. no care	100 % vs. no care	100 % vs. no care
Number of LBW cases avoided	4	5	6

Source: FRA, 2015

Sensitivity analysis

In the case of prenatal care, the following sensitivity analysis was undertaken to assess the impact of varying parameters in the final model outputs. These included:

- level of access (a scenario assuming fewer than 100 % uptake of prenatal care services);
- birth rates (including both an increase and decrease in the birth rate);
- cost of prenatal care (including both an increase and decrease in the cost of providing prenatal care);
- cost of LBW (including both an increase and decrease in the costs associated with LBW);
- probability of LBW (various scenarios where the probability of LBW with no prenatal care provided decreased).

These scenarios were agreed on by the expert panel during the June 2013 workshop at FRA. In each scenario, all other factors were held constant – i.e. when modelling varied levels of access, all other parameters in the model (birth rates, costs of prenatal care, etc.) remained the same.

Level of access

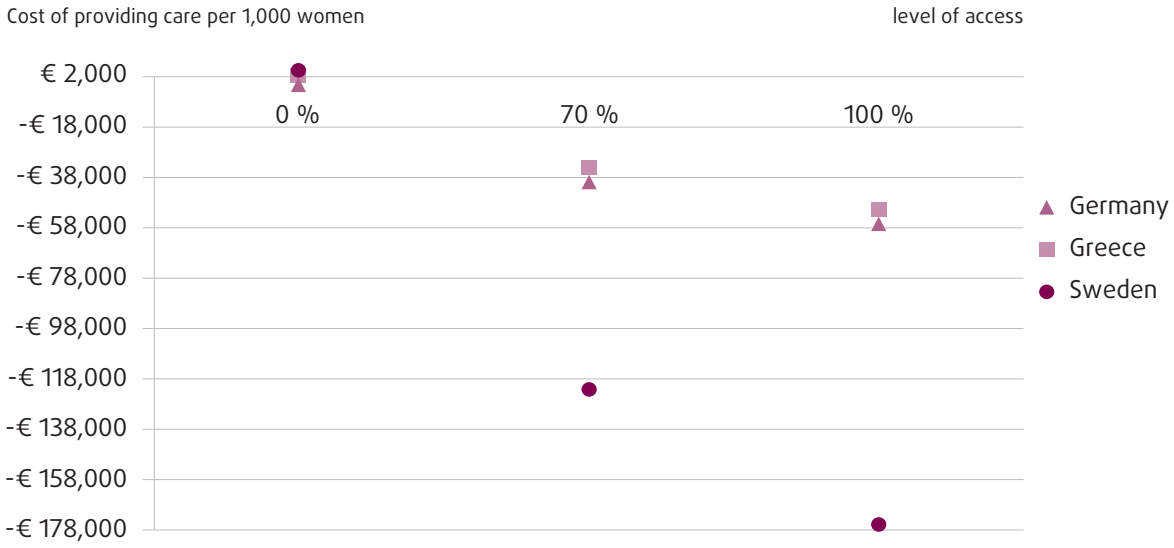
As mentioned above, only the 100 % level of access scenario was considered in the base case analysis for prenatal care. However, even if 100 % access is granted to pregnant women in an irregular situation, there is a possibility that not all of them will actually undertake prenatal care. As such, a scenario considering 70 % access to care was considered. As expected, Figure A7 shows that as the overall level of access decreases, so do the overall cost-savings for the German, Greek and Swedish healthcare systems. It should be noted that this result translates the base case scenario, only scaled to a different proportion of the overall population. As such, the cost-savings per person remain the same as when 100 % of access is provided.

Birth rates

The probability of migrants in an irregular situation between the age of 15 and 55 being pregnant was assumed to be the same as that of regular residents in Germany, Greece and Sweden.

Using the pregnancy rates of the host countries might have resulted in an incorrect estimation of pregnancies among the irregular migrant population. According to data sourced from the Clandestino project,[101] the average birth rate for irregular migrants in Germany would increase from 3.59 % (used in the base model) to 4.12 % and for Greece from 4.1 % (used in the base model) to 4.9 %. The Clandestino project does not provide information on the composition of the irregular migrant population in Sweden. Hence data on the average birth rate for irregular migrants in Sweden is not presented.

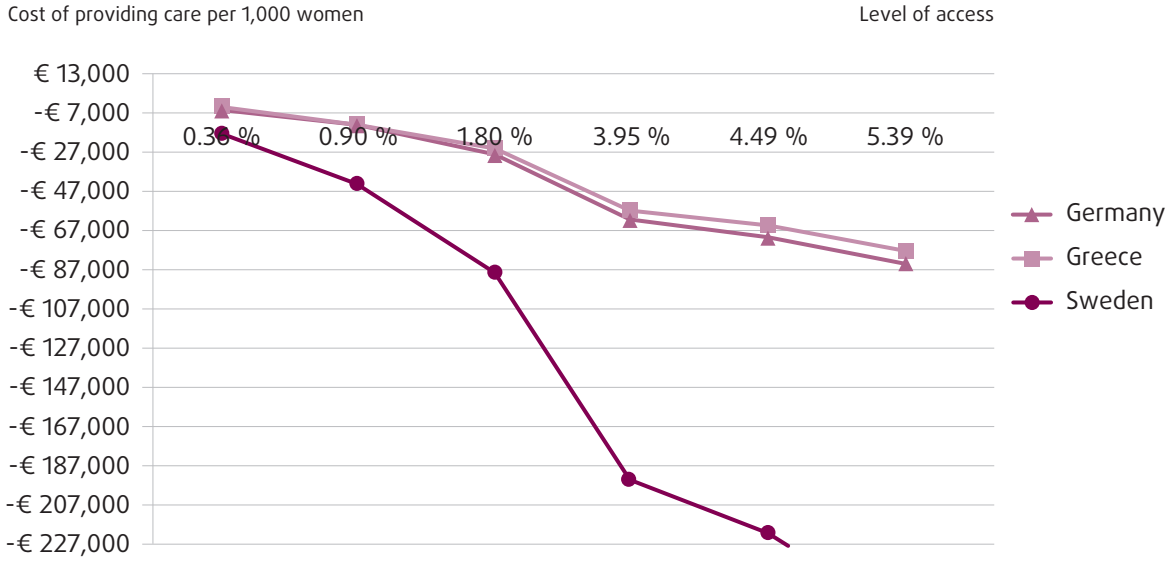
Figure A7: Cost differences per child of care provision scenarios (access vs. no access in the first year) according to variable levels of access to prenatal care for Germany, Greece and Sweden



Source: FRA, 2015

101 The project aimed to provide an inventory of data and estimates on undocumented migration (stocks and flows) in 12 EU Member States. For more information, see: European Commission (2009a).

Figure A8: Cost differences in care provision scenarios (access vs. no access) according to variable birth rates for Germany, Greece and Sweden



Source: FRA, 2015

Figure A8 shows that as the number of pregnant women increases, so do the overall cost savings in Sweden, Greece and Germany.

Costs of prenatal care

The cost of prenatal care is a key parameter within the model. While efforts were made through desk research and expert consultation to identify country-specific costs, these data were not always available. Therefore, the real costs associated with prenatal care might differ from those assumed in the base case scenario. The sensitivity analysis includes the possible outcomes of varying prenatal care costs.

In the sensitivity analysis the cost of prenatal care per woman varied according to a number of values. This included decreasing the cost of prenatal care per woman by 90 % from the base case cost to increasing the cost of prenatal care per women by 50 %.

Figure A9 shows a common trend for all three countries. Providing access to prenatal care remains cost-saving even when the cost of prenatal care increases by 50 %.

In Germany for instance, where the base case cost-saving of providing regular access to healthcare is €56 per women, increasing the cost of prenatal care by 50 % (around €1,464 per case) still yields cost-savings of €39.

Therefore, these results indicate that the model's conclusions (i.e. is providing access to prenatal care cost-saving or not) do not seem to be too sensitive to the cost of prenatal care.

Cost of LBW

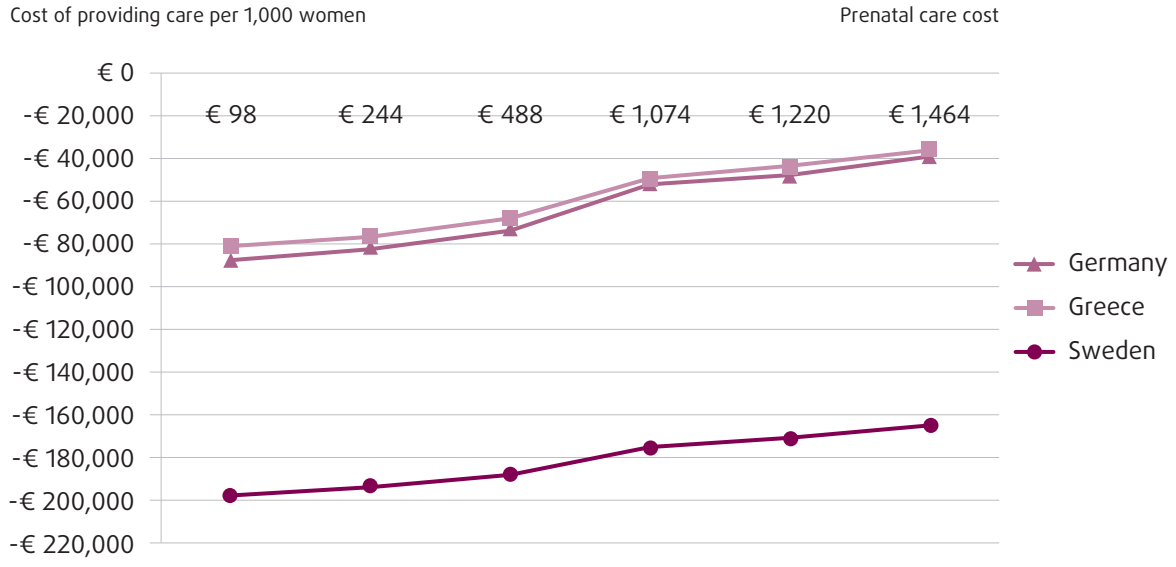
There is considerable variation in the literature regarding LBW cost estimates.[102] The selection of baseline data was based on the likely robustness of the analysis used to derive costs and the timeliness of the analysis. However, the costs of LBW could be either over- or under-estimated. Sensitivity analysis is carried out to isolate the effect of LBW costs on the results. The main driver of the variation in costs is the variation of the length of stay in hospital. The variable which has most impact on length of stay is weight at birth.[103]

As expected, decreasing the cost of LBW generates fewer cost-savings (or higher costs). In other words, if a case of LBW is not that costly to the healthcare system, then the monetary benefit of avoiding a case is also not great.

Figure A10 shows that in Sweden, decreasing the cost of a LBW case from the baseline cost estimate by 80 % (i.e. from €33,652 to €8,413) still shows that providing access to prenatal care is cost-saving. In this case, accessing care generates savings of €26,834 per 1,000 women.

102 See, for example, Godfrey, C. *et al.* (2010); United States, Office of Technology Assessment (1987), Ch. 2.
103 *Ibid.*

Figure A9: Cost differences in care provision scenarios (access vs. no access) according to variable prenatal care costs for Germany, Greece and Sweden



Source: FRA, 2015

Figure A10 also shows that when decreasing the cost of LBW in Germany from its base case value of €22,451 to less than €8,600 (i.e. approximately a 62 % decrease), providing access to prenatal care is no longer cost saving.

For Greece, it is no longer cost-saving when the cost of LBW is decreased to less than €7,000 (i.e. approximately a 61.5 % decrease from the base case value of €18,199).

There is a marked difference in costs in Sweden (as reported) and in Germany and Greece (as estimated using proxy data). However, if the costs associated with LBW in Germany and Greece were like those estimated in Sweden, then providing access to care to pregnant women would result in cost-savings above €100,000 (see Figure A10).

From another perspective, increasing the costs of LBW could also imply the costs of events associated with the mother's outcomes. This means that making a case of LBW more expensive can reflect the additional costs of treating a mother who has not received adequate prenatal care. As expected, Figure A10 reveals that as the cost of LBW increases, so do the cost-savings associated with providing prenatal care to pregnant migrant women in an irregular situation.

The results presented show that the model outcomes (for Germany and Greece) are not extremely sensitive to the cost of LBW. Varying this cost considerably (an increase of up to 62 % from the original base case value) leads to the same economic conclusions (i.e. providing access to care is still cost-saving). For Sweden, it seems very unlikely that the cost of LBW would have an impact on the results. Decreasing this cost as much as 80 % of the baseline value still lead to a cost-saving scenario.

Probability of LBW

The probability of experiencing LBW without access to prenatal care is an obvious key parameter of the model. As this represents the base case risk of experiencing the outcome of LBW without care, the probability rate drives the costs associated with not providing care to pregnant migrant women in an irregular situation. As explained previously, the data associating prenatal care with LBW is not mono-causal, and other factors are associated with LBW. Therefore, it is important to consider a range of probabilities within the sensitivity analysis.

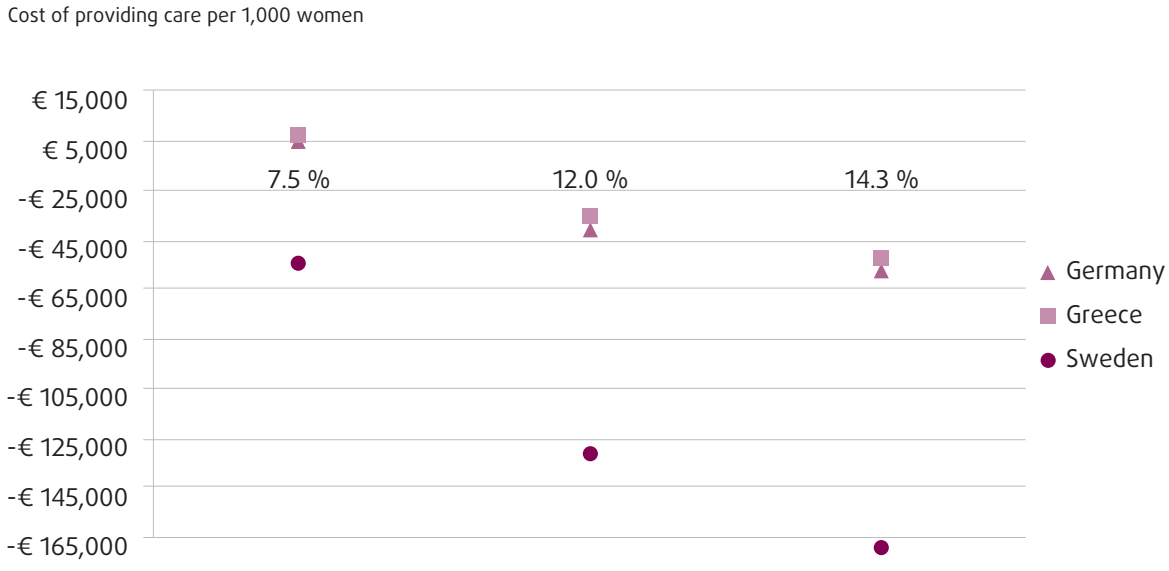
The base case value used in the model was a 15 % probability of experiencing LBW with no prenatal care provided (compared to a 3.2 % chance of experiencing LBW with adequate prenatal care).

As we can observe from Figure A11, when this probability is reduced by 50 % (i.e. to 7.5 %), the results for Sweden are still cost-saving. However, for Greece and Germany, reducing the probability of LBW with no care by 50 % shows that providing access to prenatal care is no longer cost-saving.

Figure A10: Cost differences of care provision (access vs. no access) according to variable LBW costs for Germany, Greece and Sweden

Source: FRA, 2015

Figure A11: Cost differences of care provision (access vs. no access) according to variable probabilities of LBW without access to prenatal care for Germany, Greece and Sweden



Source: FRA, 2015

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This report aims to estimate the economic cost of providing timely access to screening and treatment for migrants in an irregular situation, compared with providing treatment only in emergency cases. It presents an economic model to calculate such costs for two medical conditions: hypertension and prenatal care. To better illustrate its application in practice, the model is applied to three European Union (EU) Member States – Germany, Greece and Sweden.

Although results must be interpreted with caution, the testing shows that providing access to regular preventive healthcare for migrants in an irregular situation would be cost-saving for healthcare systems. Even when using a simple model to estimate costs, the implications are clear: treating a condition only when it becomes an emergency not only endangers the health of a patient, but also results in a greater economic burden to healthcare systems.

FRA - EUROPEAN UNION AGENCY FOR FUNDAMENTAL RIGHTS
Schwarzenbergplatz 11 – 1040 Vienna – Austria
Tel. +43 158030-0 – Fax +43 158030-699
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