



# Parkinson's disease among migrants in Europe: estimating the magnitude of an emerging phenomenon

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## Abstract

**Introduction** The occurrence of age-related pathological conditions among subjects with a migration background and composing ethnic minorities is an emerging challenge for Western countries. Specifically, the onset of neurodegenerative diseases in these populations of individuals might assume special relevance and generate additional complexities for our healthcare systems. The aim of the present study was to estimate the number of Parkinson's disease (PD) cases in migrant subjects living in Europe.

**Methods** The estimated cases of PD among  $\geq 50$ -year-old migrants living in Europe, and in each of the 32 considered countries, were calculated by multiplying the number of migrants (derived by the Eurostat data) with the age-specific prevalence rates of PD (obtained by a recent meta-analysis).

**Results** Nearly 20 million migrants  $\geq 50$  years lived in Europe in 2017. The application of the age-specific prevalence rates led to the estimation of 129,645 overall PD cases in this population, accounting for the 8% of overall PD cases in Europe. National estimates widely ranged from 36 cases in Iceland to 29,390 cases in France.

**Conclusion** The present findings suggest that the occurrence of PD in migrants and minority groups already constitutes an important issue for European healthcare systems and will assume further relevance given the rapidly evolving sociodemographic scenario. Characterizing the phenomenon at the "real world" level and implementing coordinated initiatives and strategies represent novel but pressing needs for our countries.

**Keywords** Parkinson's disease · Migrants · Epidemiology · Public health · Migrant health

## Introduction

In the last decades, two main sociodemographic processes have contributed to substantially modify the shape of our societies worldwide. The first is the progressive aging of the population. The second is constituted by the increase of international migratory flows. While these phenomena are well characterized individually, the impact of their combination (i.e., the aging of migrant populations) on our

healthcare systems is not completely understood. The burden of age-related pathological conditions occurring in immigrants and subjects composing ethnic minorities may have significant clinical, societal, and public health implications [1]. The occurrence of age-related neurodegenerative disorders, including Parkinson's disease (PD), in this specific population of individuals may assume special relevance and generate additional complexities.

The incidence and prevalence of PD have been assessed in numerous studies and in different geographical areas [2]. However, there are no studies investigating and quantifying its occurrence in migrant subjects living in Europe. Estimating the cases of PD among migrants is a crucial step to determine the real public health relevance of this issue. Having this information may help to adequately plan and calibrate any future action toward this emerging phenomenon. Therefore, the aim of the present study was to estimate the number of PD cases in migrant subjects

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living in Europe. Specifically, we calculated the number of European migrants with PD by multiplying the number of migrants with the age-specific prevalence rates of PD.

## Methods

### Calculation of migrants older than 50 years living in Europe

In this study, individuals that had moved from their place of birth to a given European country, regardless of the length of stay and the causes for the migration, were considered as “migrants”. The number of migrants living in Europe, aged 50 years or older, was derived by the data provided by the Statistical Office of the European Union, Eurostat (<http://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-data/database>). We retrieved data for the 28 countries of the European Union (EU-28) and the four countries belonging to the European Free Trade Association (i.e., Iceland, Liechtenstein, Norway, and Switzerland). Data were updated to 2017 for all countries with the exception of Germany (data updated to 2010). No data were available as well for migrants > 85 years living in Germany. Information concerning the country of birth of immigrant individuals, considering both geographical (i.e., continent and sub-continental region) and socioeconomic aspects, was also obtained. In this latter regard, Eurostat classifies World countries as high, medium, and less developed based on the Human Development Index, a summary composite index incorporating statistical measures of life expectancy, literacy, educational attainment and GDP per capita, calculated by the United Nations [3].

### Parkinson’s disease prevalence rates

We calculated age-specific prevalence rates of PD referring to a recent meta-analysis of 47 studies conducted worldwide, using door-to-door surveys or random population samples and including a two-phase design (i.e., a screening phase followed by a physical/neurological examination to confirm or exclude the diagnosis of PD) [2]. Specifically, 21 studies were performed in Asia, 11 in Europe, 5 in Africa, 4 in Oceania, 4 in South America, and 2 in North America. Only the data provided by the 17 studies (overall participants: 100,109; PD cases: 751) meeting the highest quality standards (defined by eight quality indicators referring to the

representativeness of study samples, the clinical assessment of participants, and the statistical analyses) were considered for the present analysis.

### Estimated Parkinson’s disease cases among migrants in Europe

The estimated number of PD cases among  $\geq 50$ -year-old migrants living in Europe, and in each of the 32 considered countries, was calculated by multiplying the number of migrants with the age-specific prevalence rates.

## Results

Overall, nearly 20 million migrants  $\geq 50$  years lived in Europe in 2017 (Table 1). These numbers may be under-representative considering that data from Germany were not available for migrants older than 85 years and were updated to 2010. The number of migrants had a marked international variability ranging from 7805 in Iceland to 3,805,974 in France (Table 2). Based on available data, only one quarter of migrants was born outside the European continent; among these subjects, the 24.3% came from medium- and less-developed World countries. Conversely, the striking majority of European international migrants were born in another European or in a non-European highly developed country (Table 3).

The application of the age-specific prevalence rates led to the estimation of 129,645 overall PD cases in the  $\geq 50$  years old European immigrant population (Table 1), with estimates ranging from 36 cases in Iceland to 29,390 cases in France (Table 2; Fig. 1).

**Table 1** Estimated cases of Parkinson’s disease among migrants living in Europe in 2017

Age	Prevalence (per 100,000) <sup>a</sup>	Migrants ( <i>n</i> ) <sup>b</sup>	Estimated cases ( <i>n</i> )
50–59	156	8,713,332	13,593
60–69	503	5,678,760	28,564
70–79	1277	3,374,922	43,098
$\geq 80^c$	2498	1,777,052	44,391
Total		19,544,066	129,645

<sup>a</sup>Age-specific prevalence rates are taken from [2]

<sup>b</sup>Source: Eurostat (<http://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-data/database>). Data are updated to 2017 except for Germany (2010)

<sup>c</sup>No data were available for migrants  $\geq 85$  years living in Germany

**Table 2** Estimated cases of Parkinson's disease among migrants living in each European country in 2017

Country age	Belgium		Bulgaria		Czech Republic		Denmark	
	Migrants	Est. cases	Migrants	Est. cases	Migrants	Est. cases	Migrants	Est. cases
50–59	281,622	439	16,972	26	69,627	109	89,779	140
60–69	193,091	971	15,013	76	30,634	154	48,132	242
70–79	108,731	1388	9217	118	8930	114	24,754	316
≥ 80	58,044	1450	4626	116	3472	87	9914	248
Total	641,488	4249	45,828	335	112,663	463	172,579	946
Country age	Germany		Estonia		Ireland		Greece	
	Migrants	Est. cases	Migrants	Est. cases	Migrants	Est. cases	Migrants	Est. cases
50–59	1,656,211	2584	38,431	60	80,463	126	203,331	317
60–69	1,064,702	5355	46,973	236	50,308	253	113,540	571
70–79	560,021	7151	34,257	437	28,510	364	48,268	616
≥ 80	128,156	3201	22,389	559	13,862	346	35,041	875
Total	3,409,090	18,292	142,050	1293	173,143	1089	400,180	2380
Country age	Spain		France		Croatia		Italy	
	Migrants	Est. cases	Migrants	Est. cases	Migrants	Est. cases	Migrants	Est. cases
50–59	872,888	1362	1,348,943	2104	111,918	175	961,926	1501
60–69	442,153	2224	1,250,064	6288	97,966	493	411,189	2068
70–79	234,962	3000	749,574	9572	65,557	837	145,450	1857
≥ 80	99,838	2494	457,393	11,426	33,083	826	85,284	2130
Total	1,649,841	9080	3,805,974	29,390	308,524	2331	1,603,849	7557
Country age	Cyprus		Latvia		Lithuania		Luxembourg	
	Migrants	Est. cases	Migrants	Est. cases	Migrants	Est. cases	Migrants	Est. cases
50–59	15,944	25	53,979	84	31,240	49	44,290	69
60–69	14,003	70	64,490	324	29,300	147	25,778	130
70–79	5619	72	52,238	667	18,188	232	12,973	166
≥ 80	2052	51	32,091	802	10,268	256	6078	152
Total	37,618	218	202,798	1877	88,996	685	89,119	516
Country age	Hungary		Malta		Netherlands		Austria	
	Migrants	Est. cases	Migrants	Est. cases	Migrants	Est. cases	Migrants	Est. cases
50–59	61,408	96	7858	12	349,000	544	239,146	373
60–69	49,368	248	4845	24	224,790	1131	157,778	794
70–79	39,930	510	3019	39	117,633	1502	99,130	1266
≥ 80	20,723	518	1130	28	51,218	1279	46,939	1173
Total	171,429	1372	16,852	103	742,641	4457	542,993	3605
Country age	Poland		Portugal		Romania		Slovenia	
	Migrants	Est. cases	Migrants	Est. cases	Migrants	Est. cases	Migrants	Est. cases
50–59	22,376	35	141,238	220	21,011	33	54,336	85
60–69	28,708	144	70,740	356	15,443	78	41,400	208
70–79	184,771	2360	30,191	386	21,518	275	18,902	241
≥ 80	158,015	3947	16,564	414	11,185	279	8631	216
Total	393,870	6486	258,733	1375	69,157	665	123,269	750
Country age	Slovakia		Finland		Sweden		United Kingdom	
	Migrants	Est. cases	Migrants	Est. cases	Migrants	Est. cases	Migrants	Est. cases
50–59	29,209	46	41,451	65	248,080	387	1,102,344	1720

**Table 2** (continued)

Country age	Slovakia		Finland		Sweden		United Kingdom	
	Migrants	Est. cases	Migrants	Est. cases	Migrants	Est. cases	Migrants	Est. cases
60–69	32,840	165	19,465	98	178,372	897	683,473	3438
70–79	20,742	265	6949	89	110,474	1411	434,432	5548
≥ 80	10,250	256	3599	90	58,617	1464	292,469	7306
Total	93,041	732	71,464	341	595,543	4159	2,512,718	18,011
Country age	Iceland		Liechtenstein		Norway		Switzerland	
	Migrants	Est. cases	Migrants	Est. cases	Migrants	Est. cases	Migrants	Est. cases
50–59	4727	7	4105	6	99,080	155	410,399	640
60–69	1938	10	2600	13	45,914	231	223,750	1125
70–79	772	10	1553	20	20,337	260	157,320	2009
≥ 80	368	9	637	16	8352	209	86,764	2167
Total	7805	36	8895	55	173,683	854	878,233	5942

Source: Eurostat (<http://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-data/database>). Data are updated to 2017 except for Germany (2010). No data were available for migrants ≥ 85 years living in Germany

## Discussion

The present study represents the first attempt to explore the public health relevance of PD among migrants in Europe. We found that nearly the 8% of overall PD cases in Europe (129,645 out of 1,567,835 estimated total cases) is expected to currently occur in foreign-born populations.

The present estimates suggest that this issue, despite being just emerging and only poorly addressed, has probably already reached relevant dimensions. These numbers are even likely underestimated (e.g., they do not include unregistered migrants) and are forecasted to further raise in the next future due to the projected increase in size of the two underlying sociodemographic phenomena (i.e., population aging and international migration to Europe).

Nevertheless, if population aging appears as unavoidable, migration is a much less predictable process due to the fluctuations in migratory flows across continents and the uncertain national and international political strategies targeting this issue. Under all circumstances, it can be expected a growing number of immigrant subjects with PD exceeding the one already attending clinical and social services in their novel European country of residence, and that healthcare providers will increasingly deal with this problem in their daily practice.

These reflections assume even greater importance considering that, although most of migratory movements take place between European countries, a sizeable proportion

of PD cases will affect subjects coming from developing countries and reasonably composing minority groups once they moved to Europe (thus probably with lower socio-economic status and reduced access to care [1]). In this regard, it is noteworthy that a number of studies have suggested that PD subjects belonging to ethnic minorities tend to present late to dedicated services, usually showing severe clinical manifestations and disabilities [4], and have a lower likelihood of receiving a timely diagnosis compared to majority groups [5]. Moreover, once diagnosed with PD, these patients are less likely to receive targeted medical treatments [6], surgical procedures for advanced stages [7], and participate in clinical trials and research protocols [8].

The occurrence of PD in this specific population may give life to other additional challenges. In fact, the diagnostic approach to specific non-motor symptoms (e.g., cognitive and behavioral disturbances) can be complicated by linguistic and cultural barriers. Moreover, migrants and underserved minorities may reasonably have different knowledge and attitudes about PD, with profound consequences in terms of medical help-seeking behaviors, social support, stigmatizing beliefs [9] and, ultimately, quality of life.

The present data underline the need for a better characterization of this issue from the perspective of clinical and social services devoted to the management of patients with PD in Europe. In fact, information concerning the use of

**Table 3** Country of birth of migrants ( $\geq 50$  years) living in Europe by geographic area and Human Development Index

	Migrants
Classification by geographic area	
Europe ( <i>n</i> )	6,142,685
Asia ( <i>n</i> )	798,488
Southeastern (%)	33.6
Southern (%)	28.9
Western (%)	21.0
Eastern (%)	13.2
Central (%)	3.2
Africa ( <i>n</i> )	682,605
Northern (%)	62.2
Eastern (%)	13.4
Central (%)	9.7
Western (%)	1.8
Southern (%)	12.8
America ( <i>n</i> )	524,564
Southern (%)	66.1
Northern (%)	18.9
Central (%)	2.9
Caribbean (%)	12.1
Oceania ( <i>n</i> )	24,198
Classification by Human Development Index	
Non-European HDC ( <i>n</i> )	3,561,465
Non-European MDC ( <i>n</i> )	5,222,404
Non-European LDC ( <i>n</i> )	622,831

Source: Eurostat (<http://ec.europa.eu/eurostat/web/population-demography-migration-projections/population-data/database>)

Data on the specific country of birth of migrants, updated to 2017, were available for the following countries: Belgium; Bulgaria; Czech Republic; Denmark; Estonia; Italy; Latvia; Lithuania; Luxembourg; Netherlands; Austria; Romania; Slovenia; Slovakia; Finland; Sweden; Iceland; Liechtenstein; Norway; Switzerland. These data accounted for the 41.8% of the total older migrant population living in Europe on 2017

World countries were classified in high, medium and less developed based on the Human Development Index, a summary composite index incorporating statistical measures of life expectancy, literacy, educational attainment and GDP per capita, calculated by the United Nations. Data on this index were updated to 2013 (except for Germany, 2010) and were available for all the 32 considered countries

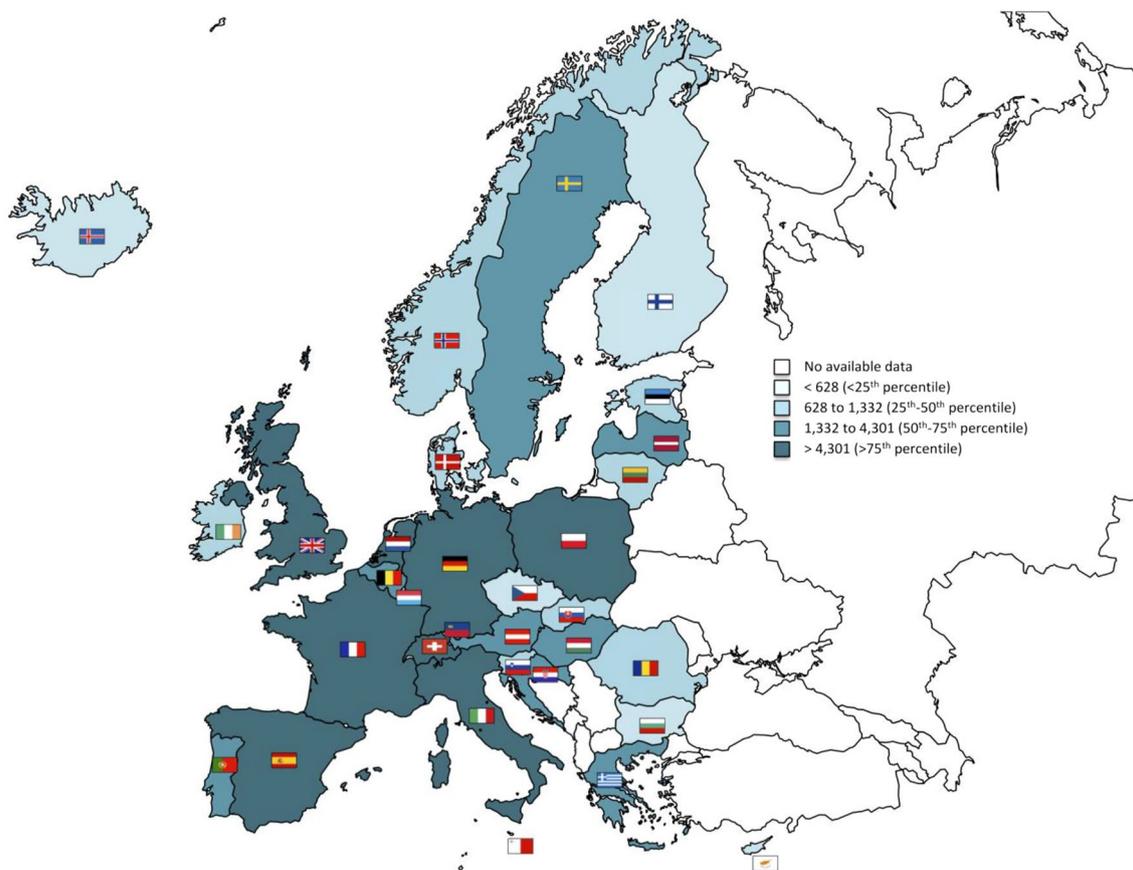
*HDC* highly developed countries, *LDC* less-developed countries, *MDC* medium-developed countries

healthcare resources (e.g., GP consultations, visits to secondary and tertiary services, drug prescriptions), the barriers and inadequacies encountered in the provision of care,

the instruments adopted in the approach of specific manifestations of the disease (e.g., cognitive testing), are still lacking but are pivotal to understand the real public health implications of the phenomenon. In this perspective, conducting *ad hoc* surveys of PD services at the national and continental levels, as well as qualitative research activities (e.g., focus groups) involving patients with a migration background and/or composing minority groups may add fundamental information for a better understanding of this issue. The resulting data should ideally be combined with the present epidemiological estimates to design and implement tailored initiatives aimed at exploring and reducing its burden and consequences.

Several potential limitations of the present study should be mentioned and discussed. In particular, the estimates of PD cases in migrants were obtained without accounting for possible differences in the disease's prevalence across races and ethnic groups, and among individuals moving from different world regions. Nevertheless, the meta-analysis used as a reference for our purposes documented, in sensitivity analyses, that the prevalence rates of PD are only marginally influenced by the geographic location [2]. Specifically, a significant difference in prevalence was observed only for individuals aged 70–79 years, with higher rates in North America, Europe and Australia compared to Asia. Along the same lines, no significant difference was found between males and females in any of the considered world region (although a slight male preponderance of PD was present in most of age groups) [2]. This supported the decision of not presenting our estimates stratified by sex. Finally, the present estimates were not weighted for the life expectancy of migrants, a factor that inevitably affects the prevalence on any age-related disease. Indeed, it has recently been shown that international migrants have different patterns of mortality and survival compared with general populations in the destination countries [10].

In conclusion, the present findings suggest that the occurrence of PD in migrants and minority groups already constitutes a relevant issue for European healthcare systems and will assume further relevance given the rapidly evolving sociodemographic scenario. Therefore, achieving an in-depth characterization of the phenomenon at the “real world” level and implementing coordinated initiatives and strategies represent novel but pressing needs for our countries.



**Fig. 1** Estimated cases of Parkinson's disease among migrants living in each European country in 2017

## Compliance with ethical standards

**Conflicts of interest** This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. Authors have no conflicts of interest to disclose for the present study. Marco Canevelli is supported by a research grant of the Italian Ministry of Health (GR-2016-02364975) for the project “Dementia in immigrants and ethnic minorities living in Italy: clinical-epidemiological aspects and public health perspectives” (ImmiDem).

**Ethical standards** The manuscript does not contain clinical studies or patient data.

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