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New HIV diagnoses among older adults in 31 European countries: an analysis of surveillance data from 2004 to 2015

Authors: Lara Tavoschi, Joana Gomes Dias, Anastasia Pharris, the EU/EEA HIV Surveillance Network

European Centre for Disease Prevention and Control, Tomtebodavägen 11A, 171 65 Solna, Sweden
[L Tavoschi (PhD); J Gomes Dias (MSc); A Pharris (PhD)]

Corresponding author: Lara Tavoschi, ECDC, Tomtebodavägen 11A, 171 65 Solna, Sweden; email address: lara.tavoschi@ecdc.europa.eu; Phone +46 (0)8 58 60 1183

Abstract

Background: HIV burden among older adults in the European Union/European Economic Area (EU/EEA) is increasing. We investigated factors associated with HIV diagnosis among older adults in 31 EU/EEA countries over 12-year period.

Methods: We defined older and younger adults as ≥ 50 and 15-49 years old, respectively. We extracted new HIV diagnoses reported to the European Surveillance System during 2004-2015 and stratified them by age, gender, migration status, transmission route and CD4 count. We performed comparisons between the two age groups using chi-square test for difference, and assessed temporal trends using linear regression analysis.

Findings: During 2004-2015 54102 new HIV diagnoses were reported in the EU/EEA among older adults. The average rate was 2.6 per 100000 population, significantly increasing over time (average annual change, AAC, 2.1%; $p=0.0009$). Notification rates increased in 16 countries, clustering in the EU/EEA central and eastern parts. In 2015, compared to younger adults, older individuals were more likely to originate from the reporting country, have acquired HIV via heterosexual contact, and present late ($p<0.0001$ for all). HIV diagnoses increased over time among older males (AAC 2.2%; $p=0.0006$), females (AAC 1.3%; $p=0.0250$), men who have sex with men (AAC 5.8%; $p<0.0001$) and injecting drug users (AAC 7.4%; $p<0.0001$).

Interpretation: Our results point towards the compelling need to deliver more targeted testing interventions for older adults and the adult population at large, such as by increasing awareness among health care workers and expanding opportunities for provider-initiated and indicator-condition guided testing programmes.

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Research in context

Evidence before this study: We performed a literature review during the scoping phase of the study to assess the available evidence on HIV new diagnoses among older adults in the EU/EEA and other western countries. We searched PubMed and Embase in March 2016 and run monthly updates until 30th June 2017, using the concepts of HIV infection and disease and older adults. Only few studies were available which focussed on this specific age group. The majority were national studies from few EU/EEA countries and other non-EU/EEA countries. One article described new HIV diagnoses among older adults in the period 2003-2007 in the broader WHO European region. Finally in 2013 UNAIDS published a special report on the global HIV epidemic among older adults.

Added value of this study: Older adults are an often overlooked population with respect to the HIV epidemic. Increased life expectancy, coupled with changes in lifestyle among older people makes them a potential population at risk for the transmission of diseases such as HIV. Our study provides the first comprehensive overview of the HIV epidemic and its burden in older adults in the EU/EEA. We analysed data reported to the European Surveillance System over a period of more than a decade to identify trends and epidemic dynamics. We compared younger and older adults being diagnosed with HIV across a range of factors to help identify distinctive features in this population and to contribute to the design of more effective prevention interventions.

Implications of all available evidence: Our study confirms the existing observations from some countries of an increasing trend in new diagnoses among older adults in the EU/EEA. We highlighted the existence of clear geographical patterns across the region, and provided valuable elements to assess the burden of new infections in EU/EEA countries and in the region at large. Our findings points towards the compelling need to consider older adults and the adult population at large as a relevant target for HIV prevention programs. Decreasing the undiagnosed fraction is a global priority to combat the HIV epidemic and older adults shall not be overlooked in the process of HIV testing expansion. To this aim, our study provides valuable elements, such as distinctive socio-demographic features, that may support the design of better targeted interventions.

Introduction

The global population is aging as a combined result of improvements in the standard of living, decreasing mortality and declining fertility (1). Data from high-income countries, such as the Member States (MS) of the European Union and European Economic Area (EU/EEA), show a steady increase in life expectancy at age 60 years over the past decades (2). Health and aging is high on the global agenda in light of the growing burden of disease among older adults, the corresponding need for health care systems to adapt to evolving demands, and the call to invest in healthy aging (3).

In 2013, UNAIDS estimated that 4.2 million people aged 50 years and older were living with human immunodeficiency virus (HIV) globally. HIV prevalence in this population segment has steadily increased in recent years in all regions, particularly in Central and Western Europe and North America (2, 4). This phenomenon has been attributed to two distinct factors: the increase in life expectancy among people living with HIV (PLHIV) on antiretroviral therapy (ART), and the observed increase, in some settings, in the number of people seroconverting at an older age (2, 4-6).

Past reports show an increasing trend of new HIV diagnoses among older adults occurring across the WHO European region (5) and in select EU/EEA countries (6, 7). However, no in-depth analysis has been undertaken on the older adult population newly diagnosed with HIV in the EU/EEA. HIV incidence is challenging to estimate, because infection may occur several years before symptoms arise or a diagnosis is made. A proxy is provided by surveillance of new diagnoses reported over time. It is estimated that there are about 30 000 new infections annually across all age groups in the EU/EEA, with substantial variability in notification rates across countries within the region (8, 9). Recent studies indicate that older adults infected with HIV are more likely to present late (6, 7, 10) and are at increased risk of short-term mortality (6, 11). Older adults living with HIV and health professionals caring for them face unique challenges, first and foremost that of increasing the coverage and uptake of testing to promote early diagnosis and reduce stigma (12).

With the present study we aim to describe factors associated with HIV infection and diagnosis among older adults in the EU/EEA to support policy decisions as well as the design of effective interventions focussing on this age group. To this end, we analysed new HIV diagnoses reported by EU/EEA countries during the period 2004-2015.

Methods

Study population and data sources

We defined the study population as all individuals aged 15 years and over newly diagnosed with HIV during the period 1st January 2004 – 31st December 2015 and reported as part of routine annual surveillance by any of the 31 EU/EEA MS to the European Surveillance System (TESSy), hosted at the European Centre for Disease Prevention and Control (ECDC). Case-level anonymised data is reported on each new HIV diagnosis, including date of diagnosis, age, gender, transmission mode, country of birth, country of diagnosis, CD4 cell count at diagnosis, co-morbidities, laboratory test and disease stage (9). While completeness of reporting on age and gender is very high (>99% during the period), data on country of birth/migration status are somewhat less complete (86-90% during the period) and only 23 countries report data on CD4 count at diagnosis for 68.5% of their cases diagnosed during the period.

In accordance with previously published studies (4, 6, 7, 13), we selected a cut-off of 50 years of age. The primary study population were individuals aged 50 years or older at HIV diagnosis (older adults), and the comparator group were individuals aged 15-49 years at diagnosis (younger adults).

We defined late diagnosis and diagnosis with advanced HIV disease as those with a CD4 cell count of less than 350 cells/ μ L and 200 cells/ μ L at diagnosis, respectively (14). We derived migrant status from the variables: native (born in the reporting country), EU-born (born in an EU/EEA country different from the reporting country), or non-EU-born (born in a non-EU/EEA country). We derived the population estimates up to 2015 from Eurostat for all EU/EEA countries, accessed on 10 August 2016 (<http://ec.europa.eu/eurostat/data/database>). We adjusted the population data used for Spain and Italy according to the extent of subnational coverage for years when surveillance data reported to TESSy did not cover all regions, assuming uniform coverage across all age groups.

Statistical analysis

We described the study population receiving a new HIV diagnosis in 2015 by gender, transmission modes, migrant status and CD4 cell count at diagnosis. We performed comparison between the two age groups using chi-square test for difference. We assessed temporal trends by estimating the percentage change in annual rate of new HIV diagnoses with 95% confidence intervals (CI), overall, by age group and country, using linear regression analysis of the log of the annual rate. We assessed trends by transmission mode using the log of the number of cases due to absence of denominator. We defined statistical significance as p value <0.05. We used STATA® 14.0 software for statistical analysis.

We included all 31 EU/EEA countries in the epidemiological analysis. Due to aggregate or inconsistent reporting over the period we excluded Estonia, Bulgaria, Italy, Poland and Spain from the trend analysis by transmission mode. These countries represent 28% of all HIV diagnoses and 26% of HIV diagnoses in older adults made in the EU/EEA during 2015. In addition, we excluded from any country-specific analysis those countries reporting 0 cases for one or more years, namely Cyprus, Iceland, Liechtenstein, Luxembourg and Slovenia.

Data sharing

The European Surveillance System data are available via request to ECDC Data Access (<http://ecdc.europa.eu/en/aboutus/what-we-do/surveillance/Pages/data-access.aspx>).

Role of the Funding Source

The funder of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

There were 29419 new HIV diagnoses reported in 2015 among persons 15 years and older in the 31 countries of the EU/EEA. Of these, 17.3% (5076/29419) were among older adults (people aged 50 years and over). The rate of new HIV diagnoses among older adults was 2.5 per 100 000 population, ranging between 0.4 (Slovakia) and 7.5 (Estonia) per 100000 population (Figure 1). In contrast, the rate of new diagnoses among younger adults (people

aged 15-49 years) in the EU/EEA was 10.4 per 100000, ranging from 2.9 (Slovakia) to 38.6 (Estonia) per 100000 population.

HIV diagnoses among men predominated in both groups, with a slightly higher male-to-female ratio among older adults (3.5) than among younger adults (3.3). The gender-specific rates of new diagnoses were 1.05 per 100 000 older females and 4.3 per 100 000 older males.

Among cases diagnosed in 2015, reported transmission routes showed a pattern significantly associated with age ($p < 0.0001$) (Table 1), with a higher proportion of cases attributed to heterosexual transmission among older adults as compared to younger adults. Among the latter, a higher proportion of new HIV diagnoses were attributed to sex between men. Notably, a larger fraction of reported cases among older adults was classified as having unknown or other transmission route as compared to younger adults.

Country of birth was reported for the majority (85.5%, 4257/29419) of newly diagnosed HIV cases among older and younger adults. Migration status among newly diagnosed HIV cases was significantly associated with age ($p < 0.0001$), with older adults were more often reported as native to the reporting country than younger age groups (Table 1).

More than half (63.3%, 11316/29419) of reported cases had information on CD4 count at diagnosis. A significantly higher proportion of older adults were diagnosed late ($p < 0.0001$) (Table 1). This is also reflected in the significantly lower median CD4 count at diagnosis among older adults as compared to younger adults.

In the period 2004-2015, a total of 312501 new HIV diagnoses among younger adults were reported in the EU/EEA with an average rate of 11.4 per 100000 population with no significant trend over time (annual average change (AAC) -0.4%; 95%CI -1.0%- +0.2% $p = 0.1716$). Among older adults, 54102 cases were reported in the same period, corresponding to an average rate of 2.6 per 100000 population, significantly increasing (AAC 2.1; 95%CI 1.1%-3.1%; $p = 0.0009$) over the 12-year period.

At national level, we observed significant increase in rates of new HIV diagnosis among older adults in 16 countries, namely Belgium ($p = 0.0035$), Bulgaria ($p = 0.0202$), Czech Republic ($p = 0.0085$), Estonia ($p < 0.0001$), Germany ($p < 0.0001$), Greece ($p = 0.0091$), Hungary ($p = 0.0035$), Ireland ($p = 0.0049$), Latvia ($p = 0.0004$), Lithuania ($p = 0.0046$), Malta ($p = 0.0264$), Norway ($p = 0.0262$), Poland ($p = 0.0006$), Romania ($p = 0.0104$), Slovakia ($p = 0.0341$) and United Kingdom ($p = 0.0002$); and a significant decrease in Portugal ($p = 0.0015$). In younger adults, we observed significant increases in 12 countries, namely Bulgaria ($p < 0.0001$), Croatia ($p < 0.0001$), Czech Republic ($p < 0.0001$), Germany ($p < 0.0001$), Greece ($p = 0.0019$), Hungary ($p < 0.0001$), Latvia ($p = 0.0191$), Lithuania ($p = 0.0120$), Malta ($p < 0.0001$), Poland ($p < 0.0001$), Romania ($p = 0.0004$) and Slovakia ($p < 0.0001$); and a significant decrease in six: Austria ($p = 0.0036$), France ($p = 0.0074$), Netherlands ($p = 0.0008$), Norway (0.0215), Portugal ($p < 0.0001$) and United Kingdom ($p < 0.0001$). According to our analysis, concordant positive trends in both age groups were found in 11 countries, and decreasing trends in one (Figure 2). In five countries there were significant increases in rates of new diagnoses only among older adults (Figure 2), with a corresponding significant decrease in younger adults in two (Norway and United Kingdom, data not shown).

We found an average annual rate of new diagnoses among older adults of 4.4 and 1.2 per 100000 inhabitants for males and females, respectively. The rate increased over the period in both sexes, from 1.0 to 1.2 per 100000 among females (AAC 1.3%, 95%CI 0.2%-2.4%; $p=0.0250$) and from 3.5 to 4.8 per 100000 among males (AAC 2.2%, 95%CI 1.2%-3.3%; $p=0.0006$) (Figure 3). Among younger adults, trends diverged with a significant increase in new diagnoses among males (AAC 1.4%, 95%CI 0.6%-2.3%; $p=0.0032$) and a significant decrease among females (AAC -4.8%, 95%CI -5.2% - -4.4%; $p<0.0001$).

We observed an age-specific pattern over time for reported transmission routes (Figure 4). The number of new HIV diagnoses due to sex between men increased over time in both age groups, showing a higher AAC among older adults (5.8%, 95%CI 4.3%-7.5%; $p<0.0001$) than in younger ones (2.3%, 95%CI 1.2%-3.5%; $p=0.0008$). Heterosexually acquired cases significantly decreased among younger adults (AAC -5.7%, 95%CI -6.2% - -5.1%; $p<0.0001$), as compared with a stable trend (no significant change) observed among older adults (AAC 1.1%, 95%CI -0.2% - +2.5%; $p=0.08$). New HIV diagnoses attributed to injecting drug use increased among older adults (AAC 7.4%, 95%CI 4.8%-10.2%; $p<0.0001$), while a decreasing trend was observed among younger adults (AAC -4.5%, 95%CI -7.5% - -1.4%; $p=0.0087$).

Discussion

To our knowledge, this is the first study focussing on the epidemiology of HIV among newly diagnosed older adults across all 31 EU/EEA countries. With this study we showed a steady increase in the rate of new HIV diagnoses among older adults in Europe over a 12-year period. Our cross-sectional analysis has revealed a distinctive pattern of socio-demographic factors associated with being an older adult newly diagnosed with HIV in the EU/EEA as compared to the younger age group. Newly diagnosed older adults were predominantly native to the reporting country, in line with findings from national studies reporting this information (6, 7, 11). In contrast with trends among younger adults, we showed a significant increase in new diagnosis among both sexes. Transmission via sex between men has been on the rise in both age groups over the period. On the contrary, we observed stable or increasing trends for transmission modes such as heterosexual contact and injecting drug use among older adults as opposed to significant declining trend among younger ones.

Although older adults have lower rates of new HIV diagnosis than younger age groups the burden of new diagnoses among older adults is heterogeneous, with western European and Baltic countries generally reporting higher HIV notification rates. Our finding of an increasing trend of new diagnoses in the EU/EEA as a whole is concordant with previous findings from the region and other high-income settings (2, 5, 15). In addition, our analysis detected similar increases over time in the majority of European countries included in the study, though clustering in the eastern and central part of the region. While the Baltic countries have been characterised by higher HIV notification rates in the population at large, other countries, such as Poland or Hungary, with historically low notification rates showed similar increasing patterns across age groups (8, 9). Conversely, the UK and Norway were unique in showing an increase in new diagnoses among older adults while new diagnoses among younger individuals decreased significantly. Although the observed differences are likely the result of multiple factors which differ across the EU/EEA including risk behaviour patterns, health-seeking behaviours, testing programmes and patterns, and levels of stigmatisation (5, 9, 16), our findings provide an indication of the new directions in which the epidemic is evolving.

Our findings revealed a slightly increased male-to-female ratio in the older age group, although not as pronounced as reported in the literature, where diagnoses in men are predominant in the older age group (6, 7, 17, 18). In line with published evidence, in our analysis, transmission of HIV among older adults was mainly sexual, with heterosexual acquisition of the infection reported more frequently than that through sex between men (11, 17-19). More in-depth analysis from studies at national level suggests some evidence of risks related to commercial sex (18) and travel abroad (6) among heterosexual males. Injecting drug use was a less common mode of transmission among older adults in our data, as also observed in national studies (17, 18). Finally, our observation of a larger proportion of HIV cases categorised with unknown transmission mode in the older age group is a common finding in Europe and elsewhere (7, 18, 20). This might be the result of underlying factors such as low perception and misconceptions about transmission risks, stigmatisation and subsequent under-reporting of transmission through sex between men or poor risk assessment and sexual history collection by the healthcare providers.

While new HIV diagnoses among men have been increasing steadily over time and across age groups, our analysis revealed a divergent pattern for women. Similarly to what we observed in the EU/EEA, an increasing rate of new HIV diagnoses among older women has been

reported in non-EU Eastern European countries (9) as well as in the USA and Canada (15, 21). Currently, there is no evidence as to the reasons behind such an increase.

Presenting with a late diagnosis was significantly associated with older age in our analysis and in the literature at large (6, 10, 11, 13, 18, 20, 22), with few exceptions (19, 21). A trend analysis on a subset of EU/EEA countries was reported elsewhere (23) and indicated that the average CD4 count at diagnosis among older adults is increasing over time, even though remaining well below the 350 cells/ μ L threshold. CD4 cell count slope declines more rapidly in older adults, and this may partially explain the greater proportions of the older adult population diagnosed with a CD4 cell count of <350 cells/ μ L. Still, late presentation is particularly worrying among older adults as it further increases the already higher mortality rate, compared to younger individuals (6, 11, 19). Various studies across settings and population groups report on how uncommon HIV testing is among older adults (18, 24-26); newly diagnosed older adults were less likely to have been previously tested and were more likely to be diagnosed incidentally while hospitalised (13, 20).

Low self-perception of risk and misconceptions or limited knowledge about HIV and its transmission are frequently reported as the reason for older adults not being tested (12, 24, 25). The perception of older adults as not being at risk is often shared by healthcare providers and society at large, and influenced by age-related stigma (12). Yet, multiple studies revealed a different picture, challenging the stereotype of asexuality among older adults (26, 27) and by contrast uncovering common risk behaviours, such as low levels of condom use (26), including among older adults with multiple risk factors (28). Furthermore, sexual health services in the EU/EEA often target or are preferentially frequented by younger adults, with an associated increased likelihood of the offer of HIV testing in those accessing such services.

According to existing evidence, the most significant factor influencing testing patterns among older adults appears to be the active offer of an HIV test by service providers (24). Such an offer could be effectively prompted for example by the collection of sexual history or risk assessment (25) or, existence of specific guidelines (e.g. universal testing) (12), or active case finding initiatives (21). However, healthcare providers may be reluctant to take older patients' sexual history, assess their risk, advise on sexual health and offer HIV testing (12, 25).

Despite being large consumers of healthcare services, older adults may only be diagnosed after multiple visits to their physician (22, 27). Such missed opportunities for earlier diagnosis are concerning, not only for the social, individual and healthcare costs that they inevitably generate, but also in view of the accumulating evidence on effective provider-initiated testing approaches. The offer of HIV testing triggered by specific health conditions (i.e. indicator-condition guided testing) is a very effective and promising approach (29) that could successfully target older adults if more broadly implemented (30). Similarly, other promising approaches, which may warrant scaling up, are opt-out testing in primary health care or in emergency departments (21, 27).

The EU/EEA is a heterogeneous region when it comes to HIV epidemic history, patterns and drivers, but also in terms of healthcare infrastructure and health services organisation. Therefore, implementation of testing interventions may vary considerably, depending on structural factors, but also influenced by political, cultural and societal dynamics. Nevertheless, the EU/EEA offers an excellent platform for exchanging experiences and best

practices deriving from single-site or larger scale interventions that may help to foster a culture of HIV test “normalization” while promoting coverage and uptake among older adults.

Limitations

The present study has some limitations. Data on key variables included in the analysis, namely, migration and CD4 cells at diagnosis, were missing for some of the cases. For this reason, it was not possible to include data representing about one-quarter of new HIV diagnoses in the analyses on transmission mode or migration status. We tried to minimize this by performing sensitivity analyses with and without cases with missing data and found the results were unchanged. Reporting practices and data quality differ within and between countries, and in some settings there is significant lag between the diagnosis and the time of the report of the case to the national surveillance system. Due to this reporting delay, cases in more recent years, particularly 2015, are likely to be increased once these cases are reported in future years. For this reason, increases in trends presented are likely underestimated and decreases may be overestimated. We attempted a multilevel analysis for trend and dropped it due to small numbers in some strata, however we performed stratified analysis by gender and transmission mode. Despite these challenges, this analysis is based on a large sample of persons diagnosed with HIV across 31 countries and 12 years, which strengthens the reliability of the findings presented.

Conclusion

Our study provides a broad overview on the epidemiology of new HIV diagnoses among older adults in the EU/EEA. In particular, we showed how distinctive features characterise this population sub-group, such as being diagnosed late, predominantly originating from the country in which they are diagnosed, and reporting heterosexual transmission of HIV. Increasing trends in new HIV diagnoses among older adults point towards the compelling need to heighten awareness among health care providers and deliver more targeted prevention interventions for this age group and the adult population at large. This analysis underscores that the coverage and uptake of HIV testing needs to be scaled up significantly, and not only among older adults. Based on the current evidence, this could be effectively achieved in the EU/EEA through the wider implementation of promising approaches such as provider-initiated and indicator-condition guided testing programs.

Authors' contribution

LT developed the project idea and drafted the manuscript; LT, JG and AP developed the epidemiological research idea; JG and AP performed the epidemiological analysis; AP contributed to manuscript drafting. All authors have contributed to manuscript reviews and approved the final version.

The EU/EEA HIV Surveillance Network, in alphabetical order by country: Daniela Schmid (Austria); Andre Sasse, Dominique Van Beckhoven (Belgium); Tonka Varleva (Bulgaria); Tatjana Nemeth Blazic (Croatia); Linos Hadjihannas, Maria Koliou (Cyprus); Marek Maly (Czech Republic); Susan Cowan (Denmark); Kristi Rüütel (Estonia); Kirsi Liitsola, Mika Salminen (Finland); Françoise Cazein, Josiane Pillonel, Florence Lot (France); Barbara Gunsenheimer-Bartmeyer (Germany); Stavros Patrinos, Dimitra Paraskeva (Greece); Maria Dudas (Hungary); Haraldur Briem, Gudrun Sigmundsdottir (Iceland); Derval Igoe, Kate O'Donnell, Darina O'Flanagan (Ireland); Barbara Suligoj (Italy); Šarlote Konova (Latvia); Sabine Erne (Liechtenstein); Irma Čaplinskienė (Lithuania); Aurélie Fischer (Luxembourg); Jackie Maistre Melillo, Tanya Melillo (Malta); Eline Op de Coul (Netherlands); Hans Blystad (Norway); Magdalena Rosinska (Poland); Isabel Aldir, Helena Gomes Dias (Portugal); Mariana Mardarescu (Romania); Peter Truska (Slovakia); Irena Klavs (Slovenia); Asuncion Diaz (Spain); Maria Axelsson (Sweden); Valerie Delpech (United Kingdom)

Conflicts of interest statement

The authors declare no conflict of interest

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Ethics Committee Approval

Not applicable

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Figure 1. New HIV diagnoses among adults aged 50 years and over per 100 000 persons in the same age category, by country, EU/EEA, 2015

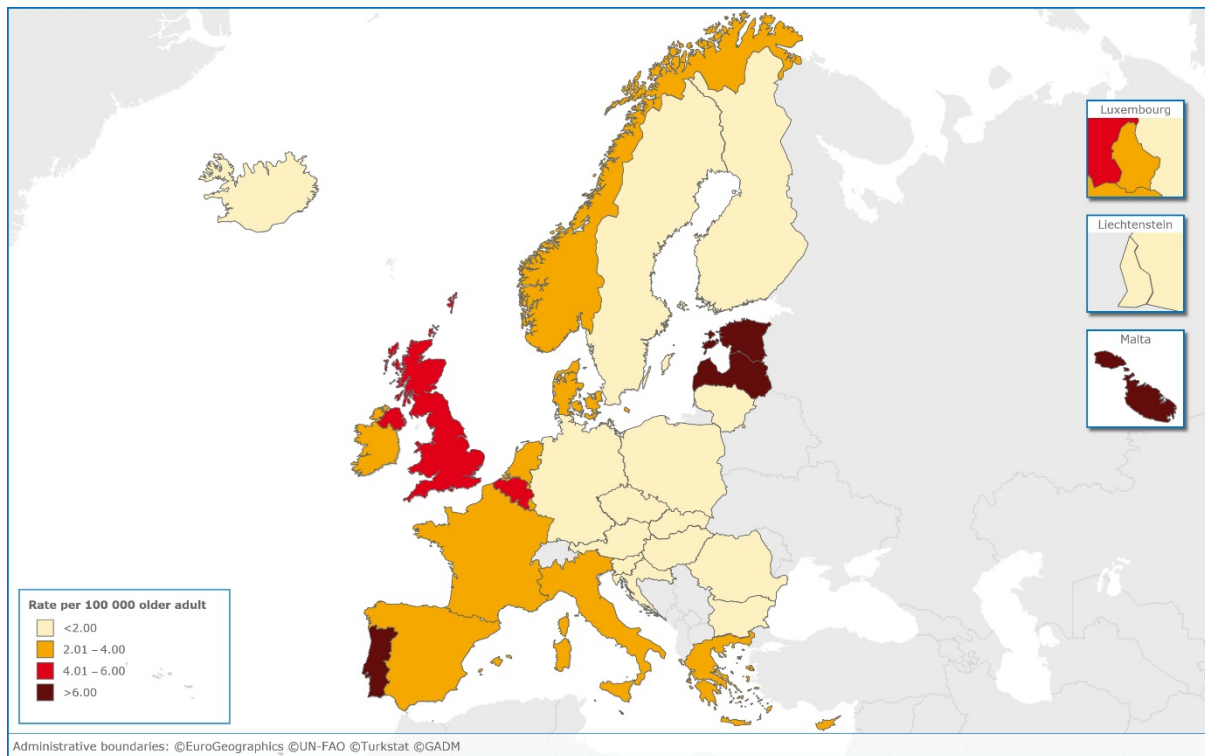
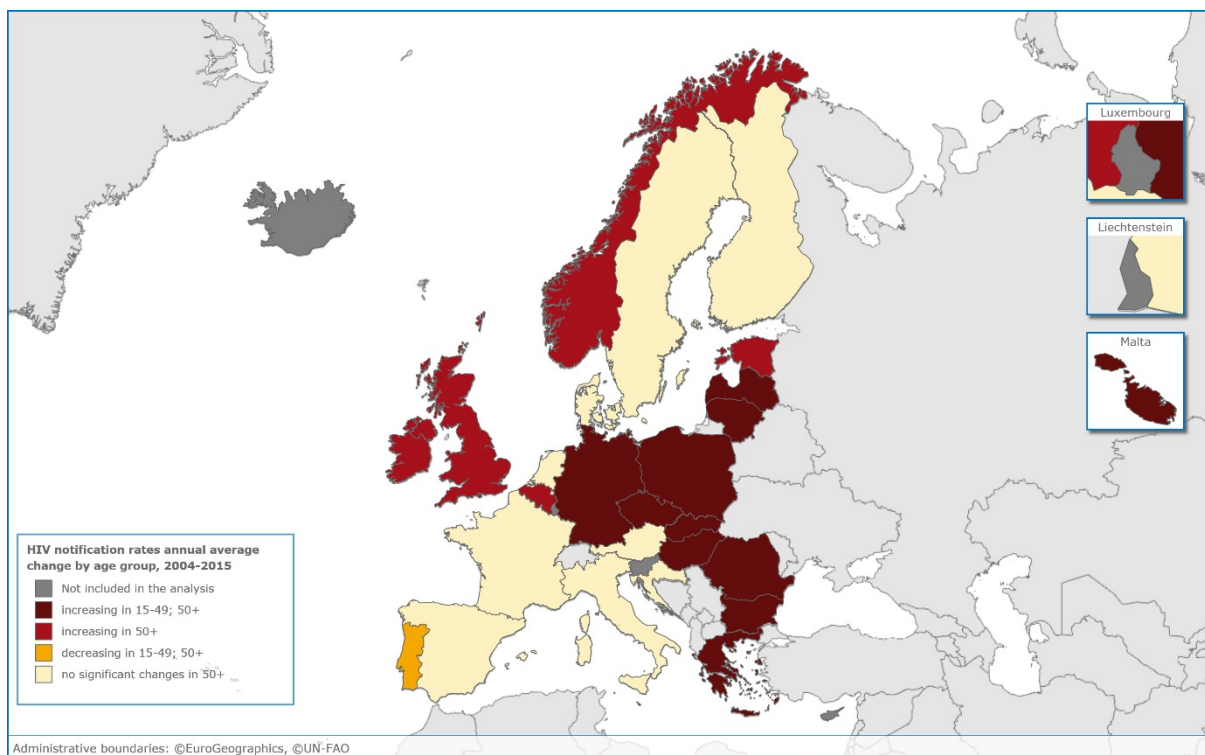


Figure 2. Average annual percentage change of trend in new HIV diagnoses in people aged 50 years and over by country, EU/EEA, 2004-2015*



*Cyprus, Iceland, Lichtenstein, Luxembourg, Slovenia were not included in the analysis due to zero case reporting in one or more year over the reporting period.

Figure 3. Trend in new HIV diagnoses in people aged 15-49 and 50 and over by gender, annual notification rate per 100 000 population, EU/EEA, 2004-2015

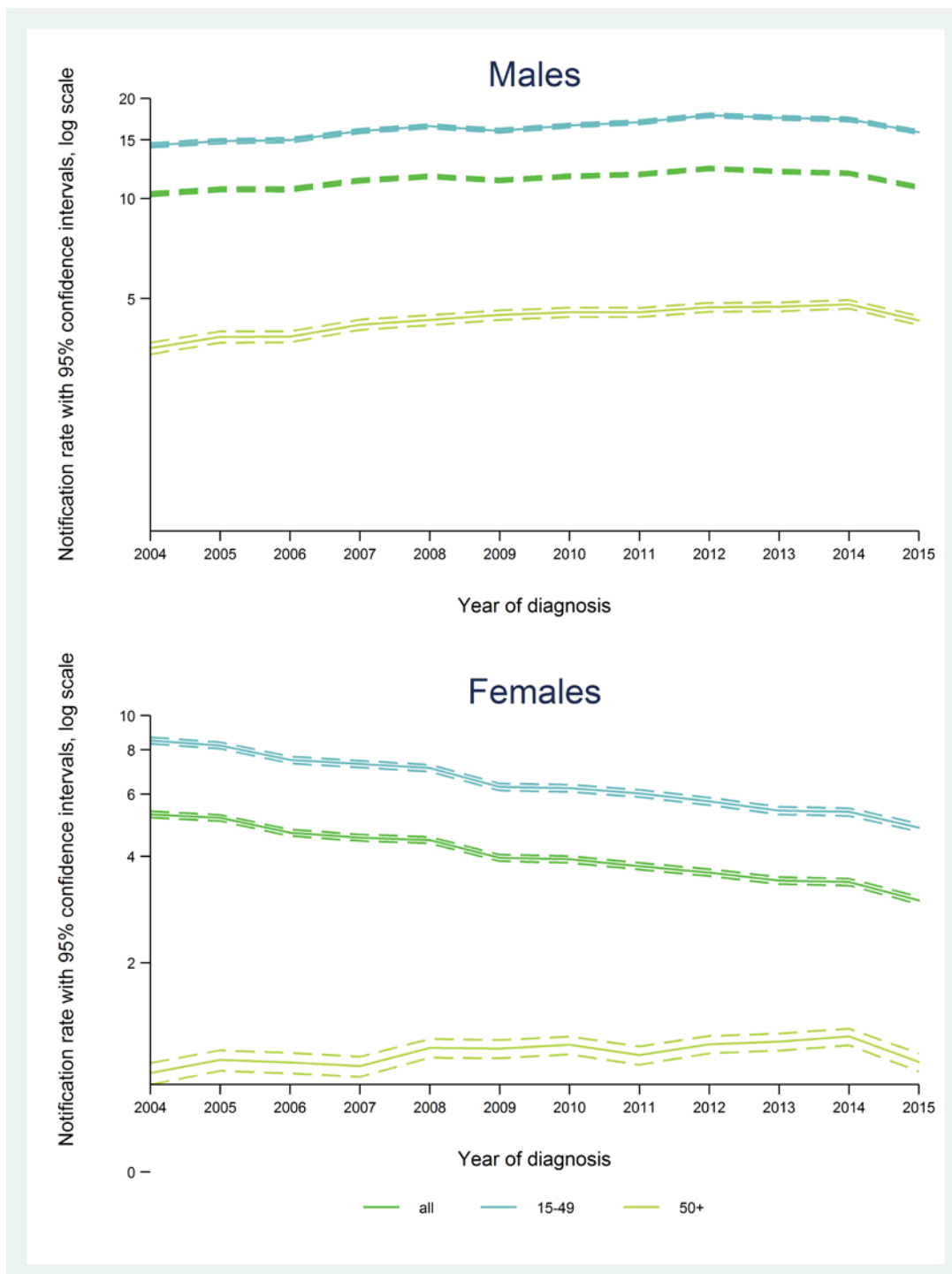


Figure 4. Trend in new HIV diagnoses among people aged 15-49 and 50 and over by transmission mode, EU/EEA, 2004-2015

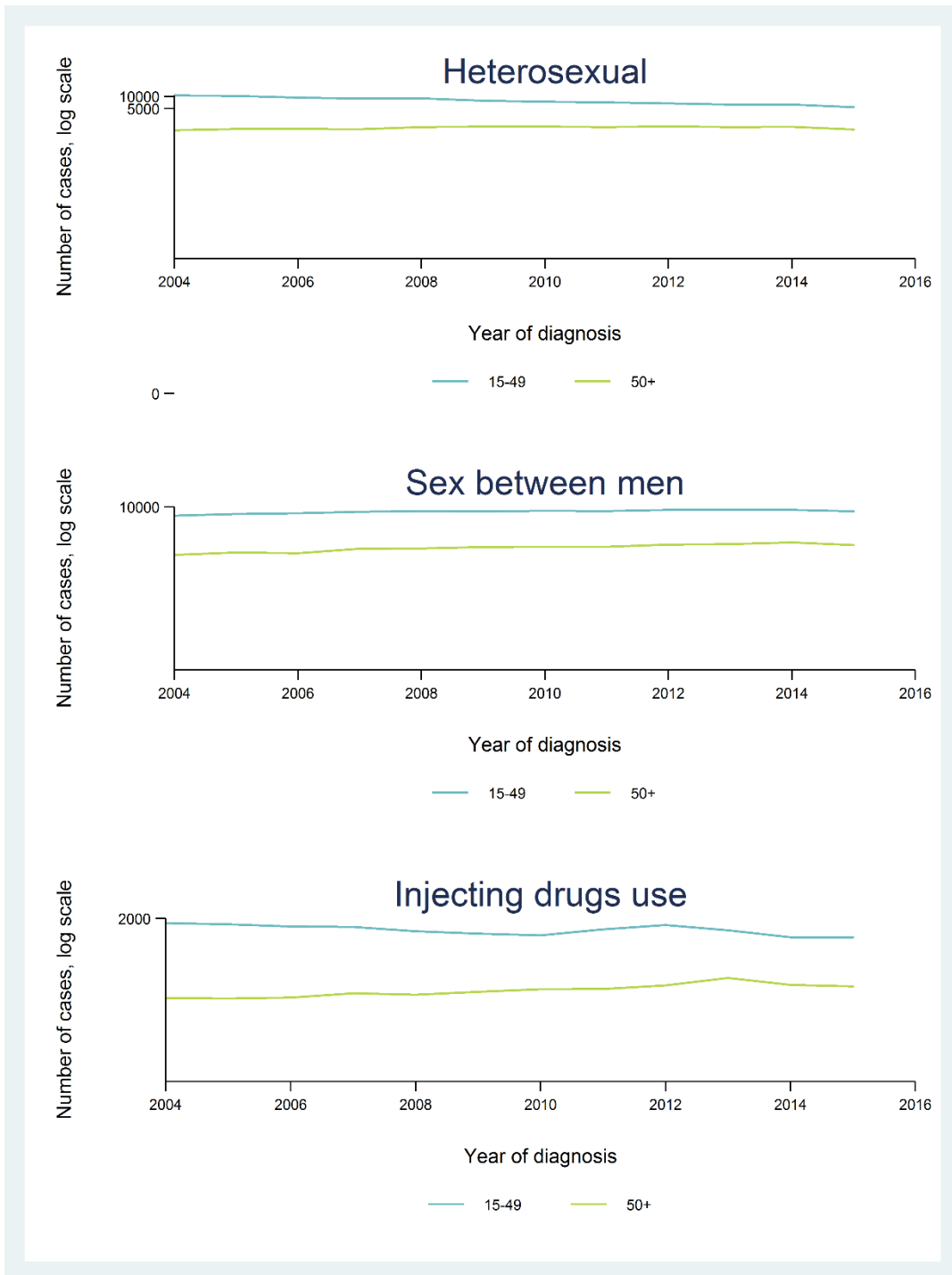


Table 1. Characteristics of new HIV diagnoses among persons 15-49 years and persons 50 years and older, EU/EEA countries, 2015 (n=29 419)

	15-49 years n (%)	50+ years n (%)	Difference between the groups (% 50+years – % 15-49 years)
Total	24 343	5 076	-
Gender			
Male	18 715 (76.9)	3 937 (77.6)	+0.7
Female	5 591 (23.0)	1 131 (22.3)	-0.7
Unknown	37 (0.15)	8 (0.16)	0
Transmission route*			
Heterosexual	7 495 (30.8)	2 153 (42.4)	+11.6
Sex between men	10 989 (45.1)	1 540 (30.3)	-14.8
Injecting drug use	1 108 (4.6)	132 (2.6)	-2.0
Unknown/other	4 751 (19.5)	1 251 (24.6)	+ 5.1
CD4 cell count*			
Median CD4 cell count (95% CI) cells/μL	394 (388-400)	240 (230-255)	-
CD4 <200 cells/μL	3 704 (15.2)	1 390 (27.4)	+12.2
CD4 200-350 cells/μL	2 790 (11.5)	606 (11.9)	+0.4
CD4 350-500 cells/μL	3 121 (12.8)	455 (9.0)	-3.8
CD4 ≥ 500 cells/μL	5 333 (21.9)	704 (13.9)	-8.0
Unknown	9 395 (38.6)	1 921 (37.8)	-0.8
Migration history*			
Native to reporting country	13 106 (53.8)	3 235 (63.7)	+9.9
EU-born	1 529 (6.3)	177 (3.5)	-2.8
non-EU-born	6 241 (25.6)	874 (17.2)	-8.4
Unknown country of birth/region of origin	3 467(14.2)	790 (15.6)	+1.4

*Significance level computed excluding the “unknown” category