Primary health care

an opportunity for early identification of people living with undiagnosed HIV infection

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Primary health care: An opportunity for early identification of people living with undiagnosed human immunodeficiency virus infection

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ABSTRACT:

Objectives:

We aimed to determine the fraction of HIV-diagnosed individuals who had primary health care (PHC) contacts 3 years prior to HIV diagnosis and whether the risk of HIV diagnosis and degree of immunodeficiency was associated with the frequency of visits or procedures performed.

Methods:

We used data from national registries to conduct a population-based nested case-control study. Cases were individuals diagnosed with HIV in Denmark from 1998-2016. Population controls were extracted from the general population matched 13:1 on gender-and age. We used conditional logistic regression. Due to statistically significant interaction analyses were further stratified by gender and Danish/non-Danish origin.

Results

We identified 2,784 cases and 36,192 controls. 93% of cases and 88% of controls attended PHC ≥once in the three years prior to diagnosis with a higher median number of visits to PHC (NVPC) for cases. We found a statistically significant association between an increasing NVPC and risk of subsequent HIV diagnosis in men and non-Danish women. A u-shaped association with an NVPC ≥0 was found among Danish women. No substantial association between NVPC and degree of immunodeficiency was found. Risk of HIV diagnosis and degree of immunodeficiency was weakly associated with type of procedures performed.

Conclusion:

For most HIV-infected individuals there seem to be many opportunities for earlier diagnosis in PHC. In men and non-Danish women, the risk of HIV diagnosis but not the degree of immunodeficiency is related to NVPC. The character of commonly performed medical procedures does not guide the primary physician in whom to test.

Introduction

Despite the enormous advances achieved in the management of infection with the human immunodeficiency virus (HIV), it is estimated that approximately 40% of people living with HIV (PLHIV) worldwide (1) and 15% in Europe (2,3) are unaware of their HIV status. An American study described that more than one third of the new HIV transmissions in the US occurred from individuals unaware of their HIV diagnosis (4). Recent data from the European Centre for Disease Prevention and Control (5) and other surveillance studies (6-9) describe that around half of the new diagnosed PLHIV are at late stages of the disease at time of the diagnosis (CD4 cell count <350 cells/μL). Thus, late HIV diagnosis remains a major concern globally with high costs both for the individual and for the public health. It is associated with increased morbidity and mortality for the individual (7,10,11), jeopardised CD4 cell recovery, poorer response to antiretroviral treatment (ART) (12,13), increased health care costs (14) and increased transmission of HIV in the community (15-19). Furthermore, knowledge of HIV status is associated with risk behaviour reduction with the potential of reducing onward transmission (19).

Targeted HIV testing is recommended in conditions where HIV is seen with an increased frequency, so-called indicator conditions (IC) (20-22), in certain groups with high risk of HIV infection (people who inject drugs (PWID), men who have sex with men (MSM) or populations coming from countries with high HIV prevalence), and in pregnant women. Despite these recommendations, several studies have shown that PLHIV have had frequent contacts with healthcare services in the years prior to their HIV diagnosis, often presenting as risk groups or with IC, representing missed opportunities for earlier HIV diagnosis (7,23-28). Therefore, efforts to identify potential barriers for HIV testing and to improve earlier HIV diagnosis are crucial (29-31). HIV risk factors pertaining to primary care are poorly described. Therefore we aimed to assess the fraction of individuals diagnosed with HIV, who had primary health care (PHC) contacts in the 3 years period prior to HIV diagnosis and investigated whether the risk of HIV diagnosis and degree of immunodeficiency was associated with the frequency of visits or character of procedures in PHC.

Methods

Setting

As of 31 December 2017 Denmark had a population of 5.7 million with an estimated HIV prevalence among the adult population of 0.1% (32). People are offered HIV testing under an opt-in policy. The Danish Health Authority recommends that people with high risk of HIV infection are routinely offered HIV testing when in contact with the health care system (33). The Danish health care system is universally tax-funded and all Danish residents have free and direct access to PHC.

Data sources

We used the unique 10-digit personal identification number assigned to all individuals in Denmark at birth or upon immigration to track individuals in the following national healthcare registries:

The Danish HIV Cohort Study (DHCS)

DHCS is an ongoing nationwide, prospective, population-based cohort study of all PLHIV treated at Danish hospitals since 1 January 1995, which has been described in detail elsewhere (34). DHCS is consecutively enrolling patients newly diagnosed with HIV and immigrants with HIV-infection. Data is updated yearly.

The Danish Civil Registration System (DCRS)

DCRS, established in 1968, is a national registry, which stores information on vital status, residency, and migration for all residents in Denmark (35).

The Danish National Health Service Register (DNHSR)

DNHSR is a national register collected from health contractors in PHC and contains data on all citizens, health providers, and health care services reimbursed by the health authorities. Data was complete from 1990 (36).

Design:

The study was designed as a case control study nested in DHCS.

Study population:

Cases:

From DHCS we identified all Danish PLHIV ≥18 years, diagnosed between 1 January 1998 and 31 December 2016 who had been registered as citizens in Denmark in the 3 years period prior to HIV diagnosis. All cases were stratified in PLHIV with 1) very late HIV diagnosis (VLHIV) (CD4 cell count <200 cells/μL or presentation with an AIDS-defining event within 6 months of the HIV diagnosis, regardless of the CD4 cell count), 2) late HIV diagnosis (LHIV) (CD4 cell count between 200-350 cells/μL), and 3) early HIV diagnosis (EHIV) (CD4 count ≥350 cells/μL or documented seroconversion within the last 12 months regardless of CD4 cell count). Study inclusion was date of HIV diagnosis.

Population controls:

For every individual diagnosed with HIV we identified 13 population controls from DCRS who were not diagnosed with HIV in the years before 31 December 2016. All controls had to be ≥18 years, alive and living in Denmark in the last 3 years prior to HIV diagnosis for the matched case. All controls were individually matched on gender and age of their study inclusion. Study inclusion was date of HIV diagnosis of the matched case.

Exposure:

In the three years prior to baseline we assessed the following factors: 1) PHC contact patterns assessed by the total number of visits to PHC (NVPC) within a year analysed as categorical variable based on different cut-offs [(a: 1-2, 3-6, 7-12, >12 (13-24, >24) vs 0) and (b: ≥1, ≥2, ≥3, ≥4, ≥5, vs < cut-off)], and 2) specific medical procedures (binary analysed). These procedures were chosen based on a prevalence of ≥1% and/or clinical knowledge (~those perceived to have a potential association with HIV) : blood tests, rapid throat antigen Group A *Streptococcus* tests, urinalysis for urinary tract infections, anoscopy, lung function tests, sending of biologic samples to reference laboratories other than blood (including microbiological test

and test for urine microalbuminuria), biopsy, conversation therapy, self-measured blood pressure monitoring, involuntary psychiatric hospitalizations and counselling for pregnancy prevention, abortion or sterilisation.

Statistics:

At study inclusion we assessed the following baseline characters: age, gender, mode of infection (MSM, heterosexual transmission, PWID or other/unknown), country of origin (Danish born vs. non-Danish), calendar year of diagnosis, co-infection with hepatitis B and C, AIDS diagnosis, first CD4 cell count and first HIV plasma viral load (within 180 days of baseline).

To identify exposures (~risk factors) associated with an HIV diagnosis and with severe immunosuppression we used logistic regression analysis to compare exposure to A) different NVPC cut-offs (as described above), and B) different medical procedures (performed vs not performed) in the last 3 years before diagnosis. These exposures were estimated for 1) PLHIV with matched controls and 2) HIV subgroups (EHIV, LHIV and VLHIV) with matched controls. We used conditional logistic regression in order to compute the unadjusted odds ratio (OR). Due to a clinical and statistically significant interaction as tested by likelihood ratio test ($p< 0.0001$), we further stratified the analyses for gender and Danish/non-Danish origin. In a sensitivity analysis, further stratification was performed according to age-intervals (18-29, 30-39, 40-49, 50-59, ≥60 years).

Based on the rare disease assumption, these ORs were used as estimates of the relative risk of acquiring HIV and presenting with advanced immunosuppression (LHIV or VLHIV infection).

Finally, based on the assumption that we would test all exposed individuals (~ certain cut-offs for NVPC or type of procedures performed) we used the fraction of exposed controls and cases in the study to estimate the percentage of people being HIV tested, the percentage being diagnosed and the effectiveness factor. The effectiveness factor was calculated by dividing the fraction of cases that would be diagnosed by the fraction of controls that would be tested and provided an estimation of how effective the different interventions would be compared to testing

at random if the population had the same demographical pattern as that of our sample. Only a factor >1 was considered effective.

STATA software (version 14) was used for data analysis.

The study was approved by the Danish Data Protection Agency (journal no 2008-41-1781).

Results

From DHCS and DCRS we identified 2784 cases and 36192 controls that fulfilled the inclusion criteria. Eighty percent were males and the median age at diagnosis was 39 years (IQR: 32-48). Eighty-six percent of the controls were of Danish origin compared to 81% of male cases and 49% of female cases. The main mode of transmission was heterosexual for women (80%) and MSM for men (61%). Non-Danish origin, older age and heterosexual mode of transmission were more common among VLHIV and LHIV. Furthermore, late and very late presentation remained common in recent calendar time. Additional baseline characteristics are provided in table 1.

During the entire three-year period prior to the HIV diagnosis, 92.6% of cases (Danish males: 96.1%, non-Danish males: 86.9%, Danish females: 97%, non-Danish females: 74.3%) and 87.8% of controls (Danish males: 92.2%, non-Danish males: 53.7%, Danish females: 98.5%, non-Danish females: 53%) had at least one contact to PHC (table 2). The median NVPC was higher for cases than controls [(Danish origin– male cases: 14; controls: 8)(Non-Danish origin male- cases: 10; controls: 2)(Danish origin- female cases: 22; controls: 17)(Non-Danish origin female Cases: 13; controls: 3)]. The median NVPC per year are shown in table 2 and figure 1a-b.

We observed an association between a NVPC ≥1 compared to an NVPC of 0 and a subsequent HIV diagnosis. The association increased with an increasing NVPC and with shorter time to HIV diagnosis. When stratifying results according to immune status at HIV diagnosis (VLHIV, LHIV and EHIV), we found no substantial differences in OR between HIV-subgroups when compared to controls (table 2).

Due to a clinical and statistically significant interaction with gender and country of origin, we further stratified the results according to gender and Danish/non-Danish origin. We found similar results for men and non-Danish women to that described above; however, we found an u-shaped association with NVPC for Danish women in

which an NVPC of both 0 and >12 was associated with an increased OR of subsequent HIV as compared to an NVPC of 1-2 (Figure 1b).

Interestingly, a high percentage of non-Danish individuals, did not attended PHC in the 3–year period (female cases: 25.7%; male cases: 13%; female controls: 47.0 %; male controls: 46.3%), whereas this only accounted for few individuals of Danish origin (female cases: 3.0%; male cases: 3.9%; female controls: 1.5%; male controls: 7.8 %).

Finally, in a sensitivity analysis, results were stratified according to age groups (results not shown). Although the association between NVPC and subsequent HIV diagnosis in men and non-Danish women was observed for all age groups, the association was more pronounced in non-Danish men <30 years (OR 6.16 (95% CI: 3.23-11.75) - results from year 3). Among Danish women no difference in results was observed when stratified according to age. However, especially for women, data was limited by small numbers.

Further stratification of the results according to immune status at HIV diagnosis by gender and country of origin did not alter the results substantially (data not shown).

In figure 2 we present the risk of subsequent HIV diagnosis related to NVPC above different cut-offs as these numbers may be easier to relate to in daily clinical practice. Furthermore, we estimated the percentage of the population that would be HIV tested, the percentage that would be diagnosed and the effectiveness factor of such interventions based on our results (figure 2). For both men and women, we found a straight linear association between the number that was tested and the number that was diagnosed. As an example, by testing all Danish adult men attending PHC at least once during a year (~ 72.4% of the Danish male adults in our study population - based on calculations from year 3 before inclusion), we would identify 79% of the undiagnosed Danish male HIV population with an effectiveness factor of such intervention of 1.09. In contrast, the effectiveness factor was higher for the non-Danish population (non-Danish men: 1.58 and women: 1.38). As a result

of the more frequent Danish female attendance to PHC and the overall lower prevalence of HIV among women of Danish origin, such interventions would have lower effect on identifying these women, needing to test 91% of the female adults to identify 84% of the undiagnosed women, further illustrated by the estimated effectiveness factor below 1 (figure 2).

When analysing differences in procedures performed in PHC between PLHIV and controls, we observed that most of the assessed procedures performed in the last year before HIV diagnosis were strongly associated with subsequent HIV. However, in the 2nd and 3rd year, these associations were much less pronounced and only the following procedures remained statistically significant: anoscopy (OR 2.87 (95% CI: 1.67-4.95)), sending biological samples (95% CI: 2.41 (2.13-2.72)), counselling for abortion and/or sterilisation in women (95% CI: 2.13 (1.22-3.70)), and to a lesser extent urinalysis for urinary tract infection, rapid strep A test, blood tests, blood tests for infection/inflammation (table 3). In a sensitivity analysis, in which the performance of these interventions were estimated according to gender and age interval, the association with anoscopy was only statistically significant in men below 50 years (95% CI: OR 4.15 (2.22-7.77- results from year 3)(results not shown).

Discussion

This study shows that PLHIV had frequent contacts to PHC in the 3 years preceding HIV diagnosis, with a median NVPC of 14 and 10 for men of Danish–and non-Danish origin and 22 and 13 for women of Danish-and non-Danish origin, respectively. We found a statistically significant association between a NVPC ≥1 and risk of subsequent HIV diagnosis in men and non-Danish women, incrementing with increasing NVPC with the strongest association in the most recent year before an HIV diagnosis. In contrast, an u-shaped association with an NVPC ≥0 and later HIV diagnosis was found among women of Danish origin. No substantial association between NVPC and degree of immunodeficiency was found. Based on our estimations from the 3rd year before inclusion, approximately 80% of the

undiagnosed Danish-born HIV population and 70% of the non-Danish-born HIV population in Denmark could be identified by testing all adult individuals attending PHC at least once during a year. Lastly, although some procedures were associated with an increased risk of a later HIV diagnosis, such interventions would not capture a large fraction of the undiagnosed HIV population due to the low procedure prevalence.

The strengths of our study include the nesting of the case-control study in a well-established nationwide population-based HIV cohort, the ability to use a well-matched control cohort and the possibility to look 3 years back in time from the established HIV diagnosis. We had full access to Danish registries of a high quality in order to identify PHC contact patterns.

Our study has some limitations. First, no validation studies of DNHSR have been performed. However, as most health care services in PHC are reimbursed by the health care authorities and thus requires registration, the completeness and degree of accuracy of this registry is considered high (36). The registry mainly contains administrative data, no diagnostic codes and in general only minimal information about clinical data and presumptive diagnosis. Therefore, we had to rely on NVPC and performed health care services in the 3 years preceding HIV diagnosis in order to describe contact patterns. Importantly, we used the same data source to ascertain this information for both cases and controls and assume that the accuracy of the data did not vary by neither HIV nor exposure status, which minimizes differential misclassification. Furthermore, HIV-infected individuals and controls may differ according to country of origin, socioeconomic status, educational level, sexual orientation, drug abuse and overall healthcare-seeking behaviour. Despite matching for age and gender and further stratification of data, residual or unmeasured confounding cannot be excluded. Finally, the effectiveness factor was used as an estimate of how effective the different interventions would be compared to testing at random with the assumption that the general population had the same demographical pattern as that of our study sample, which is the best approximation that our data allow us.

Despite major efforts to implement HIV testing for earlier diagnosis, we observed that in Denmark approximately half of the subjects with newly diagnosed HIV infection are still diagnosed in late or very late stages of HIV disease. We found that non-Danish origin was associated with not only a higher risk of HIV diagnosis but also 57% higher odds of being diagnosed with VLHIV compared to EHIV (data not shown). The latter may seem surprising since targeted HIV testing is recommended among people coming from countries with high HIV prevalence, and because it previously has been shown that most people of non-Danish origin living with HIV in Denmark originate from such countries (37). We also found that LHIV and VLHIV presenters were more likely to be older and heterosexuals which seems to indicate that these individuals are not perceived at risk of HIV infection neither by themselves nor by their PHC physicians, and thereby not being adequately reached with the traditional targeted HIV screening programs.

We found a high correlation between the NVPC and risk of a later HIV diagnosis in men and in non-Danish women when comparing cases with age- and gender-matched controls. These associations were independent of age; although, a stronger association for non-Danish men <30 years was observed (data not shown). Sixty-one percent of male cases were MSM and although no information on sexual orientation was available in the control group we expect it to be somewhat lower. However, restricting the analysis to heterosexual men did not alter our results significantly (data not shown).

Among Danish women we found a higher risk for later HIV diagnosis among those with no contacts to PHC and in those with high NVPC (>12). We have no clear explanation for this u-shaped association, but believe that this subgroup of individuals lack awareness of risk behaviour and generally have less health seeking behaviour than their age- and gender matched controls. Although, cases and controls of non-Danish origin may differ substantially, it seems interesting that a high percentage of these individuals did not attended PHC in the 3–year period. This pattern may reflect differences in healthcare-seeking behaviour in ethnic minorities,

lack of knowledge of the healthcare system and/or language barriers, and highlights the need for alternative health interventions to reach these patients.

In the last year before HIV diagnosis we observed an increase in NVPC and procedures performed for all cases, which could reflect a deterioration of health status. This prompted a reaction in the PHC physician that led to HIV testing. However, given that half of the patients were diagnosed at advanced stages of the disease, earlier HIV testing and diagnosis should be the target.

Since 2006, CDC has recommended voluntary routine HIV screening at least once for all patients aged 13-64 presenting to any healthcare facilities where the community HIV prevalence is >0.1% without regard to risk factors (38). A lower threshold of HIV prevalence of 0.05% was found to be cost-effective in a modelling study in the US (39). Furthermore, UK national guidelines recommend routine HIV screening when the local HIV prevalence >0.2% (40,41).

As of today, targeted HIV testing is recommended in most European countries (42,43) and should be offered in high risk groups, in patients with AIDS defining diseases, in pregnant women and in case of IC where HIV is seen with a prevalence of ≥ 0.1%(20-22,44). Still, several European studies have revealed a lack of recognition among health care providers of the risk factors included in the targeted HIV guidelines, representing an important barrier for earlier diagnosis (20,23-27,45).

Our observations of the cumulated PHC data shows that approximately 96% of the Danish HIV-infected population, and 87% and 74% of non-Danish HIV-infected men and women attended PHC in the three-year period before their HIV diagnosis, respectively. This makes PHC an excellent platform for earlier identification of undiagnosed HIV-infected individuals. Based on our results, it could be effective to offer universal testing to all non-Danish men and non-Danish women attending PHC ≥1time in a year (Men: OR 2.41 (1.80-3.21) and Women: OR 2.19 (1.55-3.09)) and to Danish men attending PHC ≥5 times in a year (OR 1.80 (1.62-1.99). In contrast, Danish women at risk of HIV seem more difficult to reach, as only those that do not attend primary health care (15.7%) or those attending >12 times a year (23.2%)

had a higher risk of HIV infection compared to their matched controls. Although, Danish women are clearly the smallest risk group, this means that around 10 % will be difficult to reach in PHC.

Finally, we observed an association between frequent procedures performed in PHC and the subsequent risk of HIV diagnosis, especially in the last year. It is not clear if this association represents a real risk indicator for HIV infection, or perhaps reflects the physician's tendency to perform different procedures when patients attend the clinic frequently thereby representing confounding by indication. Certain procedures were highly associated with being subsequently diagnosed with HIV such as counselling for abortion and/or sterilisation in women, performance of anoscopy, in men aged <50 years and repeated sending of biologic material other than blood. Although we do not have clinical information concerning the latter two procedures, we presume the act as proxies for indicator conditions such as STI and anal cancer/dysplasia. Furthermore, counselling for abortion and/or sterilisation in women could act as an indicator concerning risk behaviour. Testing individuals undergoing these procedures seems effective and should be recommended as the OR of subsequent diagnosis of HIV are high; however, such interventions would not capture a large fraction of the undiagnosed HIV population due to the low procedure prevalence among subjects with occult HIV infection.

The most important finding in our study was that people attended PHC frequently in the years before an HIV diagnosis. Only 4% and 13% of Danish-born and non-Danish born men and 3% and 26% of Danish-born and non-Danish born women, respectively, had no contact to PHC in the three-year period preceding an HIV diagnosis. As such, PHC ought to have many opportunities for HIV testing, and should play a major role in early identification of people living with undiagnosed HIV infection. However, despite the many opportunities, the character of commonly performed medical procedures did not seem to guide the primary physician in whom to test. And, even though an NVPC ≥ 1 was associated with subsequent HIV diagnosis in men and non-Danish women and universal testing in PHC would

capture a large proportion of the undiagnosed HIV patients, further studies are needed to investigate if this intervention would be cost effective.

Transparency statement

We hereby declare that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as originally planned have been explained.

Conflict of interest and Source of Funding

All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: no support from any organization for the submitted work; no financial relationships with any organizations that might

have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work. This work was supported by Public Regional Funds. The study was investigator-driven and thus independent of any pharmaceutical company. The funding sources were not involved in study design, data collection, analyses, report writing or decision to submit the paper.

Ethical approval and individual consent

Ethics approval and individual consent are not required by Danish legislation governing this type of research on HIV-infected individuals.

Data sharing statement

Data can only be accessed from Statistics Denmark by authorized research persons. Our research group have access to the data during a two-years period with the possibility of prolonging it by applying again to Statistics Denmark

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Table 1. Baseline characteristics of the study population

	HIV N=2784	Controls N=36192	HIV patients with NVPC ≥ 1 N=2578	HIV subgroups		
				VLHIV N=954	LHIV N=481	EHIV N=1349
Male sex (%)	2237 (80.4)	29081 (80.4)	2111 (81.9)	744 (78.0)	372 (77.3)	1121 (83.1)
Age at HIV diagnosis, median years (IQR)	39 (32-48)	39 (32-48)	40 (33-48)	43 (36-52)	39 (32-47)	36 (30-44)
Age at study inclusion:						
18-39 y, n (%)	1478 (53.1)	19231 (53.1)	1337 (51.9)	370 (38.8)	255 (53.0)	853 (63.2)
40-49 y, n (%)	727 (26.1)	9431 (26.1)	685 (26.6)	299 (31.3)	128 (26.6)	300 (22.2)
50-59 y, n (%)	381 (13.7)	4962 (13.7)	366 (14.2)	183 (19.2)	63 (13.1)	135 (10.0)
> 60 y, n (%)	198 (7.1)	2568 (7.1)	190 (7.4)	102 (10.7)	35 (7.3)	61 (4.5)
Danish origin						
Yes	2075 (74.5)	31064 (85.8)	1997 (77.5)	671 (70.3)	340 (70.7)	1064 (78.9)
No	709 (25.5)	5128 (14.2)	581 (22.5)	283 (29.7)	141 (29.3)	285 (21.1)
Infection mode:						
MSM, n (%)	1365 (49.0)	-	1305 (50.6)	366 (38.4)	230 (47.8)	769 (57.0)
Heterosexually infected, n (%)	1029 (37.0)	-	924 (35.8)	442 (46.3)	178 (37.0)	409 (30.3)
PWID, n (%)	191 (6.9)	-	166 (6.4)	41 (4.3)	31 (6.4)	119 (8.8)
Other/Unknown	199 (7.2)	-	183 (7.1)	105 (11.0)	42 (8.7)	52 (3.9)
HCV, n (%)	267 (9.6)	-	234 (9.1)	77 (8.1)	38 (7.9)	152 (11.3)
Hepatitis B core antibody positive, n (%)	397 (14.3)	-	352 (13.7)	163 (17.1)	79 (16.4)	155 (11.5)

$CD4^+$ cell count at study median cells/μL (IQR)	330 (130-540)	-	331 (130-540)	73 (30-140)	276 (236-310)	541 (430-690)
VL at study inclusion, median log_{10} copies/mL (IQR)	4.8 (4.1-5.4)	-	4.8 (4.2-5.4)	5.2 (4.8-5.9)	4.7 (4.2-5.2)	4.5 (3.7-5.0)
Calendar year of diagnosis						
1998-2003	825 (29.6)		756 (29.3)	349 (42.3)	135 (16.4)	341 (41.3)
2004-2009	1168 (42.0)		1093 (42.4)	362 (31.0)	212 (18.2)	594 (52.3)
2010-2016	791 (28.4)		729 (28.3)	243 (30.7)	134 (16.9)	414 (50.6)

Abbreviations: PC: primary care; VLHIV: Very late HIV diagnosis; LHIV: Late HIV diagnosis; EHIV: Earlier HIV diagnosis; MSM: males who have sex with males; PWID: people who inject drugs; HCV: hepatitis C infection; VL: viral load;

Low educational attainment covering mandatory education of up to 9 years; Medium educational attainment covering mandatory and vocational education of 9–12 years; High educational attainment covering formal education of more than 12 years.

Table 2. Association between the total number of annual contacts to primary care in the three years before HIV diagnosis and being diagnosed with HIV (HIV vs matched controls; HIV-subgroups vs controls).

	HIV versus age and gender matched controls					
	Total annual number of contacts to primary care in the 3 years before HIV diagnosis					
Contacts to PHC[1]	**HIV N=2784**	**Control N=36192**	**HIV vs controls OR[2] (95%CI)**	**VLHIV[3] vs controls OR[2] (95%CI)**	**LHIV[4] vs controls OR[2] (95%CI)**	**EHIV[5] vs controls OR[2] (95%CI)**
Cumulative number of contacts in the 3 years before HIV diagnosis, n (%)						
Median visits (IQR)	14 (6-25)	8 (3-16)		15 (6-27)	14 (6-24)	13 (6-24)
Total number of contacts to PHC						
0	206 (7.4)	4418 (12.2)	Ref (1)	Ref (1)	Ref (1)	Ref (1)
1-2	135 (4.9)	4044 (11.2)	0.71 (0.57-0.89)	0.51 (0.35-0.75)	0.59 (0.35-0.99)	0.96 (0.70-1.34)
3-6	373 (13.4)	7645 (21.1)	1.06 (0.89-1.26)	0.75 (0.56-1.01)	0.77 (0.51-1.14)	1.51 (1.16-1.96)
7-12	559 (20.1)	7734 (21.4)	1.62 (1.38-1.92)	1.09 (0.83-1.44)	1.08 (0.75-1.57)	2.47 (1.92-3.17)
13-24	782 (28.1)	7350 (20.3)	2.53 (2.16-2.97)	1.77 (1.36-2.31)	2.12 (1.50-3.01)	3.47 (2.71-4.45)
>24	729 (26.2)	5001 (13.8)	3.72 (3.16-4.40)	2.61 (1.99-3.42)	2.28 (1.57-3.30)	5.79 (4.48-7.47)
In the year before HIV diagnosis, n (%)						
Median visits (IQR)	6 (2-11)	2 (0-6)		7 (3-13)	6 (2-11)	5 (2-10)
Total number of contacts to PHC						
0	346 (12.4)	10136 (28.0)	Ref (1)	Ref (1)	Ref (1)	Ref (1)
1-2	411 (14.8)	8897 (24.6)	1.44 (1.24-1.67)	1.16 (0.89-1.53)	1.43 (1.01-2.02)	1.64 (1.34-2.01)
3-6	750 (26.9)	9405 (26.0)	2.65 (2.32-3.03)	2.35 (1.85-2.99)	2.46 (1.80-3.37)	2.92 (2.42-3.53)
7-12	701 (25.2)	4986 (13.8)	5.04 (4.38-5.79)	4.90 (3.85-6.25)	3.65 (2.61-5.10)	5.69 (4.67-6.93)

>12	576 (20.7)	2768 (7.7)	7.93 (6.83-9.20)	8.68 (6.74-11.17)	6.87 (4.85-9.73)	7.48 (6.00-9.32)
In the 2nd year before HIV diagnosis, n(%)						
Median visits (IQR)	3 (1-8)	2 (0-6)		3 (1-8)	4 (1-7)	4 (1-8)
Total number of contacts to PHC						
0	639 (23.0)	10366 (28.6)	Ref (1)	Ref (1)	Ref (1)	Ref (1)
1-2	552 (19.8)	8923 (24.7)	1.02 (0.91-1.15)	0.82 (0.67-1.01)	0.85 (0.63-1.13)	1.27 (1.07-1.50)
3-6	741 (26.6)	9355 (25.9)	1.35 (1.21-1.51)	1.23 (1.02-1.49)	1.11 (0.85-1.45)	1.54 (1.31-1.81)
7-12	512 (18.4)	4855 (13.4)	1.85 (1.63-2.09)	1.39 (1.12-1.72)	1.71 (1.27-2.30)	2.32 (1.93-2.78)
>12	340 (12.2)	2693 (7.4)	2.27 (1.97-2.63)	1.61 (1.26-2.06)	2.02 (1.43-2.85)	3.09 (2.50-3.82)
In the 3rd year before HIV diagnosis, n(%)						
Median visits (IQR)	3 (1-7)	2 (0-5)		3 (0-7)	3 (1-7)	3 (1-7)
Total number of contacts to PHC						
0	657 (23.6)	10317 (28.5)	Ref (1)	Ref (1)	Ref (1)	Ref (1)
1-2	603 (21.7)	9211 (25.5)	1.05 (0.93-1.17)	0.78 (0.64-0.95)	0.91 (0.69-1.20)	1.35 (1.14-1.59)
3-6	760 (27.3)	9329 (25.8)	1.33 (1.19-1.48)	1.04 (0.86-1.25)	1.25 (0.96-1.63)	1.62 (1.37-1.91)
7-12	469 (16.9)	4710 (13.0)	1.66 (1.46-1.89)	1.14 (0.92-1.41)	1.49 (1.10-2.02)	2.29 (1.90-2.76)
>12	295 (10.6)	(7.3)2625	1.92 (1.65-2.23)	1.13 (0.88-1.46)	1.41 (0.97-2.05)	3.18 (2.56-3.95)

[1] PHC primary care; [2] Odss ratio calculated by conditional logistic regression;; [3] VLHIV, Very late HIV diagnosis; [4] LHIV, Late HIV diagnosis; [5] EHIV, Earlier HIV diagnosis.

Table 3. Association between interventions performed in primary care in the 3 years before HIV diagnosis and being diagnosed with HIV (HIV vs age and gender matched controls).

Performance of specific interventions in PHC	Cases N=2784	Controls N=36192	OR (95% CI)	Percent of HIV patients being diagnosed	Percent of the controls being tested	Effectiveness factor

In the year before HIV diagnosis, n (%)						
Conversation therapy	127 (4.6)	639 (1.8)	2.69 (2.21-3.27)	4.6	1.8	2.58
Involuntary psychiatric$_1$ hospitalization$_1$	14 (0.5)	34 (0.1)	5.35 (2.87-9.97)	0.5	0.1	5.35
Anoscopy	23 (0.8)	82 (0.2)	3.67 (2.31-5.84)	0.8	0.23	3.65
Urinalysis for urinary tract infections$_2$	362 (13.0)	2527 (7.0)	2.01 (1.83-2.34)	13.0	7.0	1.86
Rapid strep A test	359 (12.9)	2218 (6.1)	2.31 (2.04-2.60)	12.9	6.1	2.10
Blood tests	1128 (40.5)	6069 (16.8)	3.68 (3.38-4.00)	40.5	16.8	2.42
Blood tests for inflammation/infectious$_3$	610 (21.9)	3369 (9.3)	2.85 (2.58-3.15)	21.9	9.3	2.35
Measurement of hemoglobin	335 (12.0)	2294 (6.3)	2.07 (1.82-2.34)	12.0	6.3	1.90
Measurement of blood sugar	305 (11.0)	2345 (6.5)	1.82 (1.60-2.07)	11.0	6.5	1.69
Sending of biologic samples excl. blood$_4$	626 (22.5)	2340 (6.5)	4.30 (3.88-4.76)	22.5	6.5	3.48
Biopsy	48 (1.7)	590 (1.6)	1.06 (0.79-1.43)	1.7	1.6	1.06
Lung function tests	140 (5.0)	877 (2.4)	2.14 (1.78-2.57)	5.0	2.4	2.08
Self-measured blood pressure monitoring	33 (1.2)	449 (1.2)	0.95 (0.67-1.37)	1.2	1.2	0.96
Gynaecological exam with cytology$_5$	62 (11.3)	1076 (15.1)	0.71 (0.54-0.94)	11.3	15.1	0.75
Pregnancy prevention counselling$_5$	69 (12.6)	1170 (16.5)	0.72 (0.55-0.94)	12.6	16.5	0.76
Counselling for abortion and/or sterilisation$_5$	12 (2.2)	79 (1.1)	2.02 (1.09-3.75)	2.2	1.1	2.00
In the 2nd year before HIV diagnosis, n (%)						
Conversation therapy	64 (2.3)	566 (1.6)	1.49 (1.14-1.93)	2.3	1.6	1.47
Involuntary psychiatric hospitalization$_1$	5 (0.2)	47 (0.1)	1.38 (0.55-3.48)	0.2	0.1	1.38
Anoscopy	12 (0.4)	76 (0.2)	2.07 (1.12-3.81)	0.4	0.2	2.05
Urinalysis for urinary tract infections$_2$	246 (8.8)	2496 (6.9)	1.32 (1.15-1.53)	8.8	6.9	1.28
Rapid strep A test	269 (9.7)	2253 (6.2)	1.63 (1.42-1.86)	9.7	6.2	1.55
Blood tests	590 (21.2)	5711 (15.8)	1.47 (1.33-1.62)	21.2	15.8	1.34
Blood tests for inflammation/infectious$_3$	308 (11.1)	3161 (8.7)	1.31 (1.16-1.49)	11.1	8.7	1.27
Measurement of hemoglobin	178 (6.4)	2279 (6.3)	1.02 (0.87-1.19)	6.4	6.3	1.02
Measurement of blood sugar	180 (6.5)	2271 (6.3)	1.03 (0.88-1.21)	6.5	6.3	1.03
Sending of biologic samples excl. blood$_4$	390 (14.0)	2352 (6.5)	2.45 (2.17-2.76)	14.0	6.5	2.16
Biopsy	44 (1.6)	579 (1.6)	0.99 (0.73-1.35)	1.6	1.6	0.99
Lung function tests	86 (3.1)	835 (2.3)	1.35 (1.08-1.69)	3.1	2.3	1.34
Self-measured blood pressure monitoring	24 (0.9)	362 (1.0)	0.86 (0.56-1.30)	0.86	1.0	0.86
Gynaecological exam with cytology$_5$	54 (9.9)	1101 (15.5)	0.59 (0.44-0.79)	9.9	15.5	0.64
Pregnancy prevention counselling$_5$	63 (11.5)	1279 (18.0)	0.58 (0.44-0.76)	11.5	18.0	0.64
Counselling for abortion and/or sterilisation$_5$	15 (2.7)	88 (1.2)	2.25 (1.29-3.93)	2.7	1.2	2.22
In the 3rd year before HIV diagnosis, n (%)						
Conversation therapy	57 (2.1)	561 (1.6)	1.33 (1.01-1.75)	2.0	1.6	1.32
Involuntary psychiatric hospitalization$_1$	4 (0.1)	43 (0.1)	1.21 (0.43-3.38)	0.14	0.12	1.21
Anoscopy	16 (0.6)	73 (0.2)	2.87 (1.67-4.95)	0.57	0.20	2.85

Urinalysis for urinary tract infections[2]	218 (7.8)	2467 (6.8)	1.17 (1.01-1.36)	7.8	6.8	1.15
Rapid strep A test	244 (8.8)	2279 (6.3)	1.44 (1.25-1.65)	8.8	6.3	1.39
Blood tests	501 (18.0)	5280 (14.6)	1.31 (1.18-1.45)	18.0	14.6	1.23
Blood tests for inflammation/infectious[3]	247 (8.9)	2891 (8.0)	1.13 (0.98-1.29)	8.9	8.0	1.11
Measurement of hemoglobin	138 (5.0)	2035 (5.6)	0.87 (0.73-1.04)	5.0	5.6	0.88
Measurement of blood sugar	152 (5.5)	2086 (5.8)	0.94 (0.79-1.12)	5.5	5.8	0.95
Sending of biologic samples excl. blood[4]	371 (13,3)	2258 (6.2)	2.41 (2.13-2.72)	13.3	6.2	2.14
Biopsy	44 (1.6)	541 (1.5)	1.06 (0.78-1.44)	1.6	1.5	1.06
Lung function tests	65 (2.3)	847 (2.3)	1.00 (0.77-1.29)	2.3	2.3	1.00
Self-measured blood pressure monitoring	20 (0.7)	289 (0.8)	0.90 (0.57-1.42)	0.72	0.80	0.90
Gynaecological exam with cytology[5]	58 (10.6)	1013 (14.3)	0.71 (0.54-0.94)	10.6	14.3	0.74
Pregnancy prevention counselling[5]	62 (11.3)	1317 (18.5)	0.54 (0.41-0.72)	11.3	18.5	0.61
Counselling for abortion and/or sterilisation[5]	15 (2.7)	93 (1.3)	2.13 (1.22-3.70)	2.7	1.3	2.08

Abbreviations: PHC: Primary care; OR: Unadjusted odds ratio calculated by conditional logistic regression; 95% CI: Confidence interval

[1] Based on performance of physician's certificate for involuntary hospitalization in psychiatric department;

[2] Performance of urine stix testing, urine microscopy, urine culture or/and resistance;

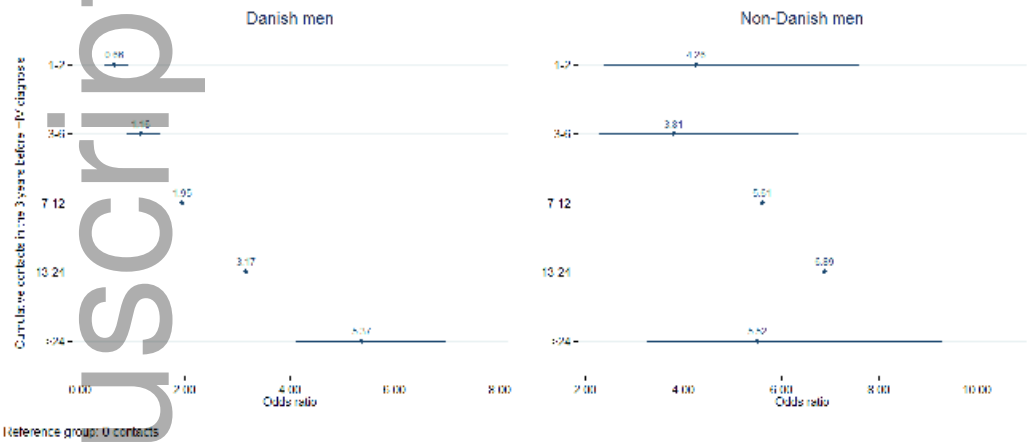
[3] Measuring CRP, sedimentation rate or/and leucocytes;

[4] Includes sending of urine microalbuminuria test and microbiology tests

[5] Women only

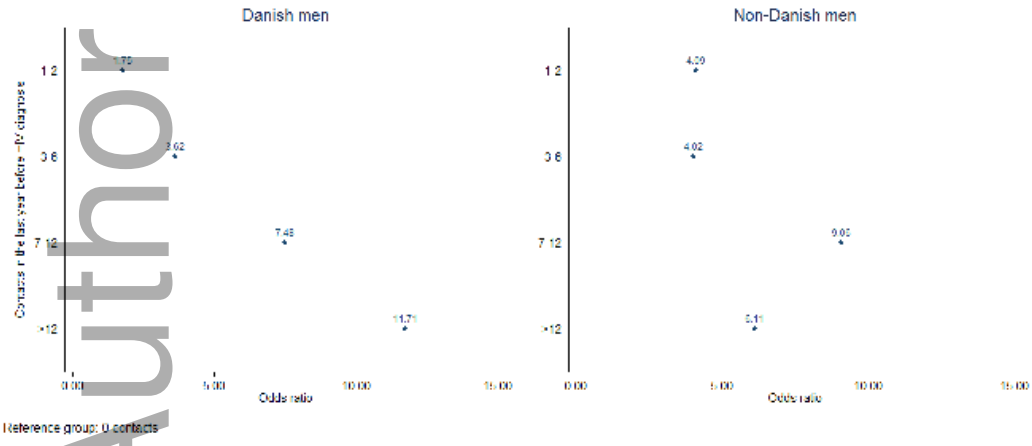
Figure 1a-b. Association between the total number of annual contacts to primary care in the three years before HIV diagnosis and being diagnosed with HIV in men and women stratified by Danish origin (HIV vs. matched controls).

Figure 1a: Men



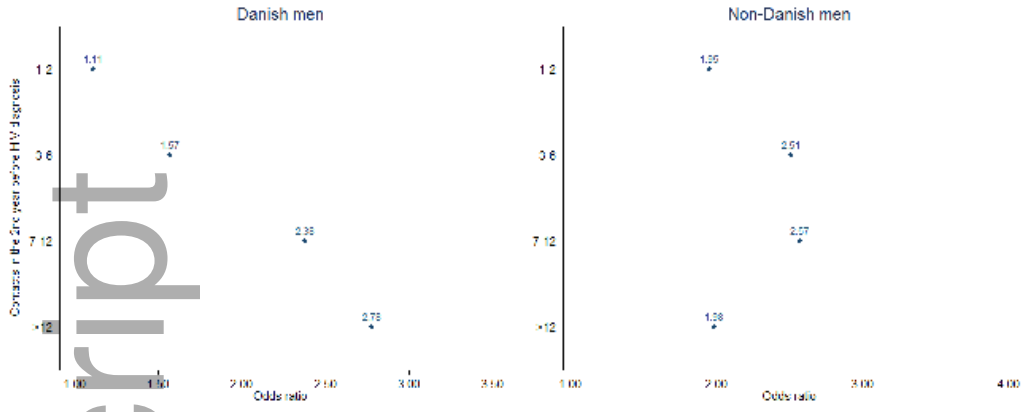
Danish men			
Cumulative contacts to PHC[1] in the 3 years before HIV diagnosis	**HIV N=1808**	**Control N=25050**	**HIV vs controls OR[2] (95%CI)**
Median visits (IQR)	14 (7-25)	7 (3-14)	
Total number of contacts to PHC			
0	70 (3.9)	1947 (7.8)	Ref (1)
1-2	85 (4.7)	3554 (14.2)	0.66 (0.48-0.92)
3-6	271 (15.0)	6412 (25.6)	1.16 (0.89-1.52)
7-12	402 (22.2)	5808 (23.2)	1.95 (1.50-2.53)
13-24	512 (28.3)	4656 (18.6)	3.17 (2.45-4.10)
>24	468 (25.9)	2673 (10.7)	5.37 (4.13-6.98)

Non-Danish men			
Cumulative contacts to PHC[1] in the 3 years before HIV diagnosis	**HIV N=429**	**Control N=4031**	**HIV vs controls OR[2] (95%CI)**
Median visits (IQR)	10 (4-19)	2 (0-10)	
Total number of contacts to PHC			
0	56 (13.1)	1865 (46.3)	Ref (1)
1-2	34 (7.9)	272 (6.8)	4.26 (2.39-7.61)
3-6	59 (13.8)	548 (13.6)	3.81 (2.28-6.36)
7-12	89 (20.8)	525 (13.0)	5.61 (3.46-9.11)
13-24	120 (28.0)	507 (12.6)	6.89 (4.37-10.85)
>24	71 (16.6)	314 (7.8)	5.52 (3.27-9.30)



Danish men			
Contacts to PHC[1] in the last year before HIV diagnosis	**HIV N=1808**	**Control N=25050**	**HIV vs controls OR[2] (95%CI)**
Median visits (IQR)	6 (3-11)	2 (0-5)	
Total number of contacts to PHC			
0	165 (9.1)	6750 (27.0)	Ref (1)
1-2	285 (15.8)	7070 (28.2)	1.75 (1.44-2.14)
3-6	521 (28.8)	6594 (26.3)	3.62 (3.01-4.36)
7-12	476 (26.3)	3057 (12.2)	7.48 (6.17-9.05)
>12	361 (20.0)	1579 (6.3)	11.71 (9.54-14.38)

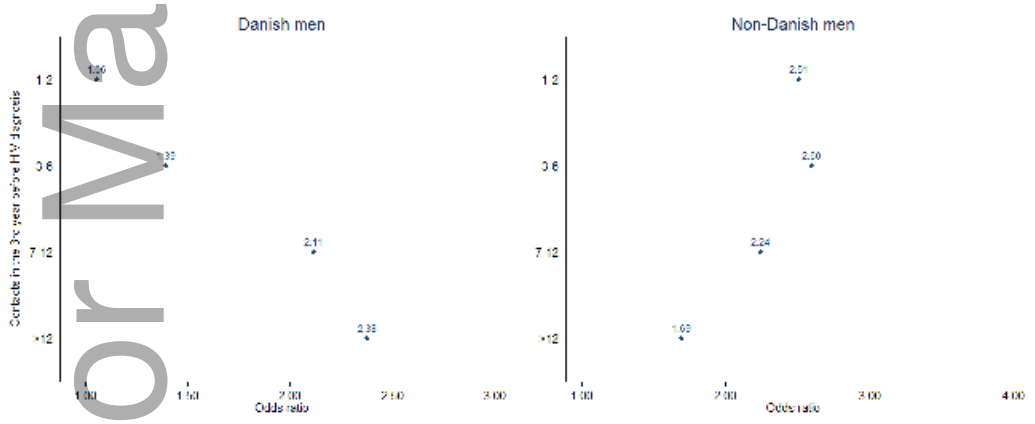
Non-Danish men			
Contacts to PHC[1] in the last year before HIV diagnosis	**HIV N=1808**	**Control N=25050**	**HIV vs controls OR[2] (95%CI)**
Median visits (IQR)	5 (1-9)	0 (0-3)	
Total number of contacts to PHC			
0	80 (18.7)	2264 (56.2)	Ref (1)
1-2	75 (17.5)	607 (15.1)	4.09 (2.62-6.38)
3-6	112 (26.1)	669 (16.6)	4.02 (2.68-6.05)
7-12	101 (23.5)	314 (7.8)	9.06 (5.62-14.61)
>12	61 (14.2)	177 (4.4)	6.11 (3.57-10.48)



Reference group: 0 contacts

Danish men			
Contacts to PHC$_1$ in the 2nd years before HIV diagnosis	**HIV N=1808**	**Control N=25050**	**HIV vs controls OR$_2$ (95%CI)**
Median visits (IQR)	3 (1-7)	2 (0-5)	
Total number of contacts to PHC			
0	359 (19.9)	6965 (27.8)	Ref (1)
1-2	403 (22.3)	7148 (28.5)	1.11 (0.96-1.29)
3-6	510 (28.2)	6541 (26.1)	1.57 (1.36-1.81)
7-12	336 (18.6)	2912 (11.6)	2.38 (2.02-2.79)
>12	200 (11.1)	1484 (5.9)	2.78 (2.30-3.36)

Non-Danish men			
Contacts to PHC$_1$ in the 2nd years before HIV diagnosis	**HIV N=1808**	**Control N=25050**	**HIV vs controls OR$_2$ (95%CI)**
Median visits (IQR)	2 (0-6)	0 (0-3)	
Total number of contacts to PHC			
0	139 (32.4)	2298 (57.0)	Ref (1)
1-2	86 (20.1)	602 (14.9)	1.95 (1.35-2.82)
3-6	103 (24.0)	625 (15.5)	2.51 (1.72-3.66)
7-12	67 (15.6)	339 (8.4)	2.57 (1.68-3.93)
>12	34 (7.9)	167 (4.1)	1.98 (1.13-3.47)

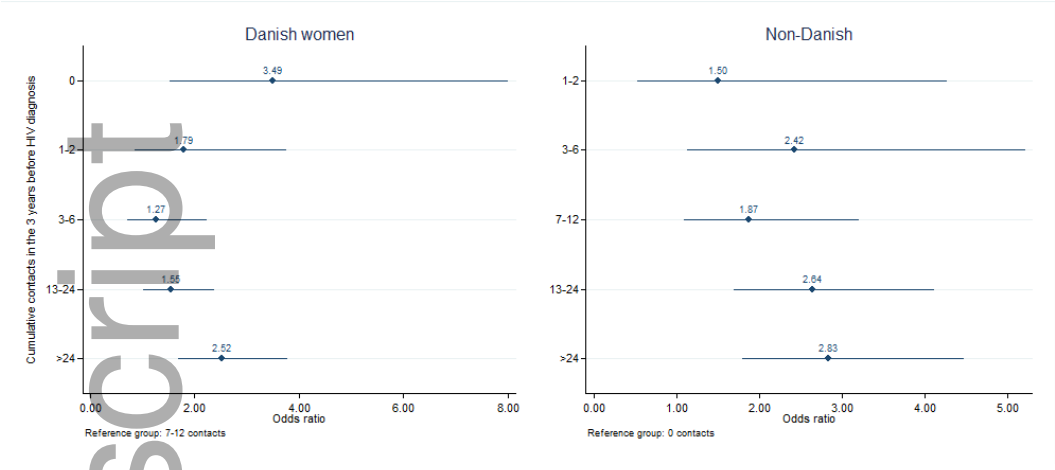


Reference group: 0 contacts

Danish men			
Contacts to PHC$_1$ in the 3rd years before HIV diagnosis	**HIV N=1808**	**Control N=25050**	**HIV vs controls OR$_2$ (95%CI)**
Median visits (IQR)	3 (1-7)	2 (0-5)	
Total number of contacts to PHC			
0	385 (21.3)	6908 (27.6)	Ref (1)
1-2	428 (23.7)	7364 (29.4)	1.06 (0.92-1.22)
3-6	500 (27.7)	6609 (26.4)	1.39 (1.21-1.60)
7-12	318 (17.6)	2766 (11.0)	2.11 (1.80-2.48)
>12	177 (9.8)	1403 (5.6)	2.38 (1.96-2.89)

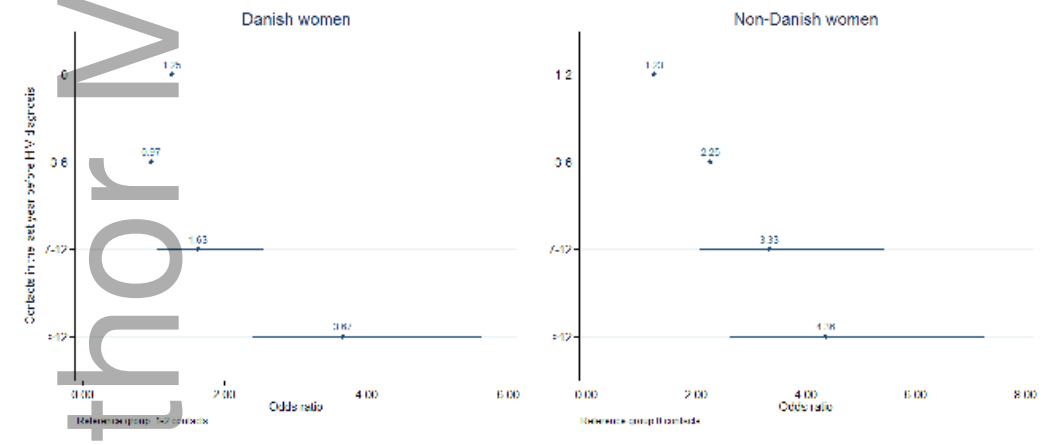
Non-Danish men			
Contacts to PHC$_1$ in the 3rd years before HIV diagnosis	**HIV N=1808**	**Control N=25050**	**HIV vs controls OR$_2$ (95%CI)**
Median visits (IQR)	2 (0-5)	0 (0-3)	
Total number of contacts to PHC			
0	134 (31.2)	2279 (56.5)	Ref (1)
1-2	103 (24.0)	661 (16.4)	2.51 (1.73-3.63)
3-6	115 (26.8)	610 (15.1)	2.60 (1.81-3.73)
7-12	48 (11.2)	314 (7.8)	2.24 (1.38-3.64)
>12	29 (6.8)	167 (4.1)	1.69 (0.94-3.04)

Figure 1b: Women



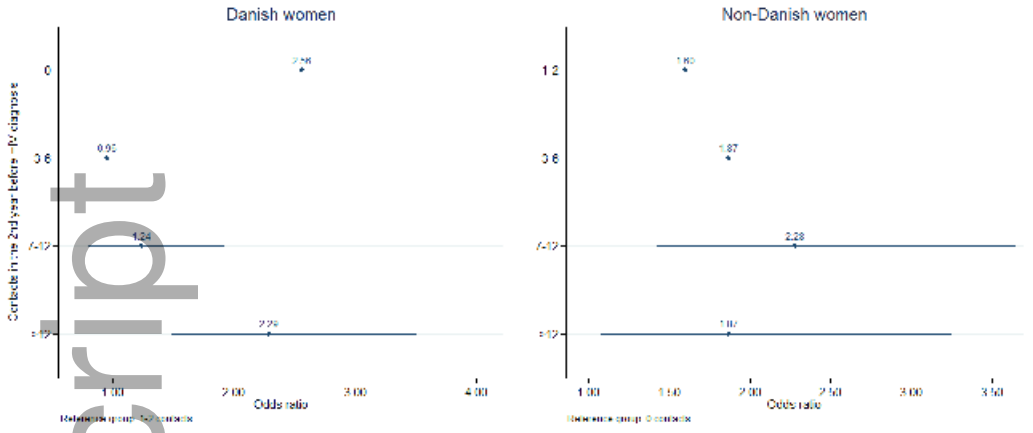
Non-Danish women			
Cumulative contacts to PHC$_1$ in the 3 years before HIV diagnosis	**HIV N=267**	**Control N=6014**	**HIV vs controls OR$_2$ (95%CI)**
Median visits (IQR)	22 (12-41)	17 (9-27)	
Total number of contacts to PHC			
0	8 (3.0)	90 (1.5)	3.49 (1.52-8.01)
1-2	10 (3.8)	196 (3.3)	1.79 (0.85-3.77)
3-6	21 (7.9)	624 (10.4)	1.27 (0.72-2.24)
7-12	32 (12.0)	1282 (21.3)	Ref (1)
13-24	76 (28.5)	1995 (33.2)	1.55 (1.01-2.37)
>24	120 (44.9)	1827 (30.4)	2.52 (1.68-3.77)

Danish women			
Cumulative contacts to PHC$_1$ in the 3 years before HIV diagnosis	**HIV N=267**	**Control N=6014**	**HIV vs controls OR$_2$ (95%CI)**
Median visits (IQR)	13 (0-24.5)	3 (0-18)	
Total number of contacts to PHC			
0	72 (25.7)	516 (47.0)	Ref (1)
1-2	6 (2.1)	22 (2.01)	1.50 (0.53-4.26)
3-6	22 (7.9)	61 (5.6)	2.42 (1.13-5.19)
7-12	36 (12.9)	119 (10.9)	1.87 (1.09-3.20)
13-24	74 (26.4)	192 (17.5)	2.64 (1.70-4.12)
>24	70 (25.0)	187 (17.1)	2.83 (1.79-4.48)



Danish women			
Contacts to PHC$_1$ in the last year before HIV diagnosis	**HIV N=267**	**Control N=6014**	**HIV vs controls OR$_2$ (95%CI)**
Median visits (IQR)	9 (4-18)	5 (2-9)	
Total number of contacts to PHC			
0	21 (7.9)	560 (9.3)	1.25 (0.70-2.24)
1-2	31 (11.6)	1121 (18.6)	Ref (1)
3-6	53 (19.9)	1956 (32.5)	0.97 (0.61-1.53)
7-12	63 (23.6)	1464 (24.3)	1.63 (1.04-2.55)
>12	99 (37.1)	913 (15.2)	3.67 (2.39-5.62)

Non-Danish women			
Contacts to PHC$_1$ in the last year before HIV diagnosis	**HIV N=267**	**Control N=6014**	**HIV vs controls OR$_2$ (95%CI)**
Median visits (IQR)	5 (0-10)	0 (0-6)	
Total number of contacts to PHC			
0	80 (28.6)	562 (51.2)	Ref (1)
1-2	20 (7.1)	99 (9.0)	1.23 (0.65-2.32)
3-6	64 (22.9)	186 (17.0)	2.25 (1.41-3.59)
7-12	61 (21.8)	151 (13.8)	3.33 (2.05-5.41)
>12	55 (19.6)	99 (9.0)	4.36 (2.62-7.24)

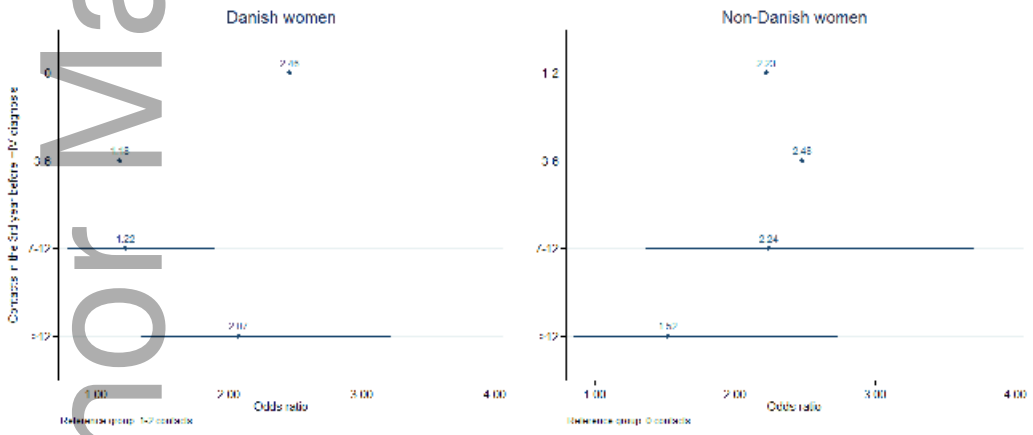


Danish women

Contacts to PHC[1] in the 2nd year before HIV diagnosis	HIV N=267	Control N=6014	HIV vs controls OR[2] (95%CI)
Median visits (IQR)	6 (2-13)	5 (2-10)	
Total number of contacts to PHC			
0	41 (15.4)	533 (8.9)	2.56 (1.58-4.15)
1-2	34 (12.7)	1068 (17.8)	Ref (1)
3-6	61 (22.9)	2006 (33.4)	0.96 (0.62-1.48)
7-12	58 (21.7)	1465 (24.4)	1.24 (0.80-1.92)
>12	73 (27.3)	942 (15.7)	2.29 (1.49-3.51)

Non-Danish women

Contacts to PHC[1] in the 2nd year before HIV diagnosis	HIV N=267	Control N=6014	HIV vs controls OR[2] (95%CI)
Median visits (IQR)	3 (0-8)	0 (0-6)	
Total number of contacts to PHC			
0	100 (35.7)	570 (52.0)	Ref (1)
1-2	29 (10.4)	105 (9.6)	1.60 (0.91-2.82)
3-6	67 (23.9)	183 (16.7)	1.87 (1.23-2.83)
7-12	51 (18.2)	139 (12.7)	2.28 (1.43-3.64)
>12	33 (11.8)	100 (9.1)	1.87 (1.07-3.25)



Danish women

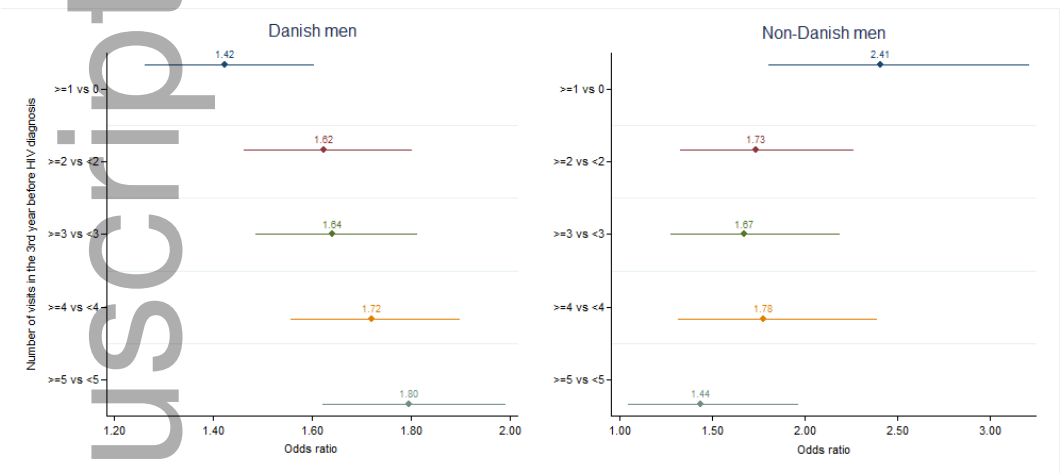
Contacts to PHC[1] in the 3rd year before HIV diagnosis	HIV N=267	Control N=6014	HIV vs controls OR[2] (95%CI)
Median visits (IQR)	6 (2-12)	5 (2-10)	
Total number of contacts to PHC			
0	42 (15.7)	554 (9.2)	2.46 (1.52-3.97)
1-2	34 (12.7)	1086 (18.1)	Ref (1)
3-6	72 (27.0)	1926 (32.0)	1.18 (0.77-1.80)
7-12	57 (21.4)	1502 (25.0)	1.22 (0.79-1.89)
>12	62 (23.2)	946 (15.7)	2.07 (1.34-3.22)

Non-Danish women

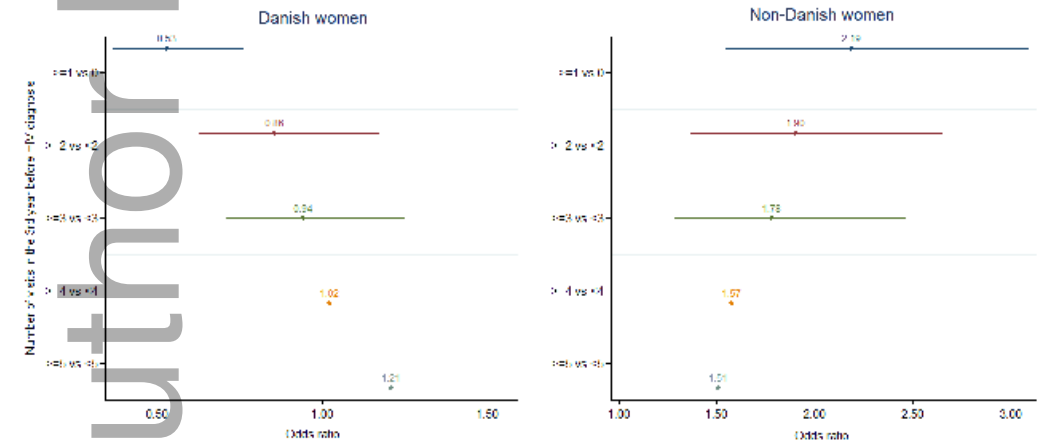
Contacts to PHC[1] in the 3rd year before HIV diagnosis	HIV N=267	Control N=6014	HIV vs controls OR[2] (95%CI)
Median visits (IQR)	3 (0-7)	0 (0-6)	
Total number of contacts to PHC			
0	96 (34.3)	576 (52.5)	Ref (1)
1-2	38 (13.6)	100 (9.1)	2.23 (1.30-3.82)
3-6	73 (26.1)	184 (16.8)	2.48 (1.62-3.81)
7-12	46 (16.4)	128 (11.7)	2.24 (1.36-3.70)
>12	27 (9.6)	109 (9.9)	1.52 (0.85-2.73)

[1] primary health care; [2] Unadjusted odds ratio calculated by conditional logistic regression
The chosen reference was 0 for all regression analyses. However, for women of Danish origin, the risk associated with 0 visits to PHC was associated with a large risk of HIV, thus distorting the results. Therefore, a different reference was also used for these analyses

Figure 2: Estimated percentage of HIV patients being diagnosed, percentage of patients in the community being HIV tested and the effectiveness factor according to the number of visits to primary care for men and women stratified by non-Danish/Danish origin in the 3rd year before diagnosis



	Danish men				Non-Danish men			
	Cases N=1808	Controls N=25050	OR$_1$ (95% CI)	Effectiveness factor	Cases N=429	Controls N= 4031	OR$_1$ (95% CI)	Effectiveness factor
0 visits	385 (21.3)	6908 (27.6)			134 (31.2)	2279 (56.5)		
≥1 visits (vs. 0)	1423 (78.7)	18142 (72.4)	1.42 (1.26-1.60)	1.09	295 (68.8)	1752 (43.5)	2.41 (1.80-3.21)	1.58
≥2 visits (vs. <2)	1212 (67.0)	14002 (55.9)	1.62 (1.46-1.80)	1.20	230 (53.6)	1382 (34.3)	1.73 (1.33-2.26)	1.56
≥3 visits (vs. <3)	995 (55.0)	10778 (43.0)	1.64 (1.49-1.81)	1.28	192 (44.8)	1091 (27.1)	1.67 (1.28-2.19)	1.65
≥4 visits (vs. <4)	837 (46.3)	8442 (33.7)	1.72 (1.56-1.90)	1.37	153 (35.7)	863 (21.4)	1.78 (1.32-2.39)	1.67
≥5 visits (vs. <5)	700 (38.7)	6618 (26.4)	1.80 (1.62-1.99)	1.47	120 (28.0)	702 (17.4)	1.44 (1.05-1.97)	1.61



	Danish women				Non-Danish women			
	Cases N=267	Controls N= 6014	OR$_1$ (95% CI)	Effectiveness factor	Cases N=280	Controls N=1097	OR$_1$ (95% CI)	Effectiveness factor
0 visits	42 (15.7)	554 (9.2)			96 (34.3)	576 (52.5)		
≥1 visits (vs. 0)	225 (84.3)	5460 (90.8)	0.53 (0.37-0.76)	0.93	184 (65.7)	521 (47.5)	2.19 (1.55-3.09)	1.38
≥2 visits (vs. <2)	210 (78.7)	4923 (81.9)	0.86 (0.62-1.17)	0.96	163 (58.2)	473 (43.1)	1.90 (1.36-2.65)	1.35
≥3 visits (vs. <3)	191 (71.5)	4374 (72.7)	0.94 (0.71-1.25)	0.98	146 (52.1)	421 (38.4)	1.78 (1.29-2.46)	1.36
≥4 visits (vs. <4)	172 (64.4)	3861 (64.2)	1.02 (0.78-1.33)	1.00	127 (45.4)	369 (33.6)	1.57 (1.14-2.17)	1.35
≥5 visits (vs. <5)	160 (59.9)	3351 (55.7)	1.21 (0.93-1.57)	1.08	111 (39.6)	319 (29.1)	1.51 (1.09-2.09)	1.36