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## **AUTHORS**

**Veerle Buffel, Thijs Reyniers, Caroline Masquillier, Estrelle Thunissen, Christiana Nöstlinger, Marie Laga, Edwin Wouters, Wim Vanden Berghe, Jessika Deblonde & Bea Vuylsteke**

## **TITLE**

**Awareness of, willingness to take PrEP and its actual use among Belgian MSM at high risk of HIV infection: secondary analysis of the Belgian European MSM Internet Survey**

## **ABSTRACT**

We examined PrEP awareness, willingness to take it and early PrEP use among men who have sex with men (MSM) at increased risk of HIV acquisition in Belgium. This analysis of the Belgian EMIS data of 2017-2018 adopts a cascade approach, with the following steps quantified as conditional probabilities: being eligible for, aware of, and willing to take PrEP and PrEP use. One out of three MSM was eligible to use PrEP according to the operationalized Belgian reimbursement criteria. PrEP awareness was lower among socioeconomically vulnerable MSM, MSM living outside large cities, MSM who were less open about their sexuality and who did not identify as gay or homosexual. A lack of PrEP knowledge, a higher level self-efficacy regarding safe sex, having a steady partner and a higher risk of depression were related to unwillingness to use PrEP. Among those willing to take PrEP, less than one third were actually using PrEP. Not using PrEP was associated with living in small cities and experiencing financial problems.

**Keywords (4-5):** Pre-exposure prophylaxis (PrEP) use, Cascade approach, Men who have Sex with Men (MSM), eligibility criteria, awareness of and willingness to use PrEP

# 1 INTRODUCTION

2 Oral Pre-Exposure Prophylaxis (PrEP) is the use of antiretrovirals as a HIV prevention method,  
3 recommended for HIV negative individuals at substantial risk of HIV infection (3). The World Health  
4 Organization recommends PrEP to be provided as part of a comprehensive approach including  
5 biomedical, behavioral, and structural interventions designed to meet the HIV prevention needs of  
6 specific people and communities (3). Although there is a decreasing trend in new HIV diagnoses among  
7 men who have sex with men (MSM) in the European Union (EU), sex between men remains the  
8 predominant mode of HIV transmission, accounting for about 39% of all diagnoses in 2019 (1). The  
9 uptake of PrEP as novel HIV prevention tool may be crucial to further reduce the number of HIV  
10 infections (4, 5). In Belgium, the yearly incidence of HIV diagnoses per 100,000 inhabitants is relatively  
11 high (8.1 in 2019) (2) when compared to the EU average (5.4 in 2019) (1).

12

13 For PrEP to be effective in reducing the number of HIV infections at population level, uptake needs to  
14 be ensured among those who are at highest risk of HIV infection (6). Therefore, PrEP guidelines usually  
15 include eligibility criteria for PrEP initiation, based on factors that are known to be associated with an  
16 increased risk for HIV infection (7,8). These eligibility guidelines are country specific, based on the  
17 local context, HIV epidemiology, groups most at risk of HIV acquisition and strategic planning and  
18 program focus (8). In Belgium the guidelines for MSM include condomless anal intercourse with at least  
19 two partners in the last 6 months, multiple Post Exposure Prophylaxis (PEP) treatments in the last 12  
20 months and/or episodes of STIs last 12 months (9).

21

22 PrEP has been made available in Belgium since June 2017 through 12 HIV reference centers (HRC).  
23 HRCs are specialized outpatient clinics providing multidisciplinary HIV and PrEP care. PrEP is  
24 partially reimbursed for individuals at increased risk for HIV infection, identified through the eligibility  
25 criteria (9,10). An online survey conducted from November 2016 to February 2017 demonstrated that  
26 the awareness of PrEP among HIV negative Belgian MSM was high (about 92%) and that about 70%  
27 of them were willing to take it (11). However, as this survey (11) took place just before the PrEP

28 reimbursement in Belgium it did not include information about actual PrEP use and we do not know  
29 how far this theoretical willingness is translated into a real use of PrEP. By December 2019, HRCs  
30 registered approximately about 4,000 PrEP users, 99% men and 98% MSM (2). But it remains unclear  
31 to what extent MSM at elevated risk of HIV acquisition are aware of, and willing to take PrEP, and  
32 actually taking it. . Measuring these gaps and identifying associated factors will help **to inform HIV  
33 prevention strategies and increase PrEP uptake among those most in need.**

34

35 The first aim of this study was to examine PrEP awareness, willingness to use PrEP and actual PrEP  
36 use among Belgian MSM who are eligible for PrEP. We used a cascade approach, which is in line with  
37 similar research on PrEP uptake and lends itself particularly well to identify critical factors to be  
38 addressed in order to improve uptake (12-16). A secondary aim was to explore which  
39 sociodemographic, structural, cognitive and psychosocial factors are related to the drops in this cascade:  
40 ‘being unaware of PrEP’, ‘being unwilling to use PrEP’ and ‘not using PrEP’. These insights will be  
41 particularly useful to tailor strategies for improving PrEP uptake among those at highest risk.

42

## 43 **METHODS**

### 44 **Data**

45 We conducted a secondary analysis of the European MSM Internet Survey (EMIS)(17). EMIS is a  
46 cross-sectional online survey conducted among gay, bisexual, and other MSM, across 50 European  
47 countries to understand their needs and to direct prevention programmes at a country level. The  
48 recruitment of respondents occurred through advertising on websites of supportive organizations,  
49 general-population social network services and MSM targeted geo-spatial ‘dating’ smartphone  
50 applications and websites. Data were collected between 01/11/2017 and 31/01/2018, which is shortly  
51 after roll-out and reimbursement of PrEP in Belgium (1/06/2017). The data included sociodemographic  
52 characteristics, morbidities, drug use, sexual risk behaviors and HIV-related prevention needs.

53 For this analysis we selected the Belgian EMIS data (18). Men were eligible to answer the questionnaire  
54 if: they were living in Belgium, they were at or over the age of homosexual consent (16 years old), they  
55 were identifying themselves as a man or trans man, and they were sexually attracted to men and/or  
56 having sex with men. The total number of respondents in Belgium was 2,746. All respondents provided  
57 consent to participate. Detailed study procedures are published elsewhere (17, 19). We excluded persons  
58 younger than 18 years (N=12) or HIV positive (N=338; 12.4%) from the sample, since they are not  
59 eligible to use PrEP according to Belgian criteria (8,9). This bring us to a sample size of 2,396  
60 respondents.

## 61 **Measures and definitions**

### 62 *Eligibility for PrEP use*

63 We considered HIV negative MSM eligible to use PrEP if they were at high risk of HIV infection  
64 according the Belgian eligibility criteria(9) (Table I). We have operationalized seven eligibility criteria  
65 based on the available information in the EMIS survey (17)(see more detailed information in Appendix  
66 A). A participant was considered eligible if at least one of these 7 criteria was met. Participants with  
67 missing data on more than 3 criteria were defined as ‘missing’ (N=2).

68 [TABLE I]

### 69 *Awareness*

70 Participants were considered to be *aware of PrEP* if they answered ‘yes’ to the question ‘Have you  
71 heard about PrEP’

### 72 *Willingness*

73 A participant was considered *willing to take PrEP* when responding ‘likely’ or ‘very likely’ on a 5-  
74 point Likert scale to the question ‘If PrEP was available and affordable to you, how likely would you  
75 be to use it?’.

### 76 *Current PrEP use*

77 *Current PrEP use* is based on the question ‘Have you ever taken PrEP?’ and operationalized as a  
78 dichotomous variable: (1) ‘currently using PrEP on a daily basis or on demand’ versus (2) ‘never used  
79 PrEP or used PrEP on a daily basis or on demand but no longer taking it’. Formal channels for obtaining  
80 PrEP included a physical pharmacy, a general practitioner or other physician, a hospital, institute, clinic,  
81 community or drop in center, and participation in a study. PrEP pills from an online pharmacy, PEP or  
82 ART as PrEP, were considered informal circuits.

83 *Potentially associated factors to PrEP awareness, willingness to take PrEP and PrEP use*

84 Sociodemographic factors included: *age* (less than 30, 31 thru 50, above 51), *years of education* (since  
85 age 16: 0 to 4 years, 5 to 6 years, 7 years or more), *relation status* (single, steady partner, not  
86 sure/complicated), *sexual orientation* (identify themselves as gay or homosexual, bisexual, other),  
87 *migrant status* (no migration background, EU/EFTA migrant, non-EU/EFTA migrant) and *employment*  
88 *situation* (employed, unemployed, student, non-employed [retired or inactive due to  
89 disability/sickness]).

90 Structural barriers such as financial hardship and geographical distance to the PrEP facility may occur  
91 and potentially reduce the PrEP accessibility (and thus effective PrEP use). In the analysis we included  
92 *struggling with present income* (feelings about present income using a 5-point Likert scale from ‘really  
93 struggling on present income’ to ‘living really comfortable on present income’), and *size of the city of*  
94 *residence* (large/medium city, small city/town, and village/countryside) as proxies for the financial and  
95 geographical barriers. HRCs in Belgium are geographically distributed across large or medium cities,  
96 which may limit the geographical accessibility for people living outside large or medium cities.

97

98 We hypothesized cognitive factors to be related to PrEP awareness, PrEP use and in particular  
99 willingness to use PrEP (11, 20). Hence, we included in the analysis *self-efficacy regarding safe sex*,  
100 and *prior knowledge on PrEP and HIV transmission*, similar to the French study about PrEP using the  
101 EMIS data (20). Self-efficacy regarding safe sex was assessed using a 5-point Likert scale from  
102 ‘strongly disagree’ to ‘strongly agree’ to the statement ‘The sex I have, is always as safe as I want it to

103 be'. Prior PrEP and HIV transmission knowledge were based on previous knowledge of two statements:  
104 'PrEP can be taken as a single daily pill if someone does not know in advance when they will have sex'  
105 and 'A person with HIV who is on effective treatment (called 'undetectable viral load') cannot pass  
106 their virus to someone else during sex'. The five answers categories were dichotomized: yes ('I knew  
107 this already') versus no ('I wasn't sure about this', 'I didn't already know this', 'I don't understand  
108 this', 'I do not believe this').

109

110 *Level of outness, alcohol dependency and depression and anxiety* are included as psychosocial factors,  
111 as they are known to be negatively related to PrEP use (21). *Level of outness* is a potential emotional  
112 barrier of PrEP use and was based on an item analyzed in previous publications (20, 22-24): 'Thinking  
113 about all the people who know you (including family, friends, and work or study colleagues), what  
114 proportion knows that you are attracted to men?' Possible options were: 'no one'; 'few'; 'less than half';  
115 'more than half'; 'all or almost all'. In line with previous research on outness (24), the variable was  
116 dichotomized as follows: those out to 'no one,' to 'few' the people they know (defined as 'in the closet'  
117 or 'having a low level of outness') versus those out to 'less than half,' 'more than half' or to 'all or  
118 almost all' of the people they know (defined as 'out' or 'having a medium to high level of outness').  
119 The CAGE-4 screening measure was used to assess possible alcohol dependency. The CAGE-4  
120 questionnaire for alcohol misuse has been previously validated for use in the general population (25).  
121 **The relatively low Cronbach's alpha we found among MSM (0.6) is comparable to other studies (26,**  
122 **27).** Depressive and anxiety were measured by the validated Patient Health Questionnaire-4 (PHQ-4),  
123 which is a brief and accurate measurement of core symptoms/signs of depression and anxiety (28). The  
124 Cronbach alpha is 0.9.

125

## 126 **Analyses**

127 We use a cascade approach with the following steps (bars): among the *MSM eligible for PrEP* (Bar 1),  
128 we examined the proportions being *aware of PrEP* (Bar 2), *willing to use PrEP* (Bar 3) and actually  
129 *using PrEP* (Bar 4). In an unconditional approach, each step is quantified with a fixed denominator, i.e.

130 all MSM being eligible for PrEP in the sample. In the conditional approach, the denominator of each  
131 step is equal to the nominator of the previous step, implying for example that willingness to take PrEP  
132 only needs to be examined among those being aware of it, or that PrEP use only needs to be examined  
133 among those being willing to take it.

134 Thereafter, the drops in the cascade were quantified (conditionally) as outcome variables of the bivariate  
135 and multivariable logistic regression analyses: unaware vs. aware (among the eligible MSM, Sample  
136 1); unwilling vs. willing (among the eligible and aware, Sample 2); and not using PrEP vs. using (among  
137 the eligible, aware and willing, Sample 3). We determined the relationships between the drops and  
138 potentially associated factors using bivariate statistics resulting in a contingency table (Table III) and  
139 bivariate logistic regressions (Table IV). Wald Chi-square tests were used to determine whether the  
140 associations between these variables were significant (with a p value < 0.05) and the strength of the  
141 associations were measured by unadjusted (or crude) odds ratio's (OR). Next, we performed  
142 multivariable logistic regression analyses to investigate which factors were independently associated  
143 with the drops in the cascade, including the factors that were significant in the bivariate analyses.  
144 Strengths of associations were measured using adjusted odds ratio's (AOR) (Table IV).

145

## 146 **RESULTS**

### 147 **PrEP cascade: Awareness of and willingness to take PrEP and PrEP use**

148 Figure 1 shows the PrEP cascade using a conditional and unconditional approach. The corresponding  
149 numbers of the PrEP cascade are presented in Table II. One out of three MSM (33.2%; 795/2,396) in  
150 this sample were *eligible for PrEP use* according the Belgian criteria (Bar 1). Around seventy percent  
151 of all MSM (70.7%; 1,659/2,346) were *aware of PrEP* (Bar 2). For PrEP eligible MSM, the proportion  
152 being aware of PrEP was somewhat higher: 82.1% (641/781). Nearly half of the MSM (43.3%;  
153 1,037/2,396) indicated to be *willing to use PrEP* and among PrEP eligible MSM who were aware about  
154 its existence this was more than half (66.1%; 424/641) (Bar 3). About 22.5% of those willing to use  
155 PrEP were not eligible.



156 The proportion of MSM currently using PrEP was 6.9% (164/2,376) in the whole sample, 18.0%  
157 (142/791) among MSM eligibly to use PrEP and 30.7% (130/424) among PrEP eligible MSM who are  
158 aware of PrEP and willing to use it was actually using PrEP (Bar 4). The majority of them (90%;  
159 117/130) were using PrEP via the formal circuit and 2.1% (6/130) informally. Twenty-two MSM were  
160 using PrEP while not eligible according the criteria, representing 0.9% (22/2,376) of all the MSM or  
161 13.4% [22/164] of all PrEP users. Among eligible PrEP users 87.7% (114/130) had received a medical  
162 prescription for PrEP, the majority (81.5%) from a HIV reference centers or primary health care center  
163 (drop in).

164 [Figure 1]

165 [Table II]

#### 166 **Factors associated with the drops in the PrEP cascade**

167 Table III shows the distribution of each factor for every sub-sample. The results of the logistic  
168 regression analyses with the ‘drops in the cascade’ as dichotomous outcomes are presented in Table IV.

169 [Table III]

170 Eligible MSM who were 51 years or older were more *likely to be unaware of PrEP* as compared to  
171 those below 30 years old, even after controlling for other factors. Being unaware of PrEP was also  
172 significantly associated with lower education level, unemployment, living in a small city, low level of  
173 outness, self-identification as bisexual and no prior HIV knowledge on ‘undetectable=untransmittable’.

174 Among PrEP eligible MSM who were aware about PrEP, *the unwillingness to use PrEP* was higher  
175 among those with a migration background (in particular non-EU/EFTA migrants), those who did not  
176 identify themselves with homosexuals, who were unemployed, who scored higher on anxiety and  
177 depression scales, who lacked PrEP knowledge and who had higher scores on self-efficacy regarding  
178 safe sex, when compared with their respective counterparts. After adding the confounding factors, MSM  
179 with a steady partner were also more likely to be unwilling to use PrEP compared to single MSM.

180 Among those who were eligible, aware of, and willing to use PrEP, *not using PrEP* was related with  
181 struggling with financial resources, being a student, living in a small city/town, and lack of prior  
182 knowledge about PrEP and HIV transmission. In the multivariate analysis, struggling with income was  
183 no longer significantly related to not using PrEP.

184

185 [Table IV]

186 **DISCUSSION**

187 In this study we examined PrEP awareness, willingness to use PrEP and PrEP use among PrEP eligible  
188 MSM soon after the roll-out of PrEP implementation in Belgium. First, we found that 82.1% of the  
189 eligible MSM was aware of PrEP, 62.6% was willing to take it and 18% was actually using it Second,  
190 different sociodemographic, structural, cognitive and psychosocial factors were related to the drops in  
191 the cascade (unaware, unwilling and not using PrEP).

192

193 The proportion of Belgian MSM in our sample aware of PrEP is 70%, increasing to 82%  
194 among MSM eligible to use PrEP. This figure is comparable to other studies performed in Belgium and  
195 France around the same period (12, 20). Socioeconomic vulnerability was related to poor awareness of  
196 PrEP and PrEP awareness was lower among MSM from outside urbanized areas, among older MSM  
197 and MSM who are bisexual or less open about their sexuality. These findings are in line with previous  
198 research on PrEP awareness (13, 29-31) and require tailored interventions. Lack of PrEP awareness was  
199 shown to be an important barrier to PrEP use, especially among the most vulnerable groups who are  
200 also at high risk of HIV (32). There is a need for more inclusive awareness campaigns that can reach  
201 larger groups of MSM, in particular those who are less directly connected to the gay communities, also  
202 paying attention to groups with a lower socioeconomic status.

203

204 Forty-three % of MSM in our total sample were *willing to use PrEP*. This proportion is similar to the  
205 willingness to use PrEP in other studies conducted in high income countries (between 40% and 60%)  
206 (11, 20, 31, 33-35). Among MSM eligible for PrEP use, we found that more than one third was not  
207 (very) likely to use PrEP. Especially among these MSM at increased risk for HIV acquisition, such low  
208 levels of willingness to use PrEP are problematic from a public health point-of-view, as the benefits of  
209 PrEP cannot be fully exploited. Similar to other research (35), we observed that unwillingness to use  
210 PrEP is higher among MSM who did not identify themselves as gay or homosexual and among those  
211 with a migration background. This is possibly because the initial PrEP studies and campaigns in Europe  
212 were focusing on white homosexual men (36). Furthermore, perceived social stigma associated with  
213 same-sex attraction, HIV and PrEP use may present a strong barrier for PrEP uptake, especially among

214 MSM with a migration background (37). There is a need to further study potential uptake of PrEP and  
215 its barriers among migrant communities (36). We also found that a lack of PrEP knowledge, suffering  
216 from depression and anxiety, a belief that the sex they have is always as safe as they wanted and having  
217 a steady partner, were all related to unwillingness to use PrEP. From other studies (30, 35), we know  
218 that a lack of PrEP knowledge is one of the most frequently reported barriers of PrEP use. One of the  
219 other main reasons of this drop in the cascade indicated in previous research (13) is a poorer risk  
220 assessment of HIV. MSM with depressive symptoms may have a poorer risk assessment and  
221 engagement in self-care and preventive health (38, 39). This may contribute to their lower willingness  
222 to use PrEP, despite their higher risk of HIV infection .

223

224 The largest drop in the cascade was found between willingness to use PrEP and *actual PrEP use*, with  
225 less than one third of the MSM being aware and willing to use PrEP (30.7%) actually using PrEP. This  
226 was expected as the gap between people who are likely to use PrEP but not using it, was also highlighted  
227 in previous European (40) and American research (41). Interventions for the improvement of the level  
228 of awareness and willingness to use PrEP alone are thus not enough to improve PrEP uptake. It confirms  
229 that the theoretical willingness to use PrEP strongly differs from actual PrEP use (31). As a result, action  
230 has to be taken to improve this last step of the PrEP cascade, by motivating people to take concrete  
231 steps towards using it (e.g. making an appointment, getting a prescription, etc.), and overcoming the  
232 last barriers to facilitate the uptake of PrEP. In previous research (20, 30), poor knowledge about PrEP,  
233 PrEP stigma, the related costs, and the poor accessibility of medical facilities where PrEP can be  
234 prescribed and followed up, were reported as potential barriers of PrEP use. The latter barrier may  
235 explain our finding that MSM living in small cities use PrEP less than MSM living in larger cities,  
236 where HRC are located. Our findings also suggest that financial barriers restrain MSM from using PrEP.  
237 Indeed: MSM at increased risk of HIV acquisition and willing to use PrEP, but who struggled with their  
238 income were less likely to using PrEP in our study.

239

240 **Limitations**

241 The EMIS uses convenience sampling, so our data may not be representative for all MSM in Belgium.  
242 As frequently seen in MSM surveys using the internet, the EMIS dataset is likely to be biased towards  
243 more highly educated MSM and fewer older MSM, migrant MSM and those more distant from the gay  
244 community (20, 42, 43). Furthermore, recruitment strategies may have had a substantial impact on our  
245 findings (44). The use of sexual networking applications for recruiting participants may have led to a  
246 selection bias, i.e., participants with high levels of sexual activity, seeking sex partners on the internet,  
247 or with a particular interest in PrEP (7). However, whilst the findings are not generalizable to the wider  
248 MSM population, respondents do represent the target group of highly sexually active and therefore most  
249 at-risk men .

250

251 Using an existing database comes also with inherent limitations: we were unable to directly measure  
252 each criterion of the Belgian PrEP eligibility criteria (e.g., PEP use last 12 months). Lack of these data  
253 might have resulted in an underestimation or overestimation of the percentage of MSM eligible to use  
254 PrEP. In addition, no information was available about some frequent reported barriers of willingness  
255 and use of PrEP (28), such as attitudes towards PrEP, worries about PrEP stigma and side effects, a  
256 poor risk perception, and not having a doctor to prescribe it, or being ashamed to ask a medical  
257 professional about PrEP etc. Self-reported and retrospective data may also lead to underreporting of  
258 sensitive subjects (e.g., condomless sex or PrEP-use via informal channels) and be subject to recall bias.

259

## 260 **Recommendations and conclusions**

261 Based on our findings we can draw a number of relevant recommendations for clinical practice and  
262 public health policy. Our study highlights that although there is a high number of MSM who may benefit  
263 from PrEP use, only a small number was actual using PrEP in Belgium at the time of the study.  
264 However, we need to be aware of the timing of the EMIS, as the data is collected just after the roll out  
265 of PrEP in Belgium. More recent numbers of the HIV Reference centers have pointed to an increase in  
266 PrEP use among MSM (2). We expect a further increase in PrEP awareness and willingness to take  
267 PrEP, as observed in Australia (12) and the US (41) after making PrEP available in these countries. It  
268 should be noted that PrEP users themselves may be drivers of further uptake, by providing information

269 and disclosing positive experiences to like-minded friends or sexual partners (45). This may partially  
270 explain why PrEP mostly remains an MSM-specific HIV prevention tool in countries such as Belgium.  
271 While the data of this study pertain to the period 2017-2018, it remains unclear to what extent the  
272 associated factors have determined actual uptake in the period thereafter. Therefore, we suggest  
273 continuous and further research to assess whether MSM at high risk for HIV acquisition are better  
274 reached to improve the roll-out of PrEP.

275

276 Across all steps in the PrEP cascade large drops are detected and each drop was associated with different  
277 factors, which asks a diversification of policy answers and interventions on the different step in the  
278 cascade for different subgroups.

279

280 The findings show that more investments are required in improving the awareness of PrEP among high  
281 risk MSM. PrEP awareness campaigns need to be up-scaled and reaching all, also the different hard-to-  
282 reach groups among the MSM such as the socioeconomic vulnerable groups and MSM who do not  
283 identify themselves as homosexual or are less open about their sexuality. Promoting PrEP via primary  
284 care services may be a good alternative for improving PrEP awareness and willingness to take it. The  
285 long-term and holistic patient-doctor relationship provided by primary care services lends itself to the  
286 provision of personalized sexual health information and opportunities. It may help reframe PrEP as  
287 sexual health promotion tool, irrespective of gender, sexual orientation, relationship status or ethnicity  
288 (46). In addition, information on PrEP could be further and continuously distributed via social and  
289 community-based organizations, who are in close contact with the target group.

290

291 To increase willingness to use among high risk MSM who are aware of PrEP, it is important to invest  
292 in improving PrEP knowledge and MSM's self-perception of their risk of HIV. Effective interventions  
293 to help at-risk individuals better understand and act on their HIV risk are required especially among  
294 MSM with a non-EU/EFTA migration background, MSM who do not identify themselves as  
295 homosexual and those who are convinced that their PrEP and HIV transmission knowledge is sufficient  
296 and believe they have safe sex.

297

298 To ensure that MSM who are ‘aware of PrEP’ and ‘willing to use PrEP’ also actually use PrEP, further  
299 investments in the accessibility and availability (proximity) of PrEP are recommended. Although PrEP  
300 is reimbursed in Belgium, there is still a relatively high out-of-pocket payment, i.e. approximately 11.90  
301 euros for 30 pills (47). Also indirect costs such as transport costs and the costs of follow-up  
302 consultations may add to expenses for PrEP. Especially for people who already struggle with their  
303 available resources or who live at a distance from the HIV reference center these may be barriers for  
304 using PrEP. Moreover, MSM at high risk with anxiety and depression related symptoms, should be  
305 proactively approached and motivated to use PrEP by for example health professionals and social  
306 workers, as they may less accurately perceive their need for PrEP, have a poorer PrEP adherence and  
307 are probably less concerned about HIV prevention. Future implementation research should explore how  
308 these services can be optimized to respond to key populations with unmet HIV prevention needs in  
309 different contextual settings (48).

310

311 Further research on PrEP, PrEP stigma and self-perceived HIV risk among MSM is needed in Belgium.  
312 Future studies should use a more representative sampling method such as a web-based respondent  
313 driven sampling technique, which combines ‘snowball sampling’ with a mathematical model that  
314 weights the sample to compensate for the fact that the sample was collected in a non-random way (49).

315

316

317

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