

# Viral Hepatitis and Human Papillomavirus Vaccination during Pre-exposure Prophylaxis: Factors Associated with Missed Vaccination

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## Background

-HIV pre-exposure prophylaxis (PrEP) visits are an opportunity for HAV, HBV and HPV vaccination.

-Aim of this study was to evaluate the factors associated with missing at least one of these vaccinations among men who have sex with men (MSM) receiving PrEP.

## Materials and methods

-Individuals receiving PrEP at the Infectious Diseases Unit of San Raffaele Scientific Institute, Milan, Italy, were considered.

-Only individuals who received at least one follow-up visit between May 2017 and May 2022 were included.

-Dropout was defined as no PrEP-related visits for at least 12 months.

-Participants were considered protected if at least on the following:

i) *Prior to PrEP access*: a positive serology (IgG-HAV+, HbsAb>10 mUI/ml) or vaccination history were recorded;

ii) *After starting PrEP*: at least one dose of each vaccination was administered.

-Participants were considered fully protected if they received before or during PrEP access all of the following:

i) HAV vaccination or infection;

ii) HBV vaccination or infection;

iii) HPV vaccination, if <46 years old.

-Chi square test or Kruskal-Wallis test were used to compare the characteristics of those fully, partially and not protected.

-Factors associated with the probability of missing at least one vaccination were assessed by multivariable logistic regression and a classification tree analysis.

## Results

-Overall, 473 MSM were considered:

i) 146 (31%) were fully vaccinated/protected

ii) 231 (48%) were partially vaccinated/protected

iii) 96 (20%) were not vaccinated/protected

-*Hepatitis A*: 131 were previously protected for HAV, 151 had negative IgG-HAV and 103 were vaccinated during PrEP visits

-*Hepatitis B*: 200 were previously protected for HBV, 88 had an HbsAb<=10 and 44 were vaccinated during PrEP visits

-*Human papilloma virus*: 12 were previously vaccinated for HPV, 209 were vaccinated during PrEP visits.

-Individuals' characteristics are presented in Table 1.

-Daily-based PrEP users (fully 93, 63.7%, partially 107, 46.3%, not protected 40, 41.7%, p=0.001) and those with a baseline STI diagnosis (43, 29.5%, 55, 23.8%, 15, 5.6%, p= 0.048) were more frequently fully vaccinated.

**Table 1. Individuals' characteristics.**

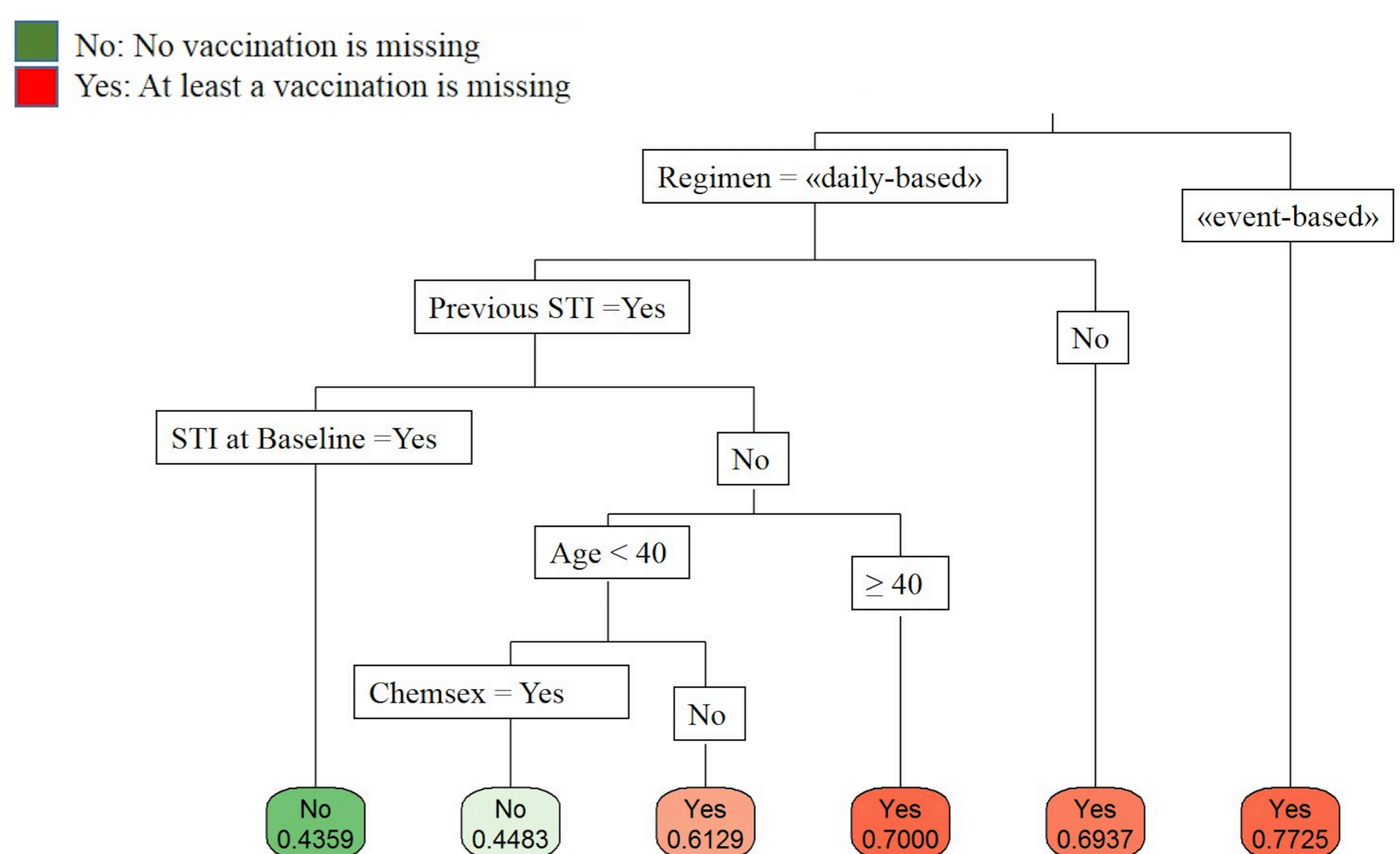
Characteristics	Overall n=473	Not protected n=96	Partially protected n=231	Fully protected n=146	p-value
<i>Age (IQR)</i>	34.6 [30.6;39.9]	33.9 [28.4;38.0]	34.9 [31.1;41.1]	34.9 [30.6;39.7]	0.052
<i>Ethnicity</i>					0.054
Asian	2 (0.42%)	1 (1.04%)	0 (0.00%)	1 (0.68%)	
Caucasian	460 (97.3%)	91 (94.8%)	225 (97.4%)	144 (98.6%)	
Hispanic	6 (1.27%)	1 (1.04%)	5 (2.16%)	0 (0.00%)	
Black	5 (1.06%)	3 (3.12%)	1 (0.43%)	1 (0.68%)	
<i>Education</i>					0.784
Middle school	11 (2.33%)	2 (2.08%)	4 (1.73%)	5 (3.42%)	
High school	164 (34.7%)	31 (32.3%)	80 (34.6%)	53 (36.3%)	
University	298 (63.0%)	63 (65.6%)	147 (63.6%)	88 (60.3%)	
<i>Partners</i>					0.193
0-9	192 (40.6%)	33 (34.4%)	105 (45.5%)	54 (37.0%)	
10-19	156 (33.0%)	41 (42.7%)	65 (28.1%)	50 (34.2%)	
20-49	102 (21.6%)	19 (19.8%)	48 (20.8%)	35 (24.0%)	
50 or more	23 (4.86%)	3 (3.12%)	13 (5.63%)	7 (4.79%)	
<i>Chemsex</i>	222 (46.9%)	45 (46.9%)	105 (45.5%)	72 (49.3%)	0.765
<i>Smith DK index</i>					0.026
10-19	42 (8.88%)	6 (6.25%)	29 (12.6%)	7 (4.79%)	
20-29	245 (51.8%)	44 (45.8%)	122 (52.8%)	79 (54.1%)	
30 or more	186 (39.3%)	46 (47.9%)	80 (34.6%)	60 (41.1%)	
<i>Previous STI</i>	249 (52.6%)	50 (52.1%)	116 (50.2%)	83 (56.8%)	0.451
<i>Baseline STI</i>	113 (23.9%)	15 (15.6%)	55 (23.8%)	43 (29.5%)	0.048
<i>PrEP Regimen</i>					0.001
Event-based	233 (49.3%)	56 (58.3%)	124 (53.7%)	53 (36.3%)	
Daily-based	240 (50.7%)	40 (41.7%)	107 (46.3%)	93 (63.7%)	
Dropout	35 (7.40%)	9 (9.38%)	17 (7.36%)	9 (6.16%)	0.646

## Results

-At multivariable analysis, the risk of having missed at least one vaccination was lower among those receiving daily-based PrEP (aOR=0.47, 95%CI=0.31-0.70, p<0.001), with a Smith index 20-29 (aOR=0.34, 95%CI=0.12-0.88, p=0.034) and >30 (aOR=0.29, 95%CI=0.08-0.94, p=0.045).

-The classification tree analysis showed that among daily-based PrEP users, who received a previous and baseline STI diagnosis, there was a lower chance of missing a vaccination (probability 44%) (Figure 1).

**Figure 1. Decision tree for missing a vaccination.**



## Discussion and conclusions

-Daily-based PrEP was associated with full protection for HAV, HBV and HPV.  
-Strategies targeting individuals at risk of missing vaccinations need to be implemented, with a main focus on event-based PrEP users.