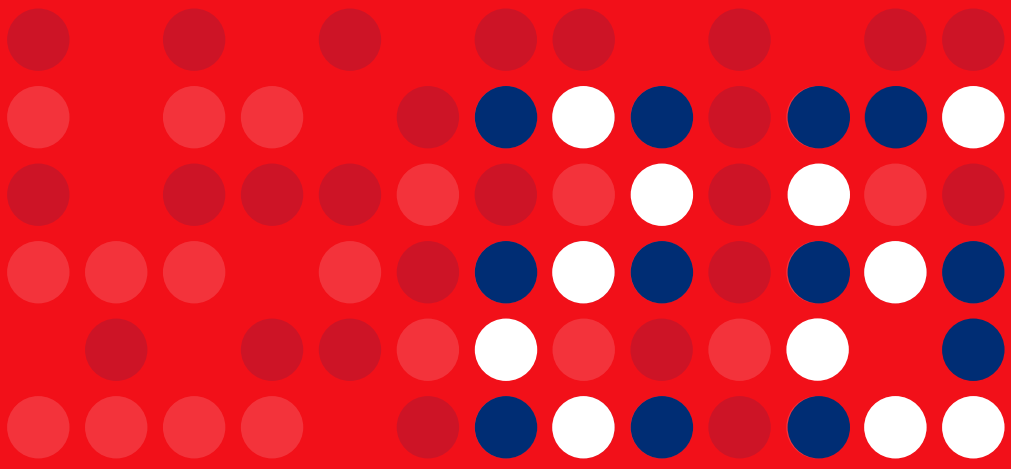
Human Immunodeficiency Virus (HIV)
Infection in the Netherlands

hiv Monitoring

HIV Monitoring Report 2026

Chapter 8: Viral hepatitis



8. Viral hepatitis

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Key findings

Hepatitis C (2016–2025)

- Of individuals with HIV in care between 2016 and 2025, 99% was at least once screened for hepatitis C (HCV).
- Of the 27,459 individuals who were ever screened for HCV, 897 were diagnosed with a primary HCV infection and 145 individuals with a reinfection between 2016-2025.
- The majority of recent HCV infections occurred in MSM (n=229/254 [90%])
- In 2025, 58 individuals were diagnosed with HCV, including 12 primary chronic infections, 13 recent infections, and 12 re-infections. Twenty- three individuals with an HCV diagnosis in 2025 (36%) originated from European countries, other than the Netherlands.
- The prevalence of individuals with detectable HCV RNA decreased from 1.5% in 2016 to 0.3% in 2025.
- The incidence of primary infection decreased from 6.63 per 1,000 persons years in 2016 to 1.62 per 1,000 person years in 2025.
- The incidence of HCV reinfection among MSM decreased from 35 reinfections per 1,000 PY in 2016 to 9 per 1,000 PY in 2025.
- 97% of individuals in care had received treatment for HCV and 98% were successfully treated and achieved treatment-induced clearance of HCV.
- Probable or definite severe liver disease was documented in 26.1% of participants with a history of HCV; cirrhosis was documented in 5.6%. Death due to liver disease occurred in less than 1% of participants with a history of HCV.

Hepatitis B

- Screening for hepatitis B (HBV) has improved over time. By 2025, 99.0% of participants in care had at least one HBV serological assay performed and 83.5% had interpretable serological profiles available.
- A total of 1,329 participants had a history of chronic HBV, of whom 348 (26.2%) had evidence of surface antigen clearance. In 2025, 89.0% of participants with chronic HBV were treated with a tenofovir prodrug and cytidine analogue.
- Probable or definite severe liver disease was documented in 17.8% of participants with a history of chronic HBV; cirrhosis was documented in 7.8%. Death due to liver disease occurred in less than 1% of participants with a history of chronic HBV.
- Among 5,136 MSM who entered HIV care between 2016 and 2025 and had no evidence of active HBV at care entry, 44.6% had HBV vaccination or vaccine-acquired immunity, 16.5% had infection-acquired immunity, and 37.2% had no evidence of HBV immunity at care entry. Between 2015 and 2026, the proportion of participants with evidence of HBV vaccination or vaccine-acquired immunity at entry to care increased from 36.3% to 47.0%.

Hepatitis A

- Screening for hepatitis A (HAV) has improved over time. The proportion of participants with serological testing for HAV increased from 51.7% in 2016 to 84.9% in 2025.
- The last outbreak of acute HAV occurred in 2017, with an annual total of 54 cases. Since 2020, 5 or less acute HAV cases have been observed annually.
- Among 5,262 MSM who entered HIV care between 2015 and 2026, 45.8% had received at least one dose of HAV vaccine or were immune by history or serology. The proportion of participants without evidence of HAV vaccination or immunity at entry to care decreased from 69.8% in 2016 to 48.7% in 2025.

Introduction

People with HIV are vulnerable to infection with viral hepatitis, due to shared routes of transmission including but not limited to sexual practices and substance use[1,2]. In this chapter, we describe the epidemiology of chronic and acute viral hepatitis in people with HIV in the Netherlands. We focus primarily on hepatitis C [HCV] and hepatitis B [HBV] (including hepatitis delta virus), the most common causes of chronic viral hepatitis in the Netherlands. We provide brief overviews of acute hepatitis due to Hepatitis A and E viruses. In our analysis, we included individuals registered in the SHM database who had at least one HIV care visit between 2016 and 2025, at time of database closure in May 2026.

Hepatitis C virus (HCV)

Box 8A: Definitions of hepatitis C infection.

Primary HCV infection
First documented HCV infection.

Chronic HCV infection
Individuals who remain HCV RNA-positive for longer than six months after their first known positive HCV RNA test result.

Recent HCV infection[3,4]

1. Case definition of recent HCV according to preferred criteria[3]:
   Positive anti-HCV IgG with a documented negative anti-HCV IgG within the past 12 months,
   or:
   detectable HCV RNA in the presence with either a documented negative HCV RNA test, or a negative anti-HCV IgG within the past 12 months.

2. Case definition of acute HCV according to alternative criteria[3]: Detectable HCV RNA in association with a rise in alanine aminotransferase (ALT) (above 200 IU/l) with a documented normal ALT within the past 12 months.

Spontaneously cleared HCV infection
Individuals with a documented positive test result for HCV antibody or RNA, a subsequent negative HCV RNA test result, and without a history of medical treatment. Spontaneous clearance was distinguished as either 'definitive' (i.e. two consecutive negative HCV-RNA test results after a positive HCV antibody or RNA test result), or 'possible' (one negative HCV-RNA test result following an earlier positive HCV antibody or RNA test result).

SVR12
Sustained virological response, defined as a negative HCV RNA test result 12 weeks after treatment discontinuation in individuals treated for prior documented recent or chronic HCV infection.

Hepatitis C reinfection
Detectable HCV RNA after an earlier achieved SVR, or after spontaneous HCV clearance, or documentation of a new infection with a different genotype.

Severe (chronic) liver disease
Presumptive, based on clinically documented evidence of:

- bleeding from gastric or oesophageal varices, hepatic encephalopathy or hepatorenal syndrome, and/or
- chronic liver disease based on radiographically documented or endoscopically documented evidence of the presence of portal hypertension in terms of oesophageal varices, ascites, splenomegaly, and reversal of portal blood flow and/or cirrhosis.

Definitive if there is:

- a liver transplantation, *or*
- presumptive evidence, combined with a pathology, histology, or transient elastography report documenting severe liver fibrosis or cirrhosis (Metavir score F3-F4 or transient elastography stiffness ≥8kPa).

HCV screening over time between 2016 and 2025

In the Netherlands the national guidelines for the treatment and monitoring of HIV recommend HCV screening during the first clinical visit after HIV diagnosis, and additional annual HCV screening for MSM who report behaviour associated with increased risk of acquiring HCV[5].

Of the 27,818[a] individuals who were in care between 2016 and 2025:

- 99% were screened at least once for HCV with anti-HCV or HCV RNA.

a The total number of people screened for HBV differs from the total number screened for HCV, as not all those screened for HBV are also screened for HCV.

Follow-up screening

Individuals with a negative first HCV test

Among individuals who ever had a negative first HCV test and who remained in care for at least one year:

- 82% had a second HCV test at some point during follow up;
- Repeat screening was highest among MSM (90%);
- And lowest for individuals who acquired HIV through heterosexual contact (67%).

As most HCV infections are observed among MSM[6], the following analysis on testing frequency is reported for MSM only.
The median cumulative number of repeated HCV tests among HCV negative MSM was 4 tests (IQR: 2-9).
Overall, the percentage of HCV seronegative MSM with HCV testing in a calendar year:

- Varied between 34% in 2016 and 48% in 2019;
- 36% of the MSM in care were tested for HCV in 2025.

When testing was stratified by age, the highest percentage of testing was seen among MSM under 30 years of age, and testing decreased with increasing age (*Figure 8.1*). From the diagnosis data we known that the median age at diagnosis of recent HCV was 46 years (IQR 39-53) (*Table 8.1A*), while in the age range 40-50 years, 39% had at least one test in 2025.

Individuals with a history of HCV infection

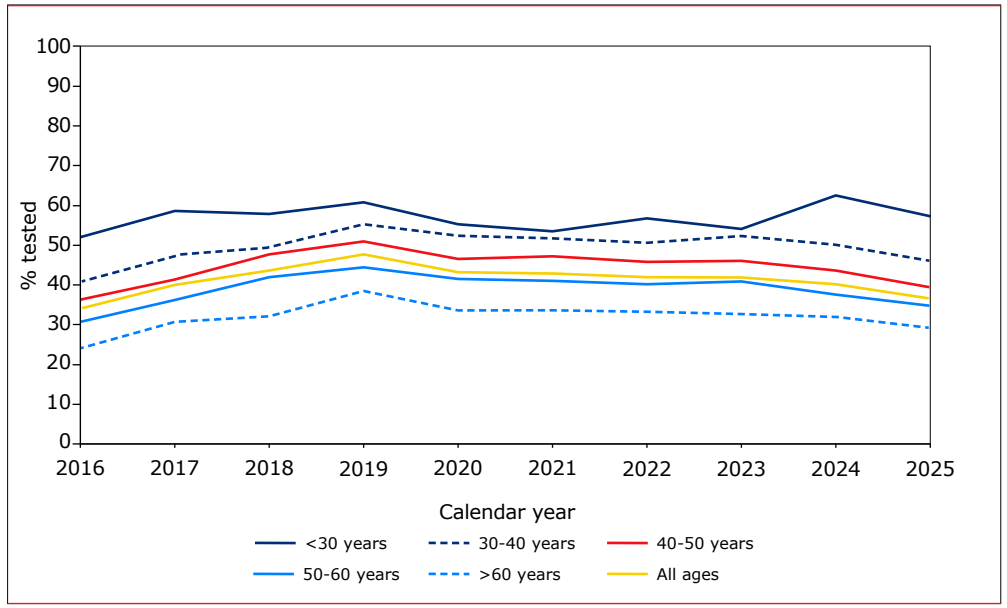
Screening with HCV RNA among those at risk of HCV reinfection is an important factor in identifying HCV reinfection. As most HCV reinfections are observed among MSM[6], the following analysis on testing frequency is reported for MSM only.
Among MSM with HIV at risk of reinfection after treatment-induced or spontaneous clearance of HCV, the percentage of MSM with repeated HCV RNA testing declined from 65% in 2016 to 35% in 2025. The median cumulative number of repeated HCV RNA tests among MSM with a history of HCV was 10 (IQR: 5-16).

Targeted screening, based on the presence of incident transaminase elevations

National guidelines advice additional annual HCV screening for MSM who report behaviour associated with increased risk of acquiring HCV[5]. The above-described HCV RNA follow up testing data may include MSM who are not considered at risk of HCV reinfection anymore by their treating physician. However, we cannot exclude these individuals as data on HCV-related risk-taking behaviour are not available to SHM.

Also of note is that repeated HCV screening among MSM at risk of HCV reinfection might be guided by a policy of targeted screening, based on the presence of incident transaminase elevations as an indicator of liver inflammation. This might be reflected by the observed higher proportion of repeat HCV screening among MSM with elevated transaminase levels (defined as an increase of at least 50% compared to the last measured ALT value). In those at risk of HCV reinfection and incident transaminase elevations, the overall percentage of men with an HCV test following elevated transaminase level varied between 57% and 76% in 2016-2025.

Figure 8.1: *The percentage of men who have sex with men (MSM) without HCV and susceptible to primary HCV infection with an HCV test in a calendar year, stratified by age.*



Number of diagnoses of primary HCV infection and reinfection between 2016–2025

As of 31 December 2025, 27,818 people with HIV (aged 15 years or older at the time of their HIV diagnosis) had been in care between 2016 and 2025 and were registered by Stichting hiv monitoring (*Figure 8.2*). Of those individuals, 27,459 (99%) were screened for HCV co-infection: 2,600 (10%) ever had a positive result with an HCV antibody test and/or HCV RNA test. Of whom 897 (35%) had a first diagnosis of HCV between 2016 and 2025. When focusing on the diagnoses between 2016 and 2025, HCV RNA data were not documented in 31 of the 897 individuals (3%), of whom:

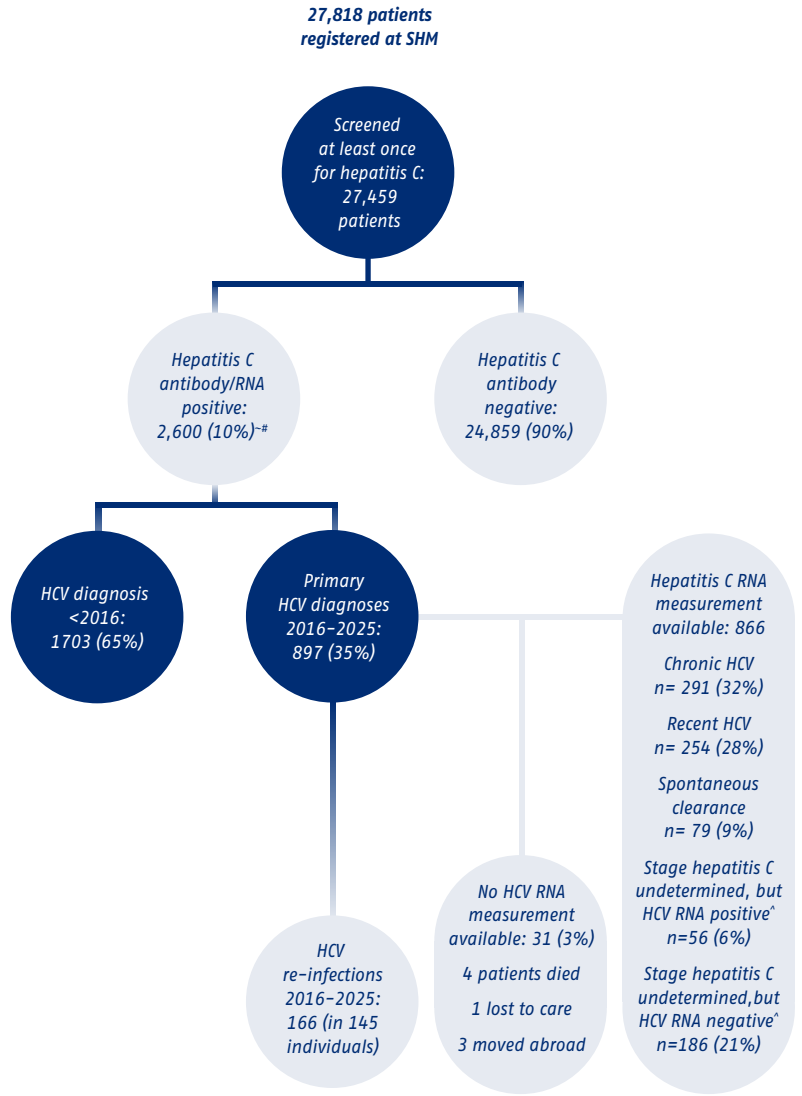
- 4 had died;
- 1 had been lost to care;
- 3 had moved abroad; and
- 23 do not have a known reason for an undocumented HCV RNA outcome.

In total, 897 individuals were diagnosed with HCV infection from 2016 to 2025, and had documented HCV RNA data:

- 291 (32%) were classified as having a chronic HCV infection at the time of their diagnosis;
- 254 (28%) were diagnosed with a recent HCV infection;
- 79 (9%) had evidence of spontaneous clearance of HCV;
- 56 individuals had one positive HCV RNA test result, and no follow-up results, rendering it impossible to determine the stage of their HCV infection at the time of diagnosis (37 individuals are no longer in care and another 9 newly entered care in 2025).
- 186 (21%) had a positive HCV antibody test result accompanied with a negative HCV RNA test.
  - 143/186 (77%) individuals originated from outside the Netherlands, mainly from eastern and central Europe (n=102).
  - 14/186 (8%) newly entered care in 2025 and all but five individuals originated from outside the Netherlands.

Between 2016 and 2025, 166 HCV reinfections occurred in 145 individuals (*Figure 8.2*).

Figure 8.2: Flowchart of individuals with HIV in care and diagnosed with hepatitis C virus (HCV) between 2016–2025.



~ including patients who are HCV RNA positive, but with no known HCV antibody data
 # including documented seroconversion
^ excluded from further analyses

Demographic characteristics of individuals with a primary HCV diagnosis between 2016 and 2025

In total, 545/866 individuals could be definitively classified as having either chronic (n=291), or recent (n=254) HCV infection at the time of their primary HCV diagnosis. Most of these were male (84% and 99%, respectively).

Most individuals with chronic HCV were not born in the Netherlands (*Table 8.1A*), 34% of the individuals diagnosed with chronic HCV between 2016 and 2025 originated from Eastern Europe and 12% from Central Europe. Eighteen percent (51/291) of the individuals with chronic HCV reported (former) injecting drug use. Another 19% reported heterosexual contact as the most likely mode of HIV transmission. However, the mode of transmission for HCV is mostly unknown and may differ from the reported HIV transmission mode.

Among the individuals with a recent HCV infection, 69% was born in the Netherlands and 90% were MSM.

Table 8.1A: *Demographic characteristics of individuals with HIV and diagnosed with a chronic or recent HCV infection between 2016–2025.*

HCV status		Chronic HCV	Recent HCV
Total N (%)		291	254
Age at HCV diagnosis	Median (IQR)	41.9 (35.1 to 49.1)	46.4 (39.0 to 53.2)
Gender at birth	men	243 (83.5)	252 (99.2)
	women	48 (16.5)	2 (0.8)
Region	Netherlands	82 (28.2)	174 (68.5)
	Caribbean/South America	26 (8.9)	25 (9.8)
	Sub-Saharan Africa	11 (3.8)	1 (0.4)
	Western Europe	21 (7.2)	18 (7.1)
	Other	4 (1.4)	10 (3.9)
	Central Europe	36 (12.4)	9 (3.5)
	Southeast Asia	13 (4.5)	10 (3.9)
	Eastern Europe	98 (33.7)	7 (2.8)
HIV transmission route	Men who have sex with men	147 (50.5)	229 (90.2)
	Heterosexual	54 (18.6)	12 (4.7)
	Other	39 (13.4)	11 (4.3)
	People who use/used injecting drugs	51 (17.5)	2 (0.8)
ART	ART	287 (98.6)	254 (100.0)

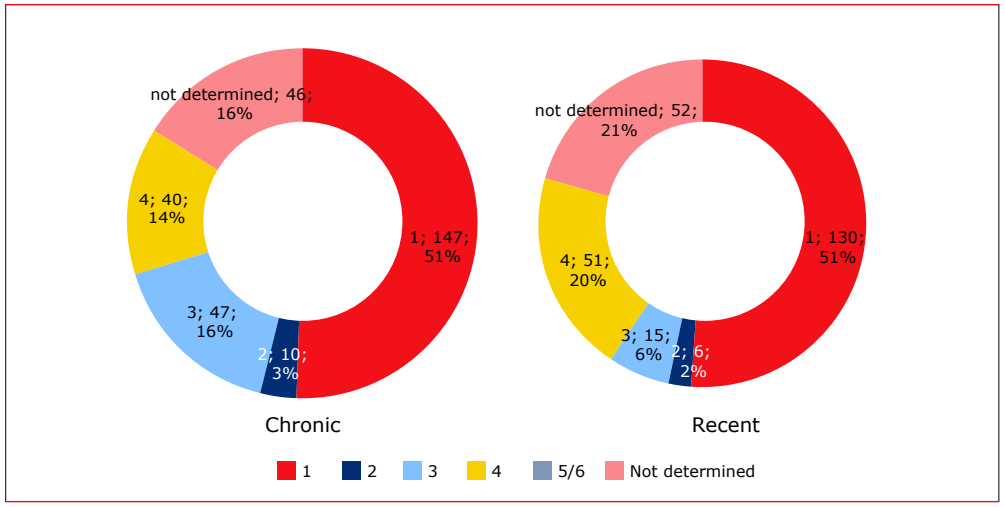
Legend: *n = total for each category; (%) = percentage of the total for each column; HCV = hepatitis C virus; ART = combination antiretroviral therapy.*

The HCV genotype was determined and documented in the clinical records of 447 of the 545 (82%) individuals with chronic or recent HCV. *Figure 8.3* shows the genotype distribution.

Table 8.1B: *Number of HCV diagnoses between 2016–2025.*

Year of diagnosis	Primary HCV infection				HCV reinfection	Total
	Chronic HCV	Recent HCV	Spontaneous clearance of HCV	HCV status, undetermined		
2016	43	53	7	5	25	133
2017	26	47	8	10	32	123
2018	38	28	7	3	31	107
2019	22	40	6	7	18	93
2020	17	21	6	0	8	52
2021	22	15	6	1	14	58
2022	52	8	15	8	3	86
2023	35	17	9	7	12	80
2024	24	12	7	2	11	56
2025	12	13	8	13	12	58
Total	291	254	79	56	166	846

Figure 8.3: *Frequency of HCV genotypes among individuals with a primary HCV diagnosis between 2016–2025, stratified by chronic and recent HCV.*



Changes over time

Number of diagnoses of primary HCV and reinfection

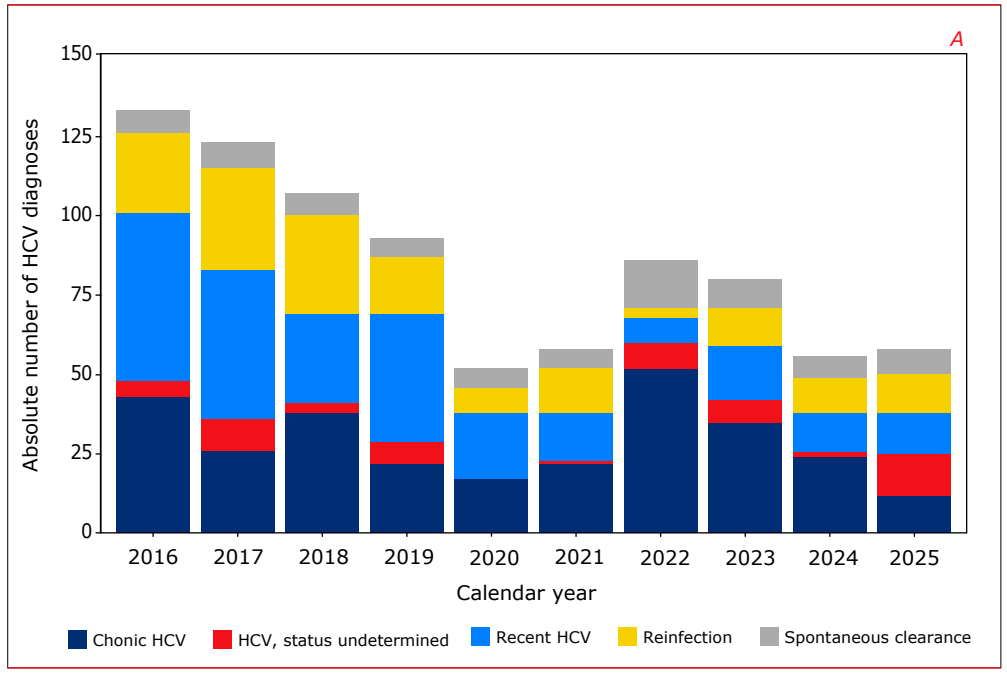
Between 2016 and 2025, 846 HCV diagnoses with detectable HCV RNA occurred (680 primary infections and 166 reinfections). The annual number of primary HCV diagnoses (ie with detectable HCV RNA) and HCV reinfection decreased from 133 cases in 2016 to 86 and 80 in 2022 and 2023, respectively. The decreasing trend continued through 2025, reaching 58 cases, including 12 reinfections (*Table 8.1B*, *Figure 8.4A*).

Of the HCV diagnoses with detectable HCV RNA between 2016 and 2025, 382 (45%) originated from the Netherlands, 19% from Eastern Europe, 8% from Western Europe and 9% from Central Europe. However, the number of individuals born in the Netherlands decreased and in 2025, 36% of the individuals originated from other European countries than the Netherlands (*Figure 8.4B*). Most reported countries in this region were Ukraine (7, 12%) and Poland (5, 9%). Many individuals with an HCV diagnosis were MSM (*Figure 8.4C*).

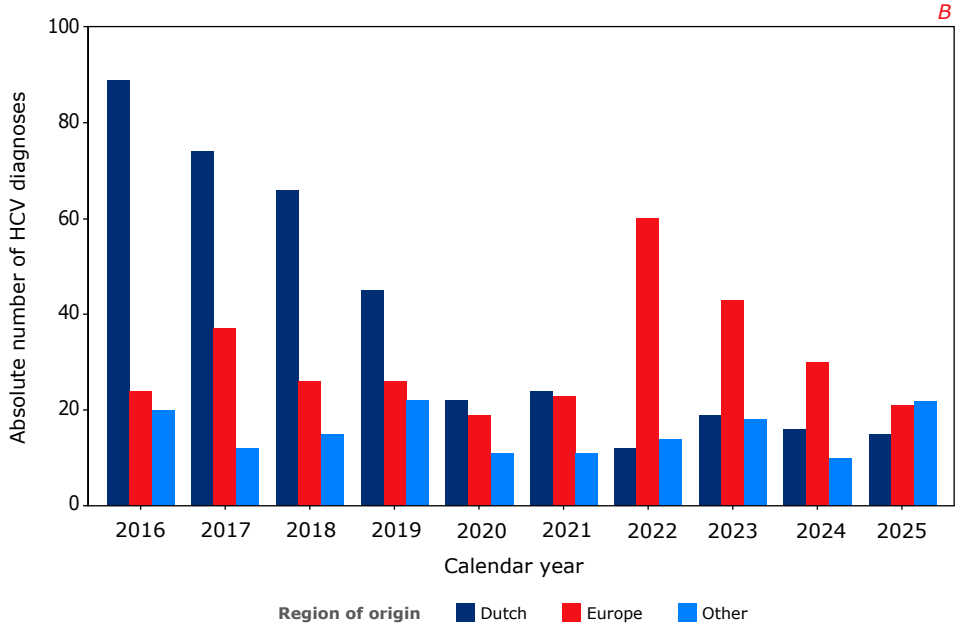
Prevalence of detectable HCV RNA

Figure 8.4D shows the percentage of individuals with detectable HCV RNA over time. Individuals contributed follow-up time to the analysis if they were screened for HCV and in care between 2016 and 2025. HCV RNA positivity was based on the last available HCV RNA test result before the end of that calendar year. The overall percentage of individuals with detectable HCV RNA decreased from 1.5% in 2016 to 0.3% in 2025. In MSM, the highest percentage of HCV RNA positivity was 1.0% in 2016; by 2022, the percentage of positive HCV RNA in this group had decreased to 0.2% and stabilizes around the 0.2% in the most recent years.

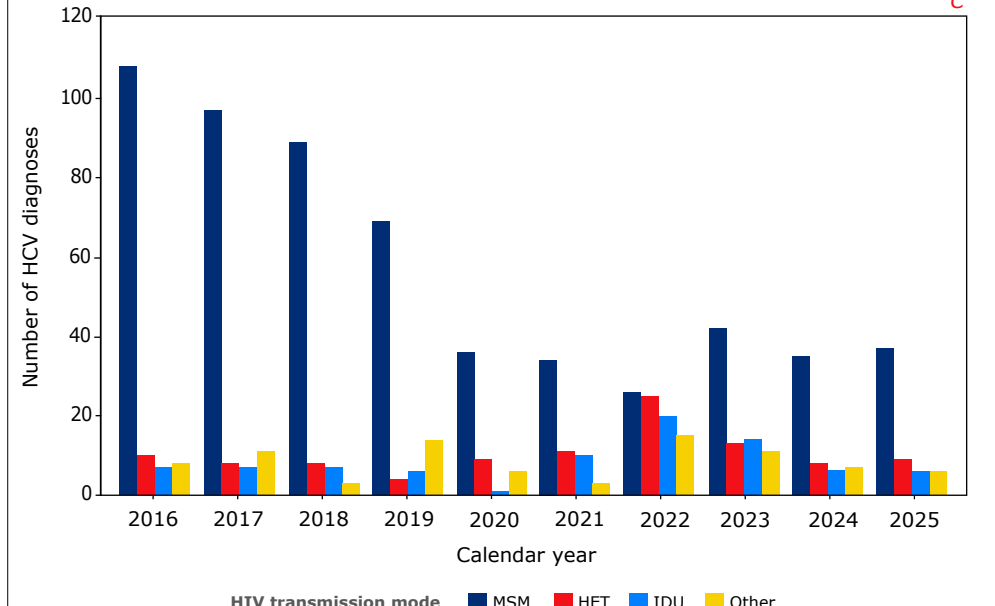
Figure 8.4: *A) Absolute number of diagnoses of hepatitis C virus (HCV) co-infection with detectable HCV RNA, B) number of HCV diagnoses of HCV with detectable HCV RNA, stratified by region of origin, C) Percentage of HCV diagnoses with detectable HCV RNA stratified by HIV transmission group, and D) detectable HCV RNA, per calendar year*



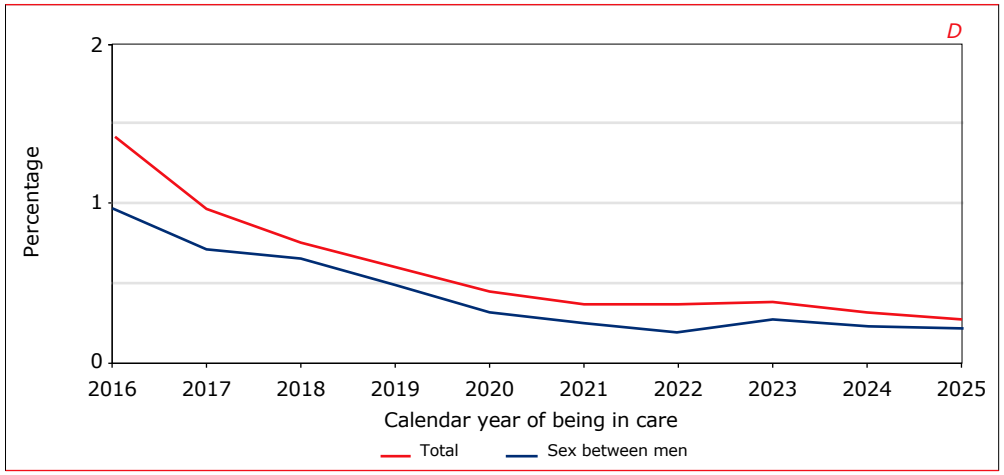
B


Absolute number of HCV diagnoses
100
80
60
40
20
0
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Calendar year
Region of origin
Dutch
Europe
Other

C


Number of HCV diagnoses
120
100
80
60
40
20
0
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Calendar year
HIV transmission mode
MSM
HET
IDU
Other

D


Percentage
2
1
0
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Calendar year of being in care
Total
Sex between men

Incidence of new HCV infections

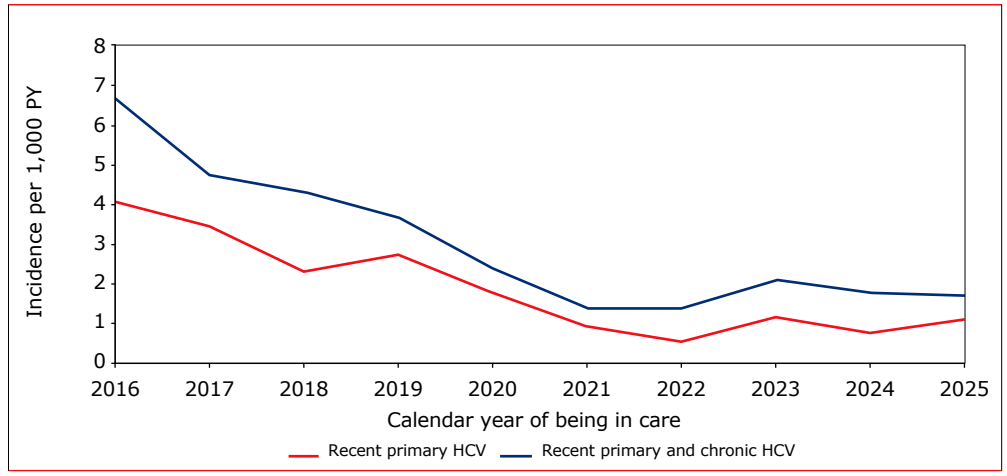
The incidence of primary infection is calculated for individuals with a first documented HCV infection, based on the date of their first positive HCV antibody or HCV RNA test result. The definition of recent HCV infection is consistent with the one given in the European AIDS Treatment Network's (NEAT) preferred criteria[7]. We have expanded this definition to include alternative criteria[3,4]. This alternative definition is based on (i) detectable HCV RNA associated with an acute rise in alanine aminotransferase (ALT) greater than five times the upper limit of normal (above 200 U/l), and (ii) a documented normal ALT within the past 12 months, together with (iii) no change in antiretroviral regimen in the last six months.

There were important differences in the incidence of primary recent HCV infection in terms of HIV transmission category. Between 2016 and 2025, most recent HCV infections occurred in MSM (n=229/254 [90%]). In contrast to the high prevalence of HCV in PWID or former PWID, the overall incidence of recent HCV in this group was low, occurring in only two PWID or former PWID. This is probably due to the high background prevalence of HCV infection in former PWID, the fact that injecting drug use has become very uncommon in the Netherlands, and the effective harm-reduction programmes implemented in addictive care centres in the Netherlands. Twelve cases occurred among individuals who had acquired HIV heterosexually (*Table 8.1A*).

Figure 8.5 shows both the incidence of recent primary HCV infection and all primary HCV diagnoses among MSM over time. Between 2016 and 2025, the overall rate of primary HCV infection was 2.59 per 1,000 person years (PY) (95% confidence interval [CI]2.37-2.82). The incidence of primary infection decreased from 6.63 per 1,000 PY (95% CI 5.23-8.27) in 2016 to 1.62 per 1,000 PY (95% CI 0.97-2.53) in 2025.

When looking at those with recent HCV, the overall rate of recent HCV infection, including cases with a rise in ALT levels, among MSM was 1.78 per 1,000 PY (95% CI 1.56-2.03). The incidence of recent HCV infection decreased from 4.00 cases per 1,000 PY (95%CI 2.93-5.31) in 2016 to 1.02 cases per 1,000 PY (95%CI 0.52-1.78) in 2025.

Figure 8.5: *Incidence of recent primary hepatitis C infection (blue line) and all primary recent and chronic HCV diagnoses (red line) among men who have sex with men per calendar year.*



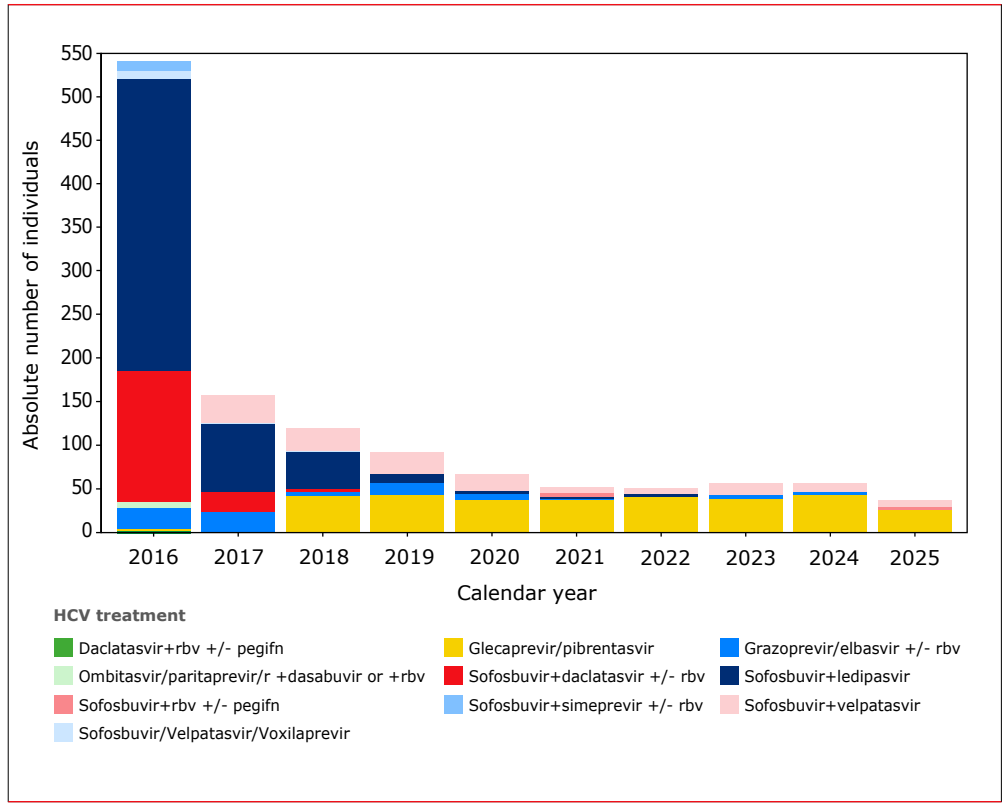
Legend: *HCV = hepatitis C virus.*

HCV treatment

The primary aim of HCV treatment is to achieve a sustained virological response (SVR)[8]. Since 2012, the introduction of the first generation of direct acting agents (DAA) improved the HCV treatment efficacy[9,10] and efficacy was further improved with the introduction of all-oral DAAs from 2014 onwards. Initially, with government restrictions, only for a defined group of individuals with severe liver fibrosis and cirrhosis. And by the end 2015, it was made available for all individuals with chronic HCV, regardless of fibrosis state. An overview of DAA-containing HCV treatment combinations currently available in the Netherlands can be found at https://hcvrichtsnoer.nl/.

Of the individuals ever diagnosed with primary chronic, recent HCV, or a reinfection, 1,091 received HCV treatment between 2016 and 2025; with in total 1220 treatment episodes with all-oral direct-acting antiviral treatment (DAAs), including those who received HCV treatment more than once (people who were unsuccessfully treated and those who reacquired HCV after prior successful treatment).

Figure 8.6: Number of individuals with HIV/HCV starting hepatitis C treatment per calendar year.



Legend: HCV=hepatitis C virus; RBV=ribavirin; PEG-IFN=pegylated interferon.

Treatment with DAAs

Figure 8.6 shows the annual number of individuals initiating HCV treatment. Between 2016 and 2025, a total of 1,091 individuals were documented as having started a DAA regimen; 108 of these received more than one episode of DAA treatment, resulting in 1,220 treatment episodes overall. The most frequent indications for repeated DAA treatment were reinfection following DAA treatment-induced clearance (n=74), and patient preference (n=12), and treatment related toxicity (n=8). Of the total 1,220 DAA treatment episodes, 540 were in 2016. The number of treatment episodes subsequently decreased to 36 in 2025 (*Figure 8.6*).

The most frequently used DAA regimens were:

1. sofosbuvir plus ledipasvir +/- RBV (n=476);
2. pibrentasvir/glecaprevir (n=306), most commonly used since 2020;
3. sofosbuvir plus daclatasvir +/- RBV (n=175);
4. sofosbuvir plus velpatasvir (n=140).

Treatment outcomes

1,205 out of 1,220 DAA treatment episodes had been completed at least 12 weeks prior to the database lock. In 1,194 treatment episodes follow up HCV RNA data was available, and in 11 there was no data after treatment completion:

- In 1,171 of the 1,194 treatment episodes (98%), SVR12 was achieved.
- No SVR was achieved in 23 treatment episodes among 23 individuals.

- For the remaining 11 treatment episodes, no follow-up data on SVR were available: three people died after being treated and 6 cases had a last clinical visit shortly after treatment discontinuation. For the remaining two cases there were no reported HCV RNA tests available.

SVR rates were lower in individuals with severe liver disease (99% vs 96%). In terms of HIV transmission risk groups, SVR rates were 99% among MSM, 97% among PWID or former PWID, and 96% among individuals who acquired HIV through heterosexual contact.

Among the 23 individuals who did not achieve SVR:

- 19 were successfully retreated with another DAA regimen;
- 4 were not retreated:
  - one individual died;
  - one moved abroad;
  - and for the remaining individuals, the reason for not being retreated is unknown.

- In total, 6 mutations among 4 individuals were identified among the individuals who did not achieve SVR.
  - 4 mutations in the NS5A region (30R, 93.S, T58P, T99S)
  - 2 mutations in the NS3 region (S122T, I/V1701, Q80K)

HCV reinfection

Reinfection with HCV following successful treatment or spontaneous clearance has been reported mainly in MSM with HIV[19]. High reinfection rates have been observed in MSM in the Netherlands, Germany[20] and the United Kingdom[21,22].

To identify possible HCV reinfections among individuals with a prior HCV infection, we selected those who had initially achieved SVR after receiving any type of HCV treatment, as well as individuals with spontaneous clearance of HCV.

Between 2016 and 2025, 2,124 individuals met the above criteria (1805 after SVR, 319 after spontaneous clearance). Among these, 166 reinfections were documented in 145 individuals. The median time from SVR or spontaneous clearance to HCV reinfection was 1.6 years (IQR 0.6-3.0). There was an increase in the time to reinfection from less than one year in 2016 to 4 years in 2025.

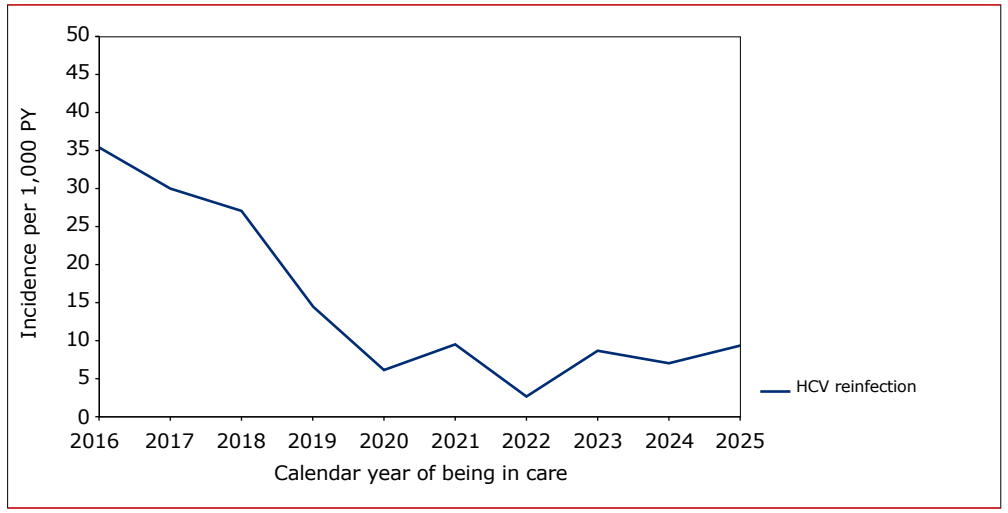
Most reinfections occurred in MSM (148 out of 166, 89%). And six reinfections were observed in PWID or former PWID (4%). Among the remaining 12 reinfections, documented HIV transmission routes were heterosexual contact (n=5) and other or unknown (n=7).

Of the 166 reinfections, 9 (5%) cleared spontaneously and 132 (80%) were subsequently retreated. The median time from reinfection to retreatment was 4 months (IQR 2-8).

We calculated the incidence of reinfection for the period 2016 and 2025. Follow-up time was calculated from the date of SVR, the date of spontaneous clearance, or from 1 January 2016, until the earliest date of HCV reinfection, death, or last known contact. In the total population, the incidence of HCV reinfection was 11 reinfections per 1,000 PY (95% CI 9-13), and for MSM it was 14 reinfections per 1,000 PY (95% CI 12-16).

Because most reinfections occurred among MSM, trends in HCV reinfection incidence are presented for MSM only (*Figure 8.7*). Among MSM, the incidence decreased from 35 reinfections per 1,000 PY in 2016 to 14 per 1,000 PY in 2019 and then declined to 7 reinfections per 1,000 PY in 2024, and 9 per 1,000 PY in 2025.

Figure 8.7: *Incidence of hepatitis C reinfection after earlier treatment-induced and spontaneous clearance among men who have sex with men, per calendar year.*



Legend: *HCV = hepatitis C virus; PY = person year.*

Continuum of care for those with diagnosed HCV

Figure 8.8 presents the HCV continuum of care among individuals known to be in HIV care as of 31 December 2025 and who had an HCV diagnosis between 2016 and 2025 or an uncleared HCV infection diagnosed before 2016. Individuals were categorised according to their last documented HCV infection episode. In total 1,496 individuals were linked to HIV care with an active HCV infection between 2016 and 2025, 1,011 individuals had primary HCV infection, and 123 individuals had an HCV reinfection.

Of the 1,496 individuals linked to HIV care:

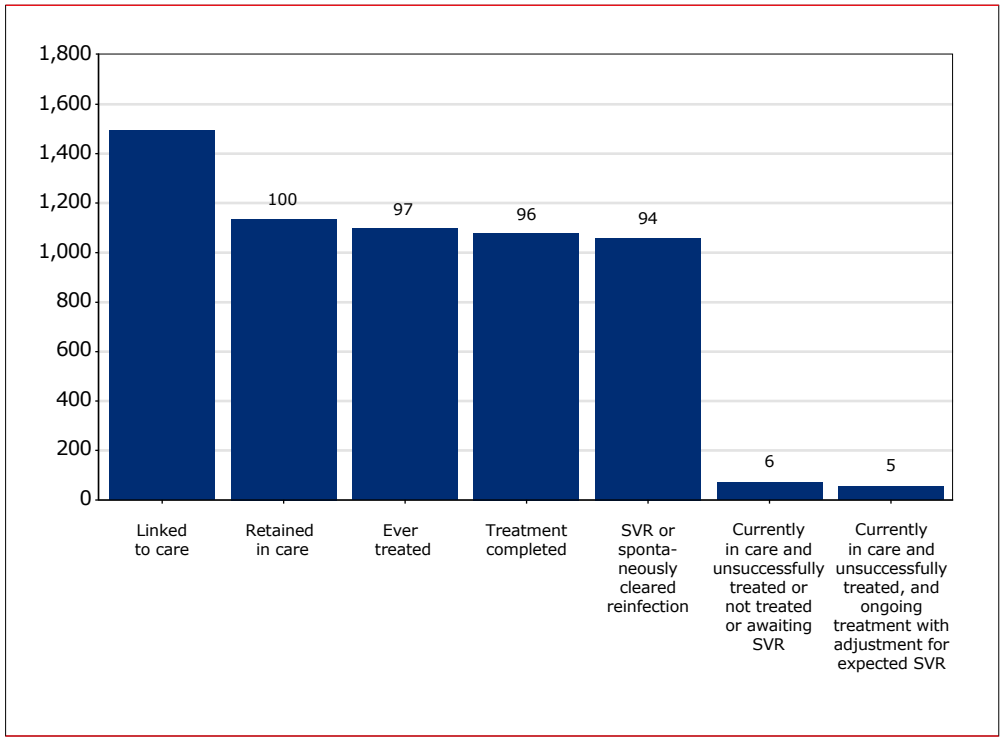
- 1,134 (76%) were retained in care;
- 362 individuals were no longer in care (157 had died; 108 had moved abroad; and 97 were lost to care). Among the 213 individuals who were lost to care or who moved abroad:
  - 151 had a negative HCV RNA test result before they left care; and
  - for 73 individuals the last HCV RNA measurement was detectable
- 1,097 (97%) of those still alive and in care had received treatment for HCV
- 1,083 (96%) of those still alive, in care, had completed HCV treatment and had available data to assess treatment response (SVR12).

Overall, 1,061(98%) of the 1,083 people in care in 2025 who completed treatment achieved SVR, including those who were successfully retreated after prior treatment failure. An additional 3 individuals with HCV reinfection had a negative last HCV RNA result without documentation of HCV treatment, suggesting spontaneous clearance of HCV. This yields a total of 1,064 individuals with either treatment-induced or spontaneous clearance of their most recent HCV episode.

The remaining 70 (6%) of 1,134 individuals known to be alive and in care on 31 December 2025, were still in need of HCV treatment (n=56) or awaiting confirmation of SVR after treatment (n=14). Of these, 34 (3%) individuals had never received HCV treatment, eight were born in the Netherlands, and 17 were born in central or eastern Europe. Thirty-three individuals were receiving ART. The proportion of individuals who remained untreated for HCV was higher among PWID (7%), those who acquired HIV through heterosexual contact (9%), and those with an unknown HIV transmission mode (3%), compared with MSM (1%).

For 14/70 individuals SVR could not yet be determined: all had been treated with novel DAA combinations. We therefore extrapolated the observed DAA SVR rate and assumed that 98% of the 14 individuals will achieve SVR. Under this assumption, an estimated 56 (70-14=56) remain in need of HCV treatment or have experienced unsuccessful treatment.

Figure 8.8: Hepatitis C continuum of care including individuals in care with an active HCV infection between 2016 and 2025. (Percentages of those who retained in care are reported at the top of each bar).



Legend: SVR=sustained virological response.

Liver-related morbidity and mortality in individuals with HCV

Additional data from liver biopsy pathology reports, transient elastography, radiology reports, or a combination of those sources, were available for:

- 1,726 of the 2,049 individuals in care between 2016 and 2025 and ever diagnosed chronic or recent HCV;
- 451/1,726 (26%) individuals had evidence of severe chronic liver disease (presumptive and definitive categories combined);
- definitive severe chronic liver disease was documented for 102 (6%) individuals with HCV co-infection.

Data on hepatocellular carcinoma (HCC) showed that between 2016 and 2025:

- 9 (0.4%) cases of hepatocellular carcinoma (HCC) were reported among 2,049 individuals with HCV and without other viral hepatitis (i.e. HBV or HDV).
- 3 of the 9 individuals with HCC were born in the Netherlands.
- No cases of HCC were reported among DAA treated individuals without cirrhosis or fibrosis.

Between 2016 and 2025, among the 2,049 individuals with HCV:

- 230 (11%) deaths from any cause occurred;
- 20 (1%) deaths were liver related.
  - 17 individuals who died of a liver-related cause were treated for HCV (13 with DAAs and 4 with older regimens).
  - 19/20 individuals were known to have liver cirrhosis.

Hepatitis B virus

Hepatitis B is a vaccine-preventable disease caused by the hepatitis B virus (HBV). HBV may be sexually or parenterally transmitted and causes both acute and chronic hepatitis. The following sections describe HBV epidemiology among 27,818 ATHENA cohort participants who had at least one HIV care visit between 2016 and 2025.

We used three serological markers of HBV infection to determine an individual's HBV clinical state: hepatitis B surface antigen (HBsAg), anti-hepatitis B surface antibodies (anti-HBs), and anti-hepatitis B core antibodies (anti-HBc). For each participant, we determined the HBV serological profile by combining assay results across time. When all three assays were available or when HBsAg was positive, we designated the serological profile as "interpretable" (see *Box 9B*). Otherwise, the profile was considered incomplete.

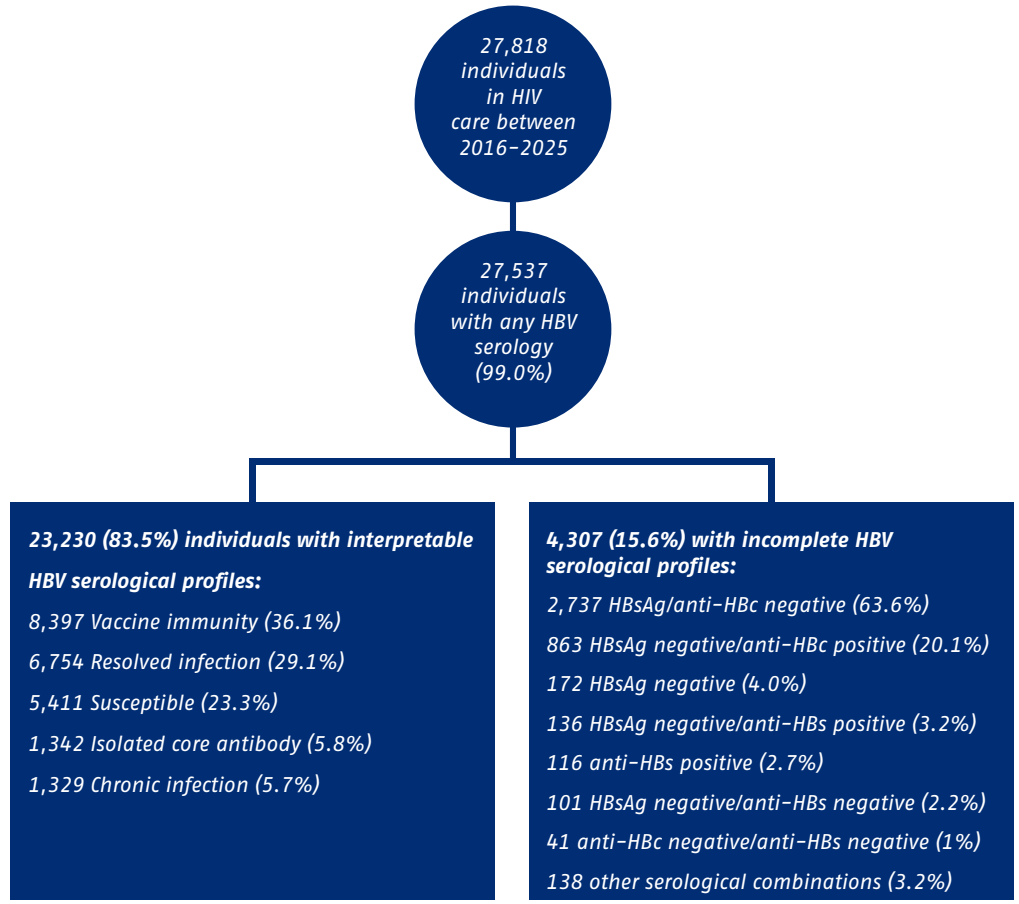
***Box 8B:** Interpretation of HBV serological profiles*

HBV Clinical state	HBsAg	Anti-HBs	Anti-HBc
Chronic infection	Positive >= 6 months	Negative or missing	Any value or missing
Resolved infection	Negative	Positive	Positive
Vaccine-derived immunity	Negative	Positive	Negative
Susceptible, never infected	Negative	Negative	Negative
Isolated core antibody positive	Negative	Negative	Positive

HBV serological profiles

Of 27,818 participants in care, 27,537 (99.0%) had any of the three key HBV serological markers performed at any time and 23,233 (83.5%) had interpretable serological profiles. The serological profiles of the 27,537 participants who underwent HBV testing is show in *Figure 8.9*.

***Figure 8.9:** HBV serological profiles among participants in care, 2016–2025 (n = 27,357).*



Of 23,233 participants with interpretable serological profiles, 8,397 (36.1%) had a profile consistent with vaccine acquired immunity, 6,754 (29.0%) with resolved infection, 1,342 (5.8%) had isolated anti-HBc, and 5,411 (23.3%) remained HBV susceptible by serology.

HBsAg testing was performed in 27,242 participants; of these, 1,370 (5.0%) were ever positive. To distinguish between participants with acute versus chronic HBV, we reviewed the duration of HBsAg positivity. We considered HBV infection to be acute if the following two conditions were present: 1) documented negative HBsAg followed by surface antigenemia; 2) documented clearance of HBsAg within 180 days of first detection. HBsAg antigen clearance was defined as at least two negative HBsAg assays, or a single negative HBsAg with a positive anti-HBs. Individuals with surface antigenemia lasting 180 days or more, or in whom the duration could not be ascertained, were categorized as having chronic HBV.

Forty-one participants met our criteria for acute HBV. The remaining 1,329 had evidence of HBsAg antigenemia lasting >=180 days or of unknown duration and are discussed in greater detail in the section on chronic HBV.

The demographic characteristics of people with interpretable HBV profiles are shown in *Table 8.2.*

Table 8.2: *Demographic characteristics of participants with interpretable HBV profiles (n=23,230)*

	Chronic (N=1329)	Immunized (N=8397)	Resolved (N=6754)	Susceptible (N=5411)	Isolated core (N=1342)
Gender					
Male	1138 (85.6%)	7331 (87.3%)	5810 (86.0%)	3882 (71.7%)	987 (73.5%)
Female	191 (14.4%)	1066 (12.7%)	944 (14.0%)	1529 (28.3%)	355 (26.5%)
Transmission group					
MSM	781 (58.8%)	6097 (72.6%)	4637 (68.7%)	2359 (43.6%)	542 (40.4%)
Heterosexual	384 (28.9%)	1641 (19.5%)	1457 (21.6%)	2405 (44.4%)	527 (39.3%)
Unknown	81 (6.1%)	303 (3.6%)	277 (4.1%)	373 (6.9%)	111 (8.3%)
Sexual transmission NOS	33 (2.5%)	209 (2.5%)	137 (2.0%)	127 (2.3%)	25 (1.9%)
PWID	34 (2.6%)	52 (0.6%)	152 (2.3%)	53 (1.0%)	113 (8.4%)
Other	16 (1.2%)	95 (1.1%)	94 (1.4%)	94 (1.7%)	24 (1.8%)
Birth region					
Netherlands	584 (43.9%)	4499 (53.6%)	3488 (51.6%)	2890 (53.4%)	453 (33.8%)
Latin America and Caribbean	177 (13.3%)	1309 (15.6%)	926 (13.7%)	782 (14.5%)	138 (10.3%)
Sub-Saharan Africa	296 (22.3%)	501 (6.0%)	1010 (15.0%)	612 (11.3%)	444 (33.1%)
W Europe, N America, Australia	73 (5.5%)	785 (9.3%)	492 (7.3%)	263 (4.9%)	87 (6.5%)
Central and Eastern Europe	91 (6.8%)	649 (7.7%)	356 (5.3%)	477 (8.8%)	123 (9.2%)
South and East Asia	82 (6.2%)	369 (4.4%)	362 (5.4%)	179 (3.3%)	63 (4.7%)
N Africa and Middle East	21 (1.6%)	237 (2.8%)	96 (1.4%)	174 (3.2%)	29 (2.2%)
Unknown	5 (0.4%)	48 (0.6%)	24 (0.4%)	34 (0.6%)	5 (0.4%)
Died					
No	1182 (88.9%)	8021 (95.5%)	6065 (89.8%)	4979 (92.0%)	1212 (90.3%)
Yes	147 (11.1%)	376 (4.5%)	689 (10.2%)	432 (8.0%)	130 (9.7%)

MSM, men who have sex with men; NOS, not otherwise specified; PWID, people who inject drugs; W, Western; N, North.

Chronic HBV

A total of 1,329 participants had a history of chronic HBV. Of these 348 (26.1%) had sustained loss of HBsAg during the observation period, while 981 (73.8%) remained antigenemic (877) or had a single negative HBsAg assay with no further follow up (104). Two hundred and sixteen participants (15.5%) lost HBsAg and seroconverted to anti-HBs positive. HBV viral DNA measurements were available in 1097 (82.5%) participants with a history of chronic HBV, of which 915 (83.4%) were undetectable (≤ 20 copies/ml or below the threshold of detection for assays using a higher cutoff).

Table 8.3 summarizes the clinical characteristics of participants with a history of chronic HBV, by serological status at last observation. Probable or definite severe liver disease was documented in 233 (17.8%) of participants with a history of chronic HBV, of whom 103 (7.8%) had documented cirrhosis and 15 had hepatocellular carcinoma (for the definition of severe disease see Box 8.1). One hundred and forty-seven deaths occurred among participants with a history of chronic HBV, of which 11 (7.5%) were attributable to liver-related causes. As a proportion of the 1,329 participants with a history of chronic HBV, less than 0.8% died of liver-related causes.

Table 8.3: *Laboratory and clinical characteristics of participants with a history of chronic HBV (n = 1,329).*

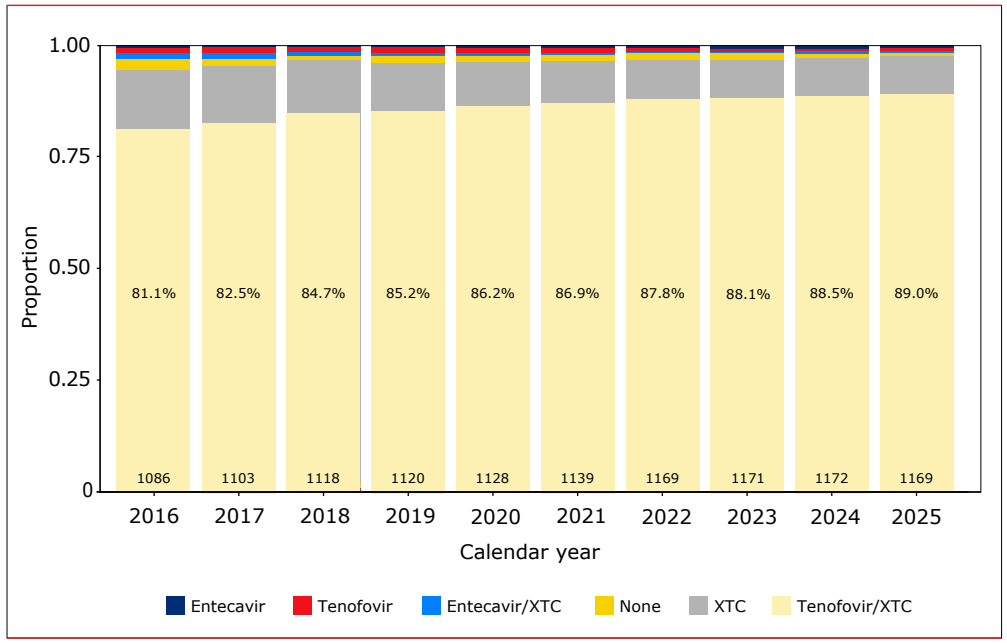
	HBsAg+ (n=981)	HBsAg-/anti-HBs+ (n=216)	HBsAg-/anti-HBs- (n=132)	Total (n=1,329)
HBV DNA below level of detection				
Missing	106	89	37	232
Yes	722 (82.5%)	112 (88.2%)	81 (85.3%)	915 (83.4%)
No	153 (17.5%)	15 (11.8%)	14 (14.7%)	182 (16.6%)
Cirrhosis				
No	902 (91.9%)	206 (95.4%)	118 (89.4%)	1226 (92.2%)
Yes	79 (8.1%)	10 (4.6%)	14 (10.6%)	103 (7.8%)
Severe liver disease				
None/not documented	788 (80.3%)	195 (90.3%)	110 (83.3%)	1093 (82.2%)
Probable	144 (14.7%)	14 (6.5%)	12 (9.1%)	170 (12.8%)
Confirmed	49 (5.0%)	7 (3.2%)	10 (7.6%)	66 (5.0%)
Hepatocellular carcinoma				
No	967 (98.6%)	215 (99.5%)	132 (100.0%)	1314 (98.9%)
Yes	14 (1.4%)	1 (0.5%)	0 (0.0%)	15 (1.1%)
Death from any cause				
No	870 (88.7%)	188 (87.0%)	124 (93.9%)	1182 (88.9%)
Yes	111 (11.3%)	28 (13.0%)	8 (6.1%)	147 (11.1%)

Treatment of chronic hepatitis B

The goal of HBV treatment is to reduce viral replication and prevent hepatic inflammation and liver disease progression[11]. Suppression of HBV DNA has been shown to reduce the risk of HCC and overall mortality in individuals with HIV/HBV coinfection[12, 13]. Antiretroviral agents with activity against HBV include the cytidine analogues lamivudine and emtricitabine, and tenofovir prodrugs.

HBV treatment data was available in 1,325 of 1,329 individuals ever diagnosed with chronic HBV. *Figure 8.10* shows changes in prescribed HBV treatment regimens over the past decade. For each calendar year, we included participants with ongoing surface antigenemia, defined as the presence of HBsAg in the most recent available serology or no evidence of HBsAg clearance (i.e. a single negative assay at last check with no evidence of anti-HBs). In 2016, 81.1% received a regimen containing tenofovir and a cytidine analogue while 13.3% were treated with a suboptimal regimen containing a cytidine analogue only. In 2025, 89.0%% were treated with tenofovir and a cytidine analogue while 8.5% were treated with a cytidine analogue only.

Figure 8.10: *Evolution of HBV treatment strategies among participants with HBsAg positive serology (n = 1,323).*



Numbers below bars represent the number of participants with surface antigenemia XTC, 3TC/TFC.

Coinfection with other hepatitis viruses

People with chronic hepatitis B may be coinfected with other hepatitis viruses, including hepatitis C, D, and E[14].

HCV, HDV and HEV testing was performed in 1,324 (99.6%), 892 (67.1%), and 168 (12.6%) participants with chronic HBV, respectively. One hundred and twelve participants (8.4%) had a history of HBV-HCV coinfection. Fifty-four participants (4.1%) had evidence of HBV-HDV coinfection by either positive antibody or RNA; of these, 22 had evidence of HDV viremia. Nine participants had a history of HBV-HCV-HDV triple infection. Sixteen participants with chronic hepatitis B had evidence of past HEV infection but none had evidence of chronic HBV-HEV coinfection.

HBV vaccination

Dutch guidelines recommend HBV immunization in MSM[15]. We estimated the proportion of MSM entering HIV care with evidence of HBV immunity acquired through vaccination or prior infection. For each participant, we reviewed data available at care entry using the baseline questionnaire, pre-entry vaccine records, and laboratory results obtained before or within 30 days of the first visit. We excluded participants with evidence of chronic or acute HBV at care entry from the analysis.

Participants were considered to have infection-acquired immunity if they had evidence of anti-HBc and anti-HBs antibodies. Participants who had isolated core positivity with no additional serological, immunization, or baseline questionnaire data were considered non-immune.

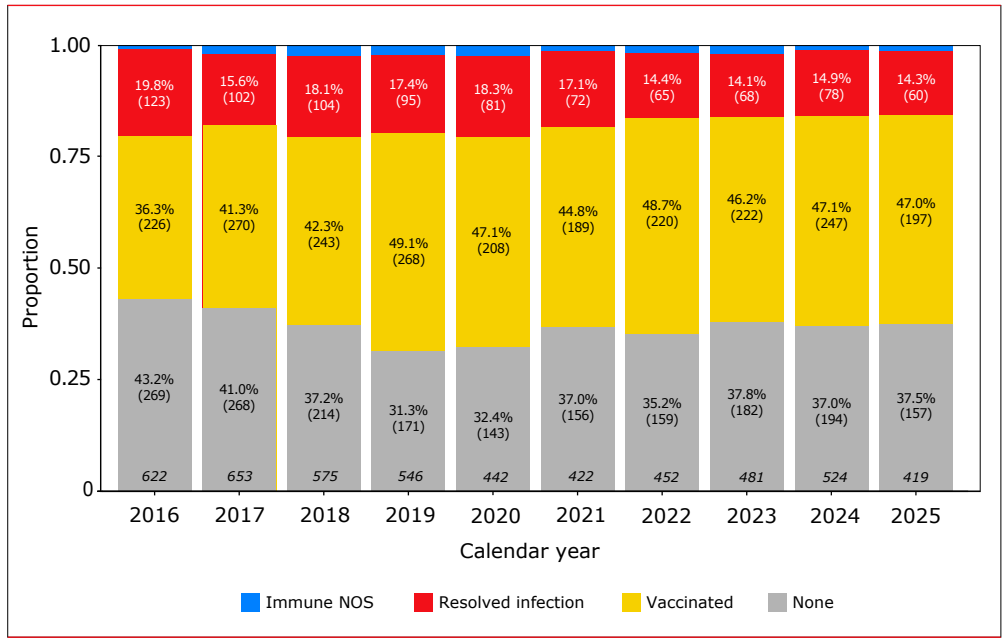
Participants were considered to have been vaccinated or have vaccine-acquired immunity if they received 3 or more doses of a hepatitis B-containing vaccine, were recorded to have been vaccinated on the baseline questionnaire, or had a serological profile consistent with HBV vaccination (anti-HBc negative and anti-HBs positive). Participants with evidence of immunity by serology and HBV vaccination were considered vaccinated. Participants with no vaccine or laboratory data but a recorded history of immunity to HBV on the baseline questionnaire, were assigned to an "immune, not otherwise specified category".

For the subset of participants without evidence of HBV vaccination or immunity at care entry, we calculated the proportion with HBV immunity among those who remained in care through 2025.

A total of 5262 MSM entered care between 2016 and 2025, of whom 126 (0.04%) had evidence of acute or chronic HBV at care entry, leaving 5,136 participants in the analysis. Of these, 2,290 (44.6%) had evidence of vaccination or vaccine-acquired immunity, 848 (16.5%) had evidence of prior infection or infection-acquired immunity, and in 1,913 (37.2%) there was no evidence of vaccination, vaccine-acquired, or infection-acquired immunity. Between 2016 and 2025, the proportion of participants with evidence of HBV vaccination or vaccine-acquired immunity at care entry increased from 36.3% to 47.0% ($p < 0.001$) (*Figure 8.11*).

Among the 1913 participants with no evidence of HBV vaccination, vaccine-acquired, or infection-acquired immunity at care entry, 1,652 (86.4%) remained in care in 2025; of these, 726 (44.1.7%) had been fully vaccinated or had evidence of vaccine-acquired immunity by serology, an additional 237 (14.4%) were partially vaccinated (≤ 2 doses) and 16 (1.0%) had evidence of infection-acquired immunity; the remaining 669 (40.6%) had no record of vaccination, vaccine-acquired or infection-acquired immunity at end observation.

Figure 8.11: *Hepatitis B immunity status in MSM entering HIV care, 2016–2025 (n = 5,136).*



Numbers in italics at bottom of bars represent the number of MSM entering care included in the analysis.

Hepatitis A virus

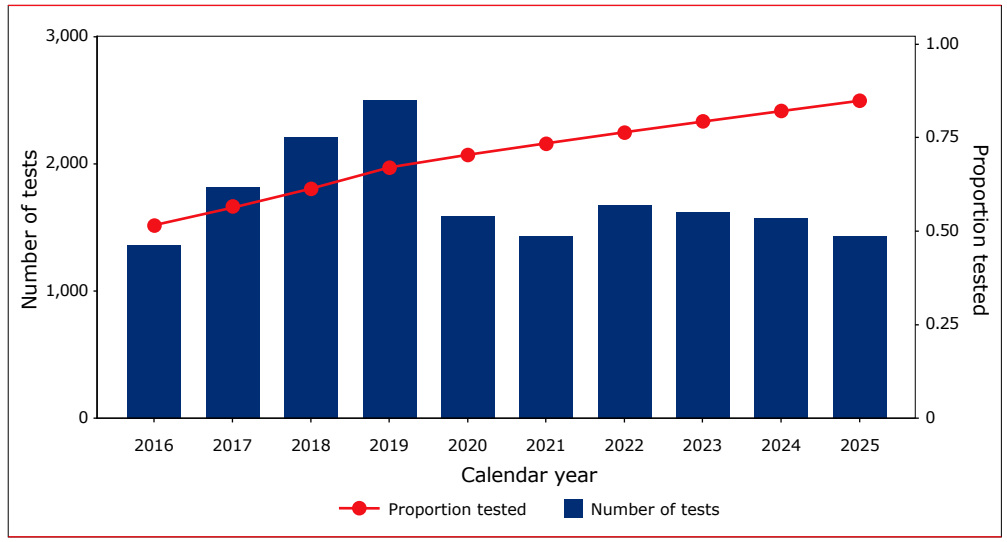
Hepatitis A is a vaccine-preventable infection caused by the hepatitis A virus (HAV). HAV is transmitted via the fecal-oral route, including anal-oral sexual contact. HAV causes acute hepatitis but does not lead to chronic infection.

A diagnosis of acute HAV is made on the basis of serology and clinical features compatible with acute viral hepatitis. Serological assays include anti-HAV IgM and liver enzymes. Anti-HAV IgG seropositivity confers lifelong immunity to HAV but does not distinguish between vaccine-induced and infection-acquired immunity.

HAV testing

Of 27,818 individuals with at least one HIV care visit over the past decade, 20,242 (72.8%) were ever tested for hepatitis A. By 2025, 84.9% of participants in care had at least one serological assay for hepatitis A performed. The number of annual tests and the cumulative proportion of participants tested for hepatitis A is shown in *Figure 8.12*.

Figure 8.12:



Of the 20,242 participants with available HAV serology, 13,330 (65.9%) had evidence of immunity to HAV. HAV seropositivity was highest in people born in sub-Saharan Africa (91.3%), followed by those born in North Africa and the Middle East (79.1%); 53.9% of people born in the Netherlands were seropositive. HAV seropositivity rate was 66.6% in cis-gender women, compared to 58.8% in cis-gender men. MSM had lower mean seropositivity than other HIV transmission groups, 57.9% versus 63.5%, respectively.

Acute HAV

A diagnosis of acute HAV was determined on the basis of available clinical and serological data. Acute HAV was defined as either 1) a diagnosis of laboratory-confirmed and/or symptomatic acute HAV documented in the medical record; or 2) positive anti-HAV IgM serology with ALT ≥ 3 times the upper limit of normal (ULN) within 3 months of IgM detection.

Between 2016 and 2025, a total of 109 cases of acute HAV were identified. The median number of acute HAV cases annually was 5. In 2016-2017, an outbreak of hepatitis A among sexually active MSM was identified across Europe[16]. In 2017, 55 cases of acute HAV were documented in the ATHENA cohort. Since 2020, the annual number of acute HAV cases has remained under 5. One hundred and six (97.2%) of all acute HAV cases occurred in men, of whom 96 (88.1%) were MSM (Figure 8.13). The majority of cases occurred in people born in the Netherlands (n = 51, 46.8%) (*Figure 8.14*).

Figure 8.13: *Number of acute HAV cases, by transmission group, 2016–2025 (n = 109).*

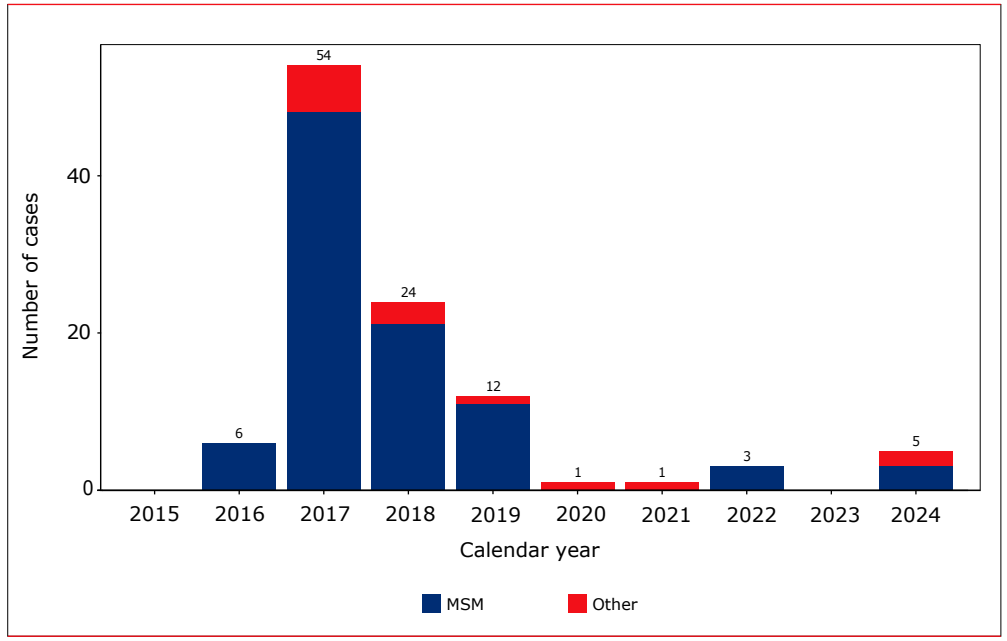
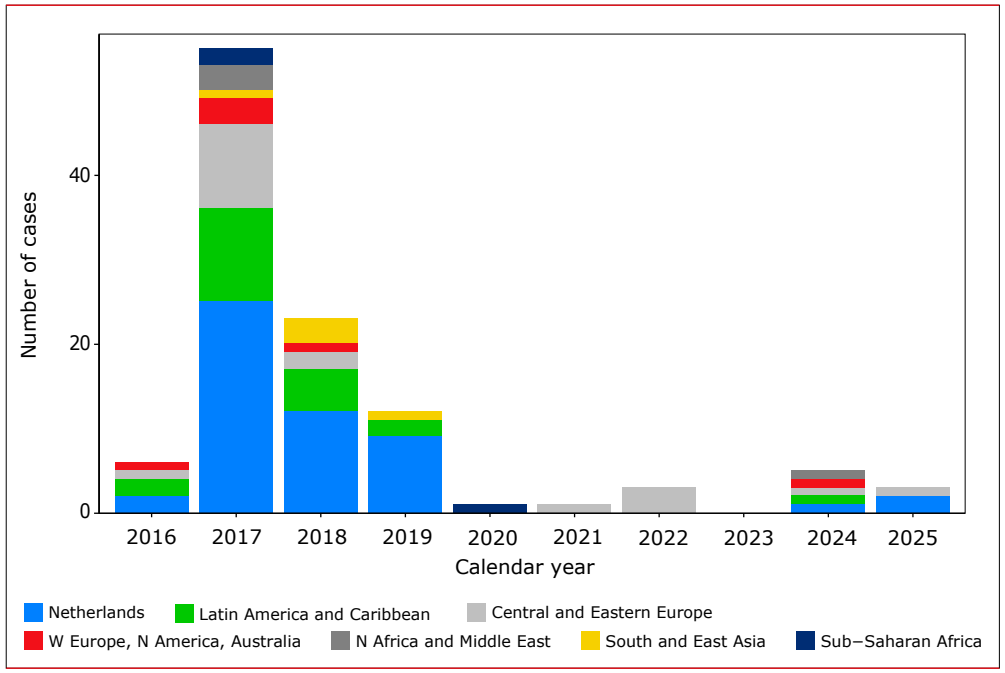


Figure 8.14: Number of acute HAV cases, by birth region, 2016–2025 (n = 109).



HAV immunity

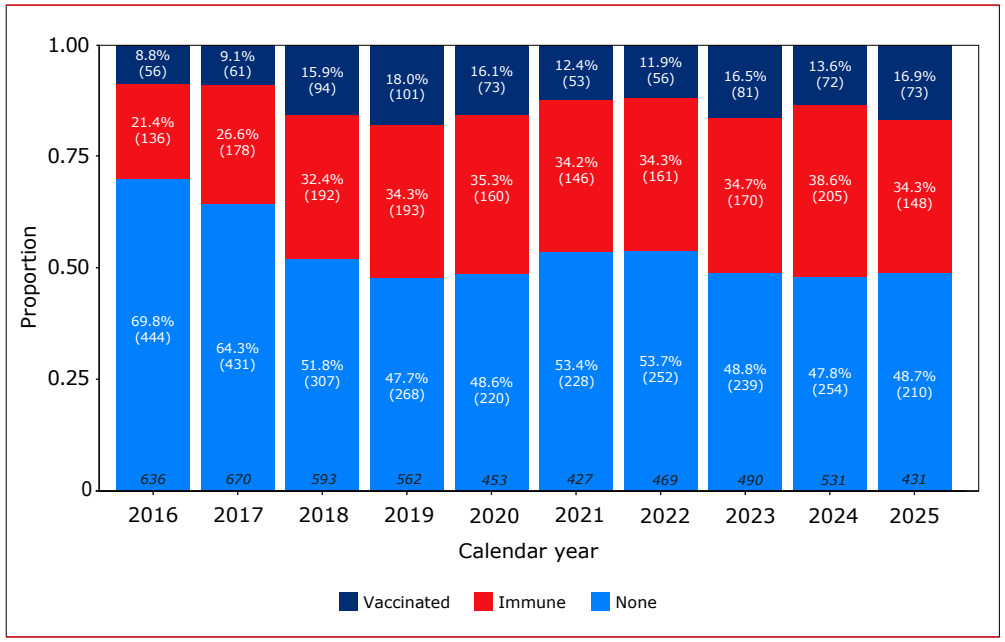
Dutch guidelines recommend HAV immunization in MSM[5]. We estimated HAV vaccination coverage and immune status among 5,262 MSM entering HIV care between 2016 and 2025. For each participant, we reviewed data available at care entry from vaccine administration records, the baseline questionnaire and laboratory assays performed before or within 30 days of the first visit. Participants were considered vaccinated if they had at least one dose of HAV vaccine administration record or were reported to have been vaccinated in the baseline questionnaire. Participants were considered immune if they had evidence of anti-HAV IgG or were reported to be immune in the baseline questionnaire. Participants with evidence of both HAV vaccination and serological immunity were considered vaccinated.

In the subset of participants without evidence of vaccination or serological immunity to HAV at care entry, we calculated the proportion who were vaccinated or immune at end observation among those who remained in care through 2025.

Figure 8.15 shows HAV vaccination and immunity status among 5,262 MSM entering HIV care between 2016 and 2025. Of these, 2,409 (45.8%) had evidence of immunity to HAV either by vaccination or serology, while 2,853 (54.2%) had no evidence of HAV vaccination or immunity at care entry. The proportion of participants without evidence of HAV vaccination or immunity at entry to care decreased from 69.8% in 2016 to 48.7% in 2025 ($p < 0.001$).

Among the 2,853 participants with no evidence of HAV vaccination or immunity at care entry, 2,459 (86.2%) remained in care in 2025; of these, 510 (20.7%) had been vaccinated, 475 (19.3%) were immune by serology, and 17 developed acute HAV, while the remaining 1,457 (59.3%) had no record of vaccination or serological immunity at end observation.

Figure 8.15: Hepatitis A vaccination and immunity status in MSM entering HIV care, 2016-2025 (n = 5,262).



Hepatitis E virus

Hepatitis E virus (HEV) is increasingly recognized as a cause of acute viral hepatitis[17]. Like HAV, HEV is transmitted via the oral-fecal route. Unlike HAV, acute HEV may lead to chronic infection. There is currently no anti-HEV vaccine available in the Netherlands.

Testing for acute and chronic HEV relies on a combination of HEV IgM, IgG and RNA measurements in a clinically compatible setting. Testing for resolved infection is determined by detection of IgG anti-HEV antibodies.

Of the 27,818 people in HIV care between 2016 and 2025, 2,370 (8.5%) were ever tested for HEV, 346 (14.6%) of whom had any evidence of acute or past HEV. Of participants with any evidence of HEV infection, 305 (88.2%) were cis-gender men; 215 (62.1%) were MSM. Ninety-five participants had evidence of acute HEV, 52 of whom had positive IgM only and 38 of whom had detectable HEV RNA only (>=200 copies per ml), while 5 had evidence of both positive IgM and viremia. Two participants had evidence of chronic HEV, with RNA detected for greater than 6 months.

Conclusions

Over the past decade, we note significant improvements in screening, treatment, and prevention of viral hepatitis in the SHM cohort.

Between 2016 and 2025, 897 individuals were diagnosed with primary HCV infection (including 254 recent infections), and 145 individuals were diagnosed with in total 166 reinfections. Recent HCV infection and reinfections occurred more often among MSM, 90% of the recent infections and 89% of the reinfections were among MSM. By the end of 2025, 99% of individuals had been screened for HCV. Between 2016 and 2025, the number of individuals with an HCV diagnosis, including reinfections, has decreased from 133 to 58. The proportion of individuals with a HCV diagnosis and born in the Netherlands also decreased and in 2025, more than one third of those with an HCV diagnosis originated from other European countries than the Netherlands. Of the individuals in care between 2016 and 2025, 97% had received treatment for HCV and 98% were successfully treated (including retreatment after earlier treatment failure) and achieved treatment-induced clearance of HCV. Effective treatment with DAAs has reduced the proportion of individuals with positive HCV RNA to 0.2%. HCV reinfection continues to occur, but rates have declined.

Screening for HBV improved over time, with nearly 100% of participants having at least one HBV serological assay available by 2025. Of 1329 participants with a history of chronic HBV, 877 (66.0%) did not have evidence of surface antigen clearance at last observation. Ninety percent of individuals with a history of chronic HBV receive an antiretroviral regimen containing a tenofovir prodrug, the optimal agent for treating HIV/HBV coinfection[18].

Evidence of severe liver disease was documented in 26% of individuals with a history of HCV and 18% of participants with a history of chronic HBV. Rates of hepatocellular carcinoma and liver-related deaths in participants with viral hepatitis and severe liver disease are low.

Vaccination against HBV and HAV in MSM remains incomplete. Among MSM entering care between 2016 and 2025, 23% of vaccine-eligible individuals had no evidence of HBV vaccination or vaccine-induced immunity by the end of observation while 48% had no documented HAV vaccination or immunity.

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