

SURVEILLANCE REPORT

Hepatitis C

Annual Epidemiological Report for 2021

Key facts

- In 2021, 14 560 cases of hepatitis C were reported in 29 EU/EEA Member States. Excluding countries that only reported acute cases the number of cases (14 550 cases) corresponds to a crude rate of 4.1 cases per 100 000 population.
- Of the cases reported, 7% were classified as acute, 35% as chronic, and 55% as 'unknown'. Three percent could not be classified due to an incompatible data format.
- Hepatitis C was more commonly reported among men than women, with a male-to-female ratio of 2:1. The most affected age group among males was 35-44 years, and among females 25-34 years.
- Route of transmission was reported for just 32% of cases. The most commonly reported mode was injecting drug use, which accounted for 61% among acute cases and 70% among those classified as chronic with complete information on mode of transmission.
- The interpretation of hepatitis C notification data across countries remains problematic, with ongoing differences in surveillance systems and difficulties in defining reported cases as acute or chronic. With hepatitis C, a largely asymptomatic disease until the late stages, surveillance based on notification data is challenging, with data reflecting testing practices rather than true occurrence of disease.
- Despite the limitations of routine surveillance for hepatitis C, data clearly indicate that a high proportion of reported cases are attributed to injecting drug use, highlighting the importance of harm reduction measures. Ongoing nosocomial transmission and transmission among men who have sex with men in the region underscore the need to implement targeted and comprehensive public health programmes tailored to the local epidemiology.

Methods

This report is based on 2021 data retrieved from The European Surveillance System (TESSy) on 7 December 2022. TESSy is a system for the collection, analysis and dissemination of data on communicable diseases.

For a detailed description of methods used to produce this report, refer to the Methods chapter [1].

An overview of national surveillance systems is available on ECDC's website [2].

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A subset of the data used for this report is available through ECDC's online Surveillance Atlas of Infectious Diseases [3].

This report includes data on newly diagnosed cases of hepatitis C virus (HCV) infection reported to ECDC by EU/EEA countries. Countries were requested to apply the EU 2018 case definition when reporting data to TESSY, but other case definitions were also accepted.

Acute and chronic hepatitis C infections were differentiated by countries using defined criteria (Table 1).

Table 1. Criteria for differentiating acute and chronic hepatitis C

| Stage | Definition |
|---------|--|
| Acute | Recent HCV seroconversion (prior negative test for hepatitis C in last 12 months) or Detection of hepatitis C virus nucleic acid (HCV RNA) or hepatitis C virus core antigen (HCV-core) in serum/plasma and no detection of hepatitis C virus antibody (negative result) |
| Chronic | Detection of hepatitis C virus nucleic acid (HCV RNA) or hepatitis C core antigen (HCV-core) in serum/plasma in two samples taken at least 12 months apart* |
| Unknown | Any newly diagnosed case which cannot be classified in accordance with the above description of acute or chronic infection |

*: in the event that the case was not notified the first time.

Surveillance systems across EU/EEA countries are heterogeneous. Twenty-one countries submitted national data for 2021 based on the 2012 or 2018 EU case definitions, three countries used the 2008 EU case definition and five countries used national case definitions. The 2012 and 2018 case definitions are essentially identical, except that the 2018 definition explicitly states that countries should differentiate between acute and chronic cases according to ECDC requirements [4,5]. The EU 2008 case definition is similar but does not include the detection of hepatitis C core antigen as one of the diagnostic criteria. All case definitions capture all acute and chronic laboratory-diagnosed cases of hepatitis C. All reported cases were included in the analysis regardless of which case definition was used. Data collected represent confirmed cases.

Hungary only submits data on acute cases of hepatitis C to ECDC. Two countries (Belgium and Bulgaria) submitted aggregate data only and did not differentiate stages of infection. No data were reported by the United Kingdom (UK) since 2019 due to its withdrawal from the EU on 31 January 2020.

Hepatitis C data are presented by the 'date of diagnosis' or, if not available, 'date used for statistics'.

Italy reported using two data sources. One had national coverage but included only a limited number of variables and was used for the calculation of national rates and analysis by age and sex. The other was a voluntary reporting system of acute cases and covered 83.1% of the population in 2021. The sentinel population is considered representative of the wider population and data were therefore scaled up to 100%. This data source contained information on a range of variables and was used for certain epidemiological analyses, including the route of transmission and importation status. The data source for Belgium was a sentinel system with unidentified population coverage. National rates were therefore not calculated for Belgium.

Epidemiology

For 2021, 29 EU/EEA Member States reported 14 560 cases of HCV infection. Excluding Hungary which only reported acute cases, the number of cases, 14 550, corresponds to a crude rate of 4.1 cases per 100 000 population. No data were reported from France. Of all cases reported, 987 (7%) were reported as acute, 5 029 (35%) as chronic, 8 051 (55%) as 'unknown' (Table 2), and 493 cases (3%) could not be classified due to an incompatible data format. From 2012 to 2022, among countries that reported data consistently and excluding those who only reported acute cases, the overall number of cases showed year-to-year fluctuations with no clear long-term trend and with a substantially lower rate of cases reported in 2020 and 2021 compared to earlier years (Figure 1).

Country-specific rates ranged from <0.5 cases per 100 000 population in Bulgaria, Greece, and Italy, to 58 cases per 100 000 population in Luxembourg (Table 2, Figure 2).

Table 2. Distribution of hepatitis C cases and rates per 100 000 population by country and year, EU/EEA, 2017–2021

| Country | 2017 | | 2018 | | 2019 | | 2020 | | 2021 | | | | | | | |
|---------------------------|---------------|------------|---------------|------------|---------------|------------|---------------|------------|---------------|------------|--------------------|------------|----------------------|------------|----------------------|------------|
| | All | | All | | All | | All | | All | | Acute ¹ | | Chronic ¹ | | Unknown ¹ | |
| | Cases | Rate | Cases | Rate | Cases | Rate | Cases | Rate | Cases | Rate | Cases | Rate | Cases | Rate | Cases | Rate |
| Austria | 987 | 11.3 | 916 | 10.4 | 840 | 9.5 | 607 | 6.8 | 649 | 7.3 | 33 | 0.4 | 175 | 2.0 | 441 | 4.9 |
| Belgium | 1 519 | NR | 1 350 | NR | 1 209 | NR | 701 | NR | 468 | NR | ND | NR | ND | NR | ND | NR |
| Bulgaria | 84 | 1.2 | 83 | 1.2 | 88 | 1.3 | 44 | 0.6 | 25 | 0.4 | ND | NR | ND | NR | ND | NR |
| Croatia | 213 | 5.1 | 212 | 5.2 | 209 | 5.1 | 95 | 2.3 | 111 | 2.8 | 2 | 0.0 | 44 | 1.1 | 65 | 1.6 |
| Cyprus | 21 | 2.5 | 40 | 4.6 | 27 | 3.1 | 8 | 0.9 | 7 | 0.8 | 0 | 0.0 | 7 | 0.8 | ND | NR |
| Czechia | 932 | 8.8 | 1 050 | 9.9 | 1 138 | 10.7 | 770 | 7.2 | 662 | 6.2 | 89 | 0.8 | 573 | 5.4 | ND | NR |
| Denmark | 192 | 3.3 | 183 | 3.2 | 122 | 2.1 | 161 | 2.8 | 149 | 2.6 | 4 | 0.1 | 145 | 2.5 | ND | NR |
| Estonia | 121 | 9.2 | 149 | 11.3 | 141 | 10.6 | 135 | 10.2 | 133 | 10.0 | 5 | 0.4 | 128 | 9.6 | ND | NR |
| Finland | 1115 | 20.3 | 1 168 | 21.2 | 1 183 | 21.4 | 1 144 | 20.7 | 1 065 | 19.2 | ND | NR | ND | NR | 1 065 | 19.2 |
| France | ND | NR | ND | NR | ND | NR | ND | NR | ND | NR | ND | NR | ND | NR | ND | NR |
| Germany | 4 837 | 5.9 | 5 880 | 7.1 | 5 965 | 7.2 | 4 536 | 5.5 | 4 718 | 5.7 | 403 | 0.5 | 1 674 | 2.0 | 2 641 | 3.2 |
| Greece | 152 | 1.4 | 125 | 1.2 | 119 | 1.1 | 54 | 0.5 | 43 | 0.4 | 0 | 0.0 | 43 | 0.4 | 0 | 0.0 |
| Hungary ^{II} | ND | NR | ND | NR | ND | NR | ND | NR | ND | NR | 10 | 0.1 | ND | NR | ND | NR |
| Iceland | 95 | 28.1 | 69 | 19.8 | 111 | 31.1 | 88 | 24.2 | 66 | 17.9 | 0 | 0.0 | 0 | 0.0 | 66 | 17.9 |
| Ireland | 614 | 12.8 | 588 | 12.2 | 468 | 9.5 | 327 | 6.6 | 414 | 8.3 | 12 | 0.2 | 45 | 0.9 | 357 | 7.1 |
| Italy | 182 | 0.3 | 156 | 0.3 | 188 | 0.3 | 48 | 0.1 | 22 | 0.0 | ND | NR | ND | NR | 22 | 0.0 |
| Latvia | 1 701 | 87.2 | 1 469 | 75.9 | 1 380 | 71.9 | 1 022 | 53.6 | 685 | 36.2 | 12 | 0.6 | 673 | 35.5 | ND | NR |
| Liechtenstein | ND | NR | ND | NR | ND | NR | ND | NR | 4 | 10.2 | ND | NR | ND | NR | 4 | 10.2 |
| Lithuania ^{II} | ND | NR | ND | NR | ND | NR | 73 | 2.6 | 59 | 2.1 | 2 | 0.1 | 57 | 2.0 | ND | NR |
| Luxembourg | 95 | 16.1 | 69 | 11.5 | 29 | 4.7 | 526 | 84.0 | 368 | 58.0 | ND | NR | 0 | 0.0 | 368 | 58.0 |
| Malta | 18 | 3.9 | 18 | 3.8 | 31 | 6.3 | 26 | 5.1 | 32 | 6.2 | 0 | 0.0 | 0 | 0.0 | 32 | 6.2 |
| Netherlands ^{II} | ND | NR | ND | NR | 738 | 4.3 | 428 | 2.5 | 474 | 2.7 | 30 | 0.2 | ND | NR | 444 | 2.5 |
| Norway | 656 | 12.5 | 639 | 12.1 | 532 | 10.0 | 395 | 7.4 | 341 | 6.3 | ND | NR | ND | NR | 341 | 6.3 |
| Poland | 4 010 | 10.6 | 3 442 | 9.1 | 3 343 | 8.8 | 955 | 2.5 | 1 244 | 3.3 | 4 | 0.0 | 0 | 0.0 | 1 240 | 3.3 |
| Portugal | 271 | 2.6 | 188 | 1.8 | 220 | 2.1 | 147 | 1.4 | 145 | 1.4 | 15 | 0.1 | 44 | 0.4 | 86 | 0.8 |
| Romania | 70 | 0.4 | 87 | 0.4 | 22 | 0.1 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | ND | NR |
| Slovakia | 156 | 2.9 | 225 | 4.1 | 247 | 4.5 | 204 | 3.7 | 182 | 3.3 | 10 | 0.2 | 172 | 3.2 | ND | NR |
| Slovenia | 117 | 5.7 | 112 | 5.4 | 70 | 3.4 | 96 | 4.6 | 95 | 4.5 | 2 | 0.1 | 28 | 1.3 | 65 | 3.1 |
| Spain | 894 | 1.9 | 1 501 | 3.2 | 1 391 | 3.0 | 694 | 1.5 | 1258 | 2.7 | 152 | 0.3 | 546 | 1.2 | 560 | 1.2 |
| Sweden | 1 664 | 16.6 | 1 610 | 15.9 | 1 397 | 13.7 | 1 023 | 9.9 | 1 131 | 10.9 | 202 | 1.9 | 675 | 6.5 | 254 | 2.4 |
| United Kingdom | 12 147 | 18.4 | 18 145 | 27.4 | 17 738 | 26.6 | ND | NR | ND | NR | ND | NR | ND | NR | ND | NR |
| Total EU/EEA | 32 863 | 7.7 | 39 474 | 9.3 | 38 946 | 8.8 | 14 307 | 3.9 | 14 550 | 4.1 | 987 | 0.3 | 5 029 | 1.9 | 8 051 | 2.6 |

ND: no data reported

NR: no rate calculated

[†]: data presented by date of diagnosis

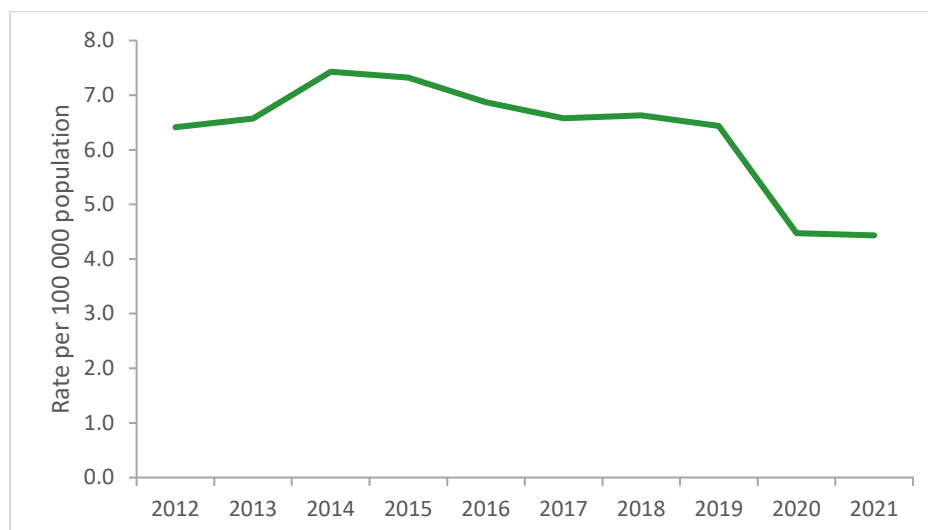
¹: includes cases reported by countries as acute, chronic or unknown using differentiation criteria. Countries reporting aggregate data only (Bulgaria and Belgium) were not able to classify cases into acute, chronic, or unknown.

^{II}: 'All cases' not displayed for countries that only report acute cases.

^{II}: Prior to 2019, the Netherlands only reported acute cases, and a number for 'All cases' is not displayed for those years.

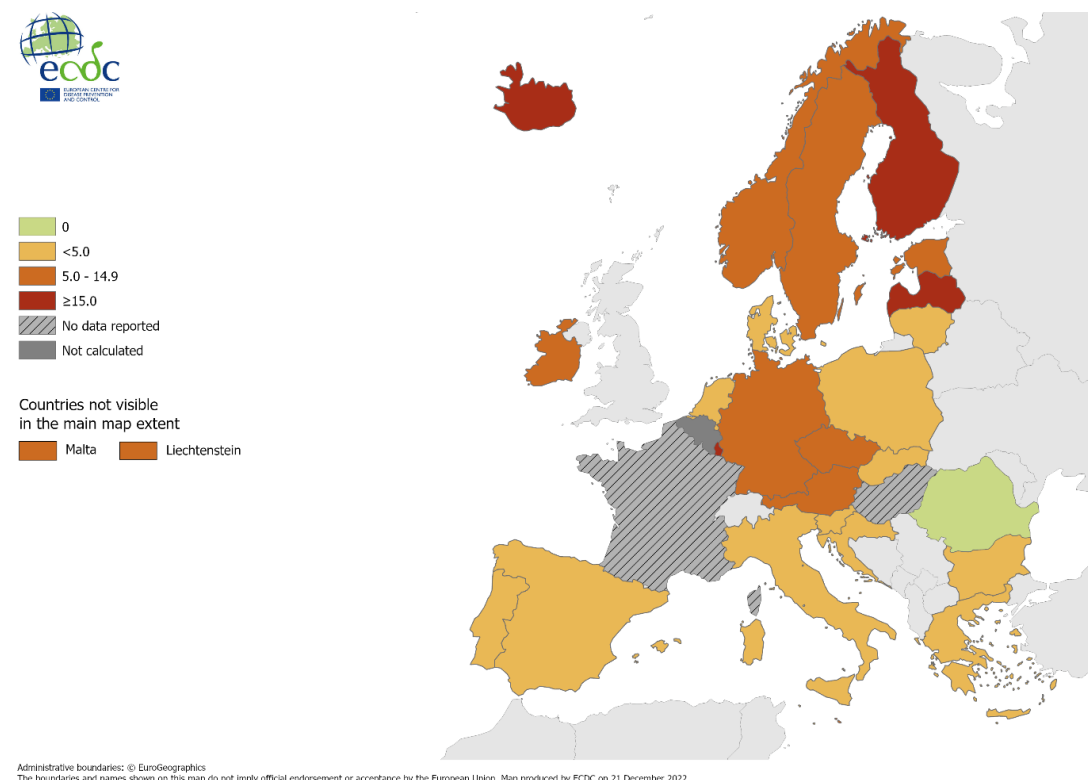
Twenty-two countries were able to provide data on acute cases (Table 2). The rate of reported acute cases was 0.3 per 100 000 population, ranging from <0.1 in Croatia, Cyprus, Denmark, Greece, Iceland, Malta, Poland, Romania, and Slovenia to 1.9 per 100 000 in Sweden. Twenty-one countries submitted data on chronic infections. The notification rate of chronic cases was 1.9 per 100 000 population, ranging from <0.1 in Iceland, Luxembourg, Malta, Poland, and Romania to 35.5 in Latvia. The rate of cases classified as unknown ranged from 0.0 cases per 100 000 population in Greece and Italy to 58.0 in Luxembourg. Overall notification rates were mostly higher in northern and western European countries than in southern European countries (Figure 2).

Figure 1. Notification rates of hepatitis C per 100 000 population by year in EU/EEA countries, 2012-2021, among countries reporting consistently and excluding countries that only reported acute cases



Source: Country reports from Austria, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, Germany, Greece, Iceland, Ireland, Italy, Latvia, Luxembourg, Malta, Norway, Poland, Portugal, Slovakia, Slovenia, and Sweden.

Figure 2. Distribution of newly diagnosed hepatitis C cases per 100 000 population by country*, EU/EEA, 2021



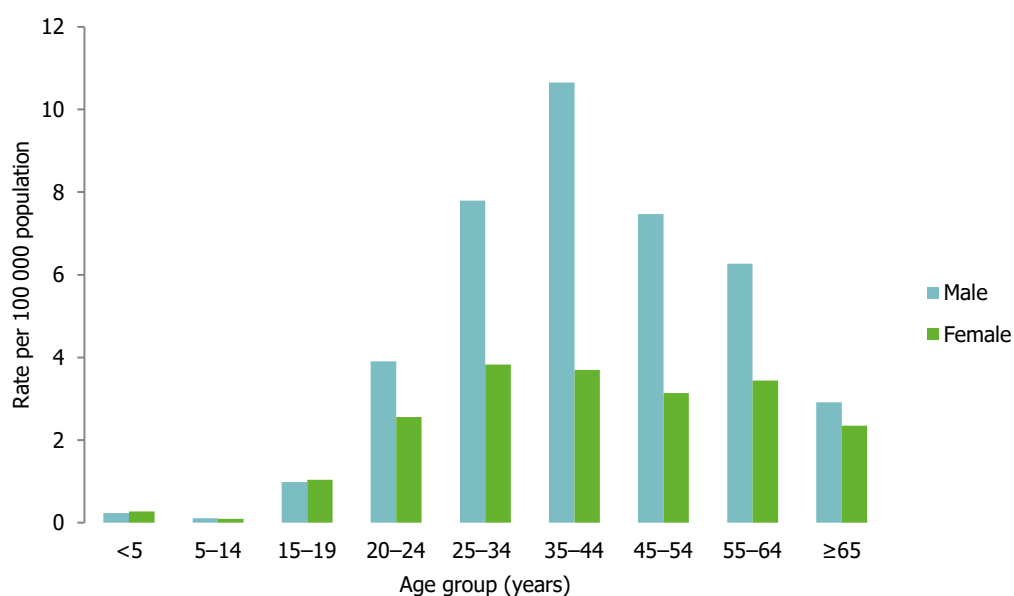
*: Countries not reporting any data or reporting data only on acute cases are excluded from this map.

Source: Country reports from Austria, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, Germany, Greece, Iceland, Ireland, Italy, Latvia, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden.

Age and sex

In 2021, 9 578 cases were reported in males (5.2 cases per 100 000 population) and 4 922 in females (2.6 cases per 100 000 population), excluding countries that only reported acute cases. This corresponds to a male-to-female ratio of 2.0:1. Rates were higher among males than females for all age categories above 20 years (Figure 3). The most affected age group was from 35 to 44 years among males (10.7 cases per 100 000 population). Among females, the highest rate (3.8 cases per 100 000 population) was seen among those aged 25–34 years but the difference compared with other age groups was less pronounced. Among countries reporting consistently since 2012, the proportion of all cases under 25 years declined from 13% in 2012 to 8% in 2021.

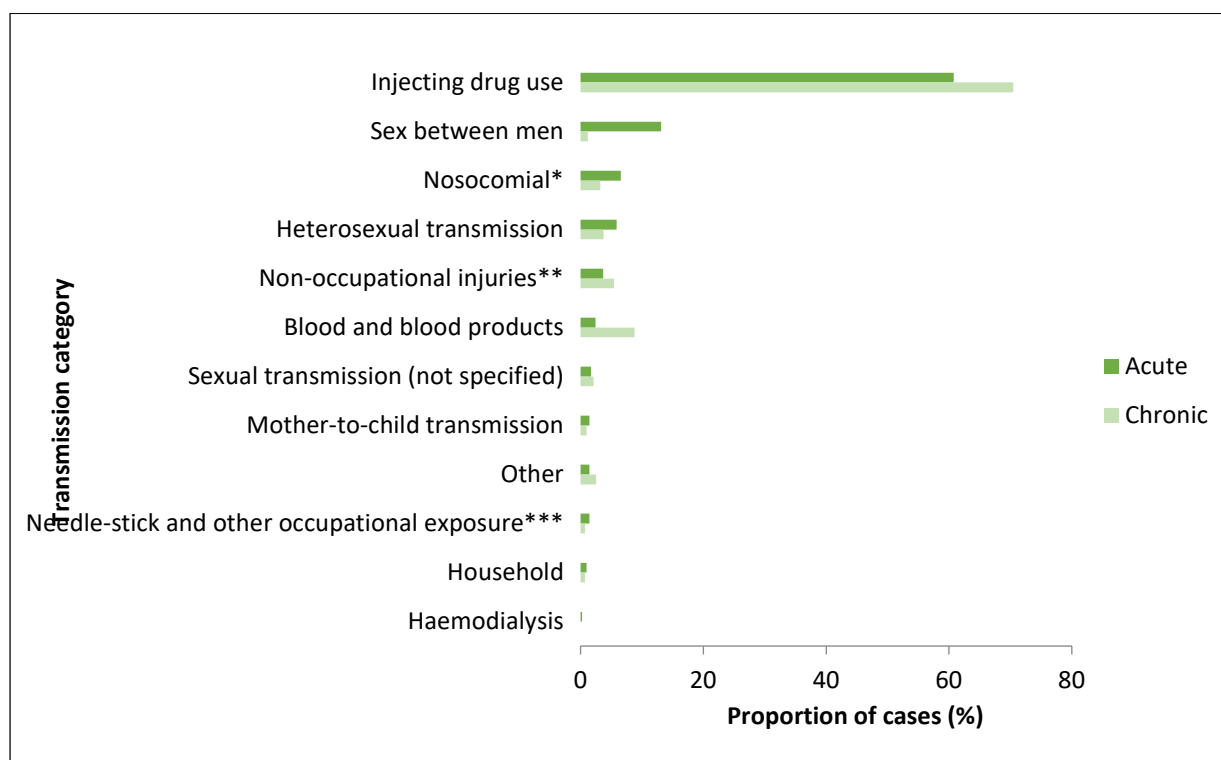
Figure 3. Notification rate of newly diagnosed hepatitis C cases per 100 000 population by age and sex, EU/EEA, 2021



Source: Country reports from Austria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, Germany, Greece, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden.

Route of transmission

Data regarding the most likely route of transmission of hepatitis C were complete for only 32% of cases in 2021. The most commonly reported route of transmission across all disease categories was injecting drug use. The percentage of transmission attributable to injecting drug use among cases with a known transmission route was 61% among acute cases and 70% among those classified as chronic (Figure 4). The second most common route of transmission among acute cases was sex between men, accounting for 13% of acute cases with information on transmission route.

Figure 4. Transmission category of hepatitis C cases by acute and chronic disease status, EU/EEA, 2021¹

¹: Cases with known transmission status.

*: 'Nosocomial transmission' includes hospital, nursing home, psychiatric institutions and dental. This category refers mainly to patients exposed through healthcare settings, distinct from 'needle-stick and other occupational exposure', which refers to staff.

**': 'Non-occupational injuries' include needle-sticks that occur outside a healthcare setting, bites, tattoos and piercings.

***: 'Needle-stick and other occupational exposure' refers to occupational injuries.

Source: Acute reports from Austria, Croatia, Denmark, Estonia, Germany, Hungary, Ireland, Italy, Latvia, the Netherlands, Poland, Portugal, Slovakia, Spain, and Sweden.

Chronic reports from Austria, Croatia, Denmark, Estonia, Germany, Ireland, Latvia, Portugal, Slovakia, Slovenia, Spain, and Sweden.

Importation status

In 2021, 14 countries provided data for 5 990 cases (41%) on whether a case was considered 'imported' from outside the reporting country or acquired in the country itself. Of those cases, 865 (14%) were reported as imported.

Discussion

The number of newly diagnosed hepatitis C cases reported from countries across Europe remains at a high level, with considerable variation between country-specific rates. An estimated 3.9 million individuals are chronically infected with HCV in EU/EEA countries, with national estimates of anti-HCV prevalence in the general population ranging from 0.1%–5.9% [6]. The burden of disease presents a serious public health challenge for national health systems. While the incidence of new infections has declined in many European countries due to implementation of prevention strategies targeting transmission through injecting drug use and healthcare, and possibly also the impact of rolling out treatment programmes to cure the infection, modelling suggests that morbidity and mortality will continue to increase [7,9].

The number of countries reporting hepatitis C surveillance data has increased in recent years, but data analysis and interpretation remain challenging on account of the incompleteness of data and heterogeneity in national surveillance systems and practices. While the number of countries using the 2012 or 2018 EU case definitions has increased, eight countries still do not use these updated definitions, which hampers the ability to compare data across countries. Data completeness for several variables remains low. Countries have difficulties defining cases as acute or chronic and the majority of cases reported are classified 'unknown'. It is likely that most 'unknown' cases are chronic infections as acute hepatitis C is difficult to diagnose and most cases are identified through screening. The variation in notification rates between countries is likely related to differences in local testing practices as hepatitis C is mostly asymptomatic. Indeed, many northern and western European countries, such as the

Netherlands, which has extensive testing programmes targeting populations at risk, report the highest notification rates in the EU/EEA but they are also known, from serosurveys, to have low prevalence estimates [6,9].

Countries in eastern and south-eastern Europe have the lowest reported rates of cases but some of the highest prevalence estimates. This discrepancy highlights the challenge of interpreting hepatitis C surveillance data and the importance of considering other sources of information, such as local testing practices and seroprevalence estimates.

The rate of diagnosed cases was substantially lower in 2020 and 2021 compared to previous years. This may be the result of a combination of changes in healthcare-seeking behaviours and testing practices during the COVID-19 pandemic [10-11]. A survey of a wide range of actors involved in the provision of testing services found that the majority reported service disruptions and declines in testing volumes, in particular in the early part of 2020 [12]. It will be important to monitor trends in 2022 and beyond in order to gain a more complete picture.

Reported data indicate that hepatitis C is an infection which predominantly affects men aged 25–44 years. This profile is consistent with the demographic profile of injecting drug use, the main route of transmission reported for chronic cases. Data are consistent with the findings of a systematic review of hepatitis C seroprevalence, which found that prevalence among people who inject drugs (PWID) in most EU/EEA countries is high (>50%) [6]. Harm reduction programmes and, more recently, treatment with new direct-acting antiviral drugs may have contributed significantly to reducing transmission in many countries. However, the burden of infection remains high among PWID and evidence of ongoing transmission emphasises the ongoing need for comprehensive harm reduction measures targeted at this at-risk population [13,14].

Among acute cases, the other main reported routes of transmission included nosocomial transmission and transmission among men who have sex with men. Reports of hepatitis C infections among HIV-positive men who have sex with men in several European countries since 2000 have resulted in many countries scaling up targeted prevention and control responses [15]. Nosocomial transmission remains uncommon in most European countries but is still a key route of transmission among newly diagnosed cases in a few countries, highlighting the importance of comprehensive infection prevention and control systems within healthcare.

The World Health Assembly adopted the first 'Global Health Sector Strategy on Viral Hepatitis' aimed at eliminating viral hepatitis as a public health threat [16]. The concept of elimination for hepatitis C is based on reducing the incidence of chronic infections by 90% and the associated mortality by 65% by 2030 compared to 2015 levels. Achieving these targets will require a significant scaling-up of key interventions, including those aimed at preventing transmission among PWID and increased testing with linkage to care and treatment.

Public health implications

Hepatitis C is a public health priority across Europe with a high burden of infection and high levels of associated morbidity and mortality. To achieve the goal of elimination as defined in the Global Strategy (above), it is essential that countries have access to robust epidemiological information to plan and monitor effective prevention and control programmes. Surveillance data alone do not provide a clear epidemiological picture and should be analysed carefully alongside information on local screening practices and available seroprevalence data. Further improvements to the quality of hepatitis C surveillance data are important to increase data utility and ECDC is working closely with Member States to improve local surveillance systems. ECDC is also developing alternative epidemiological data sources, including the generation of prevalence estimates using standardised methodologies. Despite the limitations of routine surveillance for hepatitis C, data clearly indicate that a high proportion of reported cases are attributed to injecting drug use, highlighting the importance of harm reduction measures. Ongoing nosocomial transmission and transmission among men who have sex with men in the region underscore the need to implement targeted and comprehensive public health programmes tailored to the local epidemiology.

References

1. European Centre for Disease Prevention and Control. Introduction to the Annual Epidemiological Report. In: ECDC. Annual epidemiological report for 2017. Stockholm: ECDC; 2017 [cited 10 December 2018]. Available at: <http://ecdc.europa.eu/annual-epidemiological-reports/methods>
2. European Centre for Disease Prevention and Control. Surveillance systems overview. Stockholm: ECDC; 2018. Available at: <http://ecdc.europa.eu/publications-data/surveillance-systems-overview-2017>
3. European Centre for Disease Prevention and Control. Surveillance Atlas of Infectious Diseases. Stockholm: ECDC; 2017. Available at: <http://atlas.ecdc.europa.eu/public/index.aspx?Dataset=27&HealthTopic=27>
4. European Commission. Commission implementing decision of 8 August 2012 amending Decision 2002/253/EC laying down case definitions for reporting communicable diseases to the Community network under Decision No 2119/98/EC of the European Parliament and of the Council (2012/506/EU) (notified under document C(2012) 5538) (Text with EEA relevance) (2012/506/EU) – Annex 2.17 Hepatitis B (Hepatitis B virus). Brussels: European Commission; 2012. Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012D0506&qid=1428573336660&from=EN#page=15>
5. European Commission. Commission implementing decision (EU) 2018/945 of 22 June 2018 on the communicable diseases and related special health issues to be covered by epidemiological surveillance as well as relevant case definitions) – Annex 3.17 Hepatitis B (Hepatitis B virus). Brussels: European Commission; 2012. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018D0945>
6. European Centre for Disease Prevention and Control. Prevention of hepatitis B and C in the EU/EEA. Stockholm: ECDC; 2022 Available from: [Prevention of hepatitis B and C in the EU/EEA \(europa.eu\)](http://ecdc.europa.eu/en/prevention-of-hepatitis-b-and-c)
7. Blachier M, Leleu H, Peck-Radosavljevic M, Valla DC, Roudot-Thoraval F. The burden of liver disease in Europe: a review of available epidemiological data. *J Hepatol.* 2013 Mar;58(3):593–608.
8. Dultz G, Zeuzem S. Hepatitis C Virus: A European Perspective. *Gastroenterol Clin North Am.* 2015 Dec;44(4):807–24.
9. Duffell EF, van de Laar MJ. Survey of surveillance systems and select prevention activities for hepatitis B and C, European Union/European Economic Area, 2009. *Euro Surveill.* 2015 Apr 2;20(13):17-24. Available at: <http://www.eurosurveillance.org/content/10.2807/1560-7917.ES2015.20.13.21080>
10. Kaufman HW, Bull-Otterson L, Meyer III WA, Huang X, Doshani M, Thompson WW, Osinubi A, Khan MA, Harris AM, Gupta N, Van Handel M. Decreases in hepatitis C testing and treatment during the COVID-19 pandemic. *American journal of preventive medicine.* 2021 Sep 1;61(3):369-76.
11. Simões D, Stengaard AR, Combs L, Raben D. Impact of the COVID-19 pandemic on testing services for HIV, viral hepatitis and sexually transmitted infections in the WHO European Region, March to August 2020. *Eurosurveillance.* 2020 Nov 26;25(47):2001943. Available at: <https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2020.25.47.2001943>
12. Gamkrelidze A, Handanagic S, Shadaker S, Turdziladze A, Tsereteli M, Getia V, Aslanikashvili A, Surguladze S, Gvinjilia L, Kuchuloria T, Tskhomelidze I. The impact of COVID-19 pandemic on the 2020 hepatitis C cascade of care in the Republic of Georgia. *Public Health.* 2022 Apr 1;205:182-6.
13. European Monitoring Centre for Drugs and Drug Addiction. Rapid communication: Drug-related infectious disease in Europe: update from the EMCDDA expert network, October 2017. Lisbon: EMCDDA; 2017. Available at: http://www.emcdda.europa.eu/rapid-communications/2017/drug-related-infectious-diseases-in-europe_en
14. Negro F. Epidemiology of hepatitis C in Europe. *Diges Liver Dis.* 2014 Dec 15;46(5):s158–164.
15. Yaphe S, Bozinoff N, Kyle R, Shivkumar S, Pai N P, Klein M. Incidence of acute hepatitis C virus infection among men who have sex with men with and without HIV infection: a systematic review. *Sex Transm Infect.* 2012 Nov;88(7):558-64.
16. World Health Organization. Combating hepatitis B and C to reach elimination by 2030: advocacy brief. Geneva: WHO; 2017. Available at: <http://www.who.int/hepatitis/publications/hep-elimination-by-2030-brief>