

Table 1. Summary of input parameters used in *Hep C State Policy Simulator*

Parameter	Default Value	User Adjustment to Values Allowed	Source
HCV Epidemiology			
State-level HCV prevalence	See Appendix Table A.1 for default state values	Yes	¹⁰
State-level prevalence by subpopulation			
Incarcerated population	See Appendix Table A.1 for state values	No	¹¹
Non-incarcerated population (Medicare, Medicaid, Private, Uninsured)	See Appendix Table A.1 for state values	No	CDC analysis*
HCV genotype (national estimates)	G1: 75.7%, G2: 10.7%, G3: 11.9%, G4-6: 1.7%	No	¹⁷
HCV fibrosis stages (national estimates)	F0-F1: 44.2%, F2: 28.5%, F3: 11.2%, F4: 16.1%	No	¹⁷
HCV incidence	See Appendix Tables A.3 and A.4 for state values	No	¹⁸
HCV awareness rates	See Appendix Table A.5 for insurance status and age-specific values	No	¹⁹
Transition probabilities (annual)			
F0 to F1	0.117	No	²⁸
F1 to F2	0.085	No	²⁸
F2 to F3	0.120	No	²⁸
F3 to F4	0.116	No	²⁸
F4 to DC	0.039	No	²⁹
F4 to HCC	0.014	No	²⁹
F4-SVR to DC	0.008	No	³⁰
F4-SVR to HCC	0.005	No	³⁰
DC to HCC	0.068	No	³¹
DC to LT	0.023	No	^{32,33}
DC (first year) to death from liver disease	0.182	No	³¹
DC (subsequent years) to death from liver disease	0.112	No	³¹
HCC to LT	0.040	No	^{6,34}
HCC to death from liver disease	0.427	No	²⁹
LT (first year) to death from liver disease	0.116	No	³⁵
PLT to death from liver disease	0.044	No	³⁵
Interventions			
Screening Strategy			
Provider-driven diagnostic and risk-based testing rate (annual)	3%	No	^{20,36}

Birth-cohort screening rate (annual)	9%	No	20,36
Universal screening rate (annual)	9%	Yes	20,36 **
Treatment rate (annual)			
Medicaid	50%	Yes	Unpublished data
Medicare	50%	Yes	Unpublished data
Privately insured	50%	Yes	37
Incarcerated	State-specific	Yes	11
Uninsured	10%	Yes	Unpublished data
Treatment restrictions			
Medicaid	State-specific	Yes	38
Medicare	No restrictions	Yes	39
Privately insured	No restrictions	Yes	Subject matter expertise
Incarcerated	F3 and above	Yes	40
Uninsured	F2 and above	Yes	Subject matter expertise
HCV treatment efficacy	See Appendix Table A.6 for SVR rates by viral genotype, stage of fibrosis, treatment regimen, and treatment history	No	2
Cost Parameters			
Cost of DAA treatment	\$20,000	Yes	23-26
Cost of disease management (annual)			
F0-F2	\$809	No	27,41,42
F3	\$1,661	No	27,41,42
Compensated cirrhosis	\$2,065	No	27,41,42
Decompensated cirrhosis	\$21,553	No	27,41,42
Hepatocellular carcinoma	\$39,598	No	27,41,42
Liver transplant (Year 1)	\$114,505	No	27,41,42
Liver transplant (Year 2+)	\$32,010	No	27,41,42
Cost of diagnosis (per case)			
Diagnostic and risk-based testing	\$357	No	43 ***
Birth-cohort screening	\$2,500	No	21
Universal screening	\$4,400	No	21

*Based on unpublished recent CDC analysis that used multiple state- and national-level datasets.⁴⁴⁻⁴⁸ (Appendix Table A.2).

**Based on the assumption that universal screening rate is equal to the birth-cohort screening rate.

***Based on the assumption that HCV (viremic) prevalence in high-risk groups is 15.48%,⁴⁵ cost of HCV RNA test is \$98, cost of antibody test is \$35, the cost of per HCV (viremic) case detected is \$357.

Abbreviations: HCV, hepatitis C; F0, no fibrosis; F1, portal fibrosis without septa; F2, portal fibrosis with few septa; F3, numerous septa without cirrhosis; F4, cirrhosis; DC, decompensated cirrhosis; HCC, hepatocellular carcinoma; LT, liver transplantation (first year); PLT, post liver transplantation (> 1 year), DAA treatment, direct-acting antiviral treatment.

References:

1. Chhatwal J, Chen Q, Aggarwal R. Estimation of Hepatitis C Disease Burden and Budget Impact of Treatment Using Health Economic Modeling. *Infectious Disease Clinics*. 2018;32(2):461-480.
2. Chhatwal J, Chen Q, Ayer T, et al. Hepatitis C virus re-treatment in the era of direct-acting antivirals: projections in the USA. *Alimentary pharmacology & therapeutics*. 2018;47(7):1023-1031.
3. Chhatwal J, Wang X, Ayer T, et al. Hepatitis C disease burden in the United States in the era of oral direct-acting antivirals. *Hepatology (Baltimore, Md)*. 2016;64(5):1442-1450.
4. van der Meer AJ, Veldt BJ, Feld JJ, et al. Association between sustained virological response and all-cause mortality among patients with chronic hepatitis C and advanced hepatic fibrosis. *Jama*. 2012;308(24):2584-2593.
5. Denniston MM, Jiles RB, Drobeniuc J, et al. Chronic Hepatitis C Virus Infection in the United States, National Health and Nutrition Examination Survey 2003 to 2010. *Annals of internal medicine*. 2014;160(5):293-300.
6. Lang K, Danchenko N, Gondek K, Shah S, Thompson D. The burden of illness associated with hepatocellular carcinoma in the United States. *Journal of hepatology*. 2009;50(1):89-99.
7. Hofmeister MG, Rosenthal EM, Barker LK, et al. Estimating Prevalence of Hepatitis C Virus Infection in the United States, 2013-2016. *Hepatology (Baltimore, Md)*. 2018.
8. Islam N, Kraiden M, Shoveller J, et al. Incidence, risk factors, and prevention of hepatitis C reinfection: a population-based cohort study. *The lancet Gastroenterology & hepatology*. 2017;2(3):200-210.
9. Falade-Nwulia O, Sulkowski MS, Merkow A, Latkin C, Mehta SH. Understanding and addressing hepatitis C reinfection in the oral direct-acting antiviral era. *J Viral Hepat*. 2018;25(3):220-227.
10. Rosenberg ES, Rosenthal EM, Hall EW, et al. Prevalence of Hepatitis C Virus Infection in US States and the District of Columbia, 2013 to 2016. *JAMA Network Open*. 2018;1(8):e186371-e186371.
11. Hep Corrections. <http://www.hepcorrections.org/> (last accessed: February 15, 2019).
12. Thanthong-Knight, S. "State Prisons Fail To Offer Cure To 144,000 Inmates With Deadly Hepatitis C". Kaiser Health News, July 9, 2018. Available at: <https://tinyurl.com/yycxqwh9> (last accessed: February 15, 2019)
13. Spaulding AC, Anderson EJ, Khan MA, Tabora-Vidarte CA, Phillips JA. HIV and HCV in U.S. Prisons and Jails: The Correctional Facility as a Bellwether Over Time for the Community's Infections. *AIDS reviews*. 2017;19(3).
14. Varan AK, Mercer DW, Stein MS, Spaulding AC. Hepatitis C seroprevalence among prison inmates since 2001: still high but declining. *Public health reports (Washington, DC : 1974)*. 2014;129(2):187-195.
15. Pham TT, Keast SL, Farmer KC, et al. Sustained Virologic Response and Costs Associated with Direct-Acting Antivirals for Chronic Hepatitis C Infection in Oklahoma Medicaid. *Journal of managed care & specialty pharmacy*. 2018;24(7):664-676.
16. Rice JB, Kirson NY, Shei A, et al. Estimating the costs of opioid abuse and dependence from an employer perspective: a retrospective analysis using administrative claims data. *Applied health economics and health policy*. 2014;12(4):435-446.
17. MappingHepC. AbbVie Inc, Chicago, IL. www.mappinghepc.com (last accessed: February 15, 2019).
18. Viral Hepatitis: Statistics and Surveillance. Centers for Disease Control and Prevention, Atlanta, GA.; 2018. <https://www.cdc.gov/hepatitis/statistics/index.htm>
19. Denniston MM, Kleven RM, McQuillan GM, Jiles RB. Awareness of infection, knowledge of hepatitis C, and medical follow-up among individuals testing positive for hepatitis C: National Health and Nutrition Examination Survey 2001-2008. *Hepatology (Baltimore, Md)*. 2012;55(6):1652-1661.
20. Sullivan JM, Soh J, Khan MA, Thompson WW, Nelson N. Trend analysis in hepatitis C virus testing among individuals covered by commercial insurance plans or Medicare Advantage, OptumLabs Data Warehouse, 2011–2017. International Society for Disease Surveillance (ISDS) conference, San Diego, CA, January 2019. 2019.
21. Barocas JA, Tasillo A, Eftekhari Yazdi G, et al. Population-level Outcomes and Cost-Effectiveness of Expanding the Recommendation for Age-based Hepatitis C Testing in the United States. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America*. 2018;67(4):549-556.
22. AASLD-IDSA. Recommendations for testing, managing, and treating hepatitis C. <http://www.hcvguidelines.org>. (last accessed: April 20, 2018).
23. A perspective from our CEO: Gilead Subsidiary to Launch Authorized Generics to Treat HCV "Gilead company statement. Available at: <https://www.gilead.com/news-and-press/company-statements/authorized-generics-for-hcv>; accessed February 14, 2019.
24. GoodRx. "FDA Approves Mavyret for Hepatitis C". Available at: <https://www.goodrx.com/blog/fda-approves-mavyret-for-hepatitis-c/>; accessed February 14, 2019
25. The 340B Drug Discount Program. Health Affairs Health Policy Brief, September 14, 2017. DOI: 10.1377/hpb20171024.663441.
26. Medicaid Best Price. Health Affairs Health Policy Brief, August 10, 2017. DOI: 10.1377/hpb20171008.000173.
27. Chhatwal J, Kanwal F, Roberts MS, Dunn MA. Cost-effectiveness and budget impact of hepatitis C virus treatment with sofosbuvir and ledipasvir in the United States. *Annals of internal medicine*. 2015;162(6):397-406.
28. Thein H, Yi Q, Dore G, Krahn M. Estimation of stage specific fibrosis progression rates in chronic hepatitis C virus infection: A meta analysis and meta regression. *Hepatology (Baltimore, Md)*. 2008;48(2):418-431.

29. Fattovich G, Giustina G, Degos F, et al. Morbidity and mortality in compensated cirrhosis type C: a retrospective follow-up study of 384 patients. *Gastroenterology*. 1997;112(2):463-472.
30. Cardoso AC, Moucari R, Figueiredo-Mendes C, et al. Impact of peginterferon and ribavirin therapy on hepatocellular carcinoma: incidence and survival in hepatitis C patients with advanced fibrosis. *Journal of hepatology*. 2010;52(5):652-657.
31. Planas R, Ballesté B, Antonio Álvarez M, et al. Natural history of decompensated hepatitis C virus-related cirrhosis. A study of 200 patients. *Journal of hepatology*. 2004;40(5):823-830.
32. Thuluvath P, Guidinger M, Fung J, Johnson L, Rayhill S, Pelletier S. Liver transplantation in the United States, 1999–2008. *American Journal of Transplantation*. 2010;10(4p2):1003-1019.
33. Davis G, Alter M, El-Serag H, Poynard T, Jennings L. Aging of hepatitis C virus (HCV)-infected persons in the United States: a multiple cohort model of HCV prevalence and disease progression. *Gastroenterology*. 2010;138(2):513-521.
34. Saab S, Hunt DR, Stone MA, McClune A, Tong MJ. Timing of hepatitis C antiviral therapy in patients with advanced liver disease: A decision analysis model. *Liver Transplantation*. 2010;16(6):748-759.
35. Wolfe R, Roys E, Merion R. Trends in Organ Donation and Transplantation in the United States, 1999–2008. *American Journal of Transplantation*. 2010;10(4p2):961-972.
36. Soh JE, Khan MA, Thompson WW, Nelson N. Prevalence of self-reported hepatitis C virus testing among non-institutionalized individuals in the United States: National Health Interview Survey, 2013–2017. International Society for Disease Surveillance (ISDS) conference, San Diego, CA, January 2019. 2019.
37. Isenhour C, Hariri S, Vellozzi C. Monitoring the hepatitis C care cascade using administrative claims data. *The American journal of managed care*. 2018;24(5):232-238.
38. National Viral Hepatitis Roundtable and Harvard Law School’s Center for Health Law and Policy Innovation. Hepatitis C: State of Medicaid Access. Available at: <https://stateofhepc.org/report/>; accessed February 14, 2019.
39. Jung JK, Feldman R, Cheong C, Du P, Leslie D. Coverage for hepatitis C drugs in Medicare Part D. *The American journal of managed care*. 2016;22(6 Spec No.):Sp220-226.
40. Spaulding AC, Adee MG, Lawrence RT, Chhatwal J, von Oehsen W. Five Questions Concerning Managing Hepatitis C in the Justice System. *Infectious Disease Clinics*. 2018;32(2):323-345.
41. Chhatwal J, Ferrante SA, Brass C, et al. Cost-Effectiveness of boceprevir in patients previously treated for chronic hepatitis C genotype 1 Infection in the United States. *Value in Health*. 2013;16(6):973-986.
42. McAdam-Marx C, McGarry LJ, Hane CA, Biskupiak J, Deniz B, Brixner DI. All-cause and incremental per patient per year cost associated with chronic hepatitis C virus and associated liver complications in the United States: A managed care perspective. *J Manag Care Pharm*. 2011;17(7):531-546.
43. He T, Li K, Roberts MS, et al. Prevention of Hepatitis C by Screening and Treatment in U.S. Prisons. *Annals of internal medicine*. 2016;164(2):84-92.
44. Ambulatory Health Care Data. National Center for Health Statistics. Centers for Disease Control; and Prevention, Atlanta, GA.; 1973-2015. <https://www.cdc.gov/nchs/ahcd/index.htm>.
45. HCUPnet. Healthcare Cost and Utilization Project (HCUP). Agency for Healthcare Research and Quality, Rockville, MD.; 1990-2015. <https://hcupnet.ahrq.gov/#setup>.
46. HCUP National (Nationwide) Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). Agency for Healthcare Research and Quality, Rockville, MD.; 1980-2015. <https://www.hcup-us.ahrq.gov/nisoverview.jsp>.
47. HCUP State Emergency Department Databases (SEDD). Healthcare Cost and Utilization Project (HCUP). Agency for Healthcare Research and Quality, Rockville, MD.; 2001-2015. <https://www.hcup-us.ahrq.gov/db/state/sedddbdocumentation.jsp>.
48. HCUP Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). Agency for Healthcare Research and Quality, Rockville, MD.; 2006-2015. <https://www.hcup-us.ahrq.gov/db/nation/neds/nedsdde.jsp>.
49. Weiss AJ, Heslin KC. Payers of Opioid-Related Inpatient Stays and Emergency Department Visits Nationally and by State, 2010 and 2015. *HCUP Statistical Brief #239*. 2018;May.
50. Grant WC, Jhaveri RR, McHutchison JG, Schulman KA, Kauf TL. Trends in health care resource use for hepatitis C virus infection in the United States. *Hepatology*. 2005;42(6):1406-1413.
51. Ngo-Metzger Q, Mabry-Hernandez I, Heslin K, Weiss A, Mummert A, Bierman A. Characteristics of Inpatient Stays Involving Hepatitis C, 2005–2014: Statistical Brief# 232. 2017.
52. Guy GP, Pasalic E, Zhang K. Emergency department visits involving opioid overdoses, US, 2010–2014. *American journal of preventive medicine*. 2018;54(1):e37-e39.
53. HCUP Nationwide Emergency Department Database (NEDS) Restricted Access File. Healthcare Cost and Utilization Project (HCUP). Agency for Healthcare Research and Quality, Rockville, MD; 2017. <https://healthdata.gov/dataset/hcup-nationwide-emergency-department-database-neds-restricted-access-file>.
54. HCUP State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). Agency for Healthcare Research and Quality, Rockville, MD.; 1990-2015. <https://www.hcup-us.ahrq.gov/db/state/siddbdocumentation.jsp>.

Appendix

Table A.1. State-Level Estimates of Hepatitis C Prevalence by Insurance Status and Incarceration, United States

State	HCV Prevalence ^a	Breakdown by Insurance Status and Incarceration, % ^b				
	No. of Viremic People	Medicaid	Medicare	Private	Uninsured	Incarcerated
Alabama	30,623	37%	27%	15%	14%	7%
Alaska	5,608	38%	29%	16%	4%	14%
Arizona	64,251	47%	26%	14%	4%	9%
Arkansas	21,976	30%	30%	27%	6%	6%
California	335,355	42%	32%	16%	5%	6%
Colorado	38,555	41%	29%	18%	4%	8%
Connecticut	19,244	44%	27%	15%	4%	9%
District of Columbia	12,012	47%	27%	18%	7%	1%
Delaware	6,159	30%	30%	16%	15%	9%
Florida	148,541	26%	32%	16%	21%	5%
Georgia	56,195	31%	29%	19%	14%	7%
Hawaii	6,917	47%	28%	13%	3%	9%
Idaho	11,100	45%	29%	17%	6%	4%
Illinois	57,616	40%	25%	20%	6%	9%
Indiana	39,819	38%	28%	18%	10%	5%
Iowa	12,626	41%	31%	18%	4%	6%
Kansas	14,424	32%	31%	18%	15%	4%
Kentucky	44,005	56%	20%	12%	5%	6%
Louisiana	50,638	24%	30%	21%	18%	6%
Maine	7,370	42%	23%	15%	14%	6%
Maryland	41,489	52%	26%	13%	4%	4%
Massachusetts	38,196	48%	30%	16%	3%	2%
Michigan	70,527	39%	33%	17%	6%	5%
Minnesota	25,070	41%	25%	27%	3%	4%
Mississippi	22,771	37%	27%	15%	14%	7%
Missouri	41,576	38%	24%	14%	15%	10%
Montana	7,669	44%	28%	16%	6%	5%
Nebraska	7,938	18%	34%	36%	7%	6%
Nevada	23,272	39%	30%	17%	6%	8%
New Hampshire	8,087	46%	28%	16%	5%	5%
New Jersey	47,727	38%	28%	25%	7%	2%
New Mexico	29,046	49%	26%	13%	4%	7%
New York	119,646	50%	27%	14%	5%	4%
North Carolina	66,244	27%	27%	22%	20%	4%
North Dakota	2,787	37%	19%	24%	8%	11%
Ohio	101,577	39%	25%	16%	6%	14%
Oklahoma	55,826	28%	31%	16%	18%	7%
Oregon	51,870	45%	30%	15%	4%	5%
Pennsylvania	100,939	43%	26%	17%	5%	9%
State	HCV Prevalence ^a	Breakdown by Insurance Status and Incarceration, % ^b				

	No. of Viremic People	Medicaid	Medicare	Private	Uninsured	Incarcerated
Rhode Island	10,535	49%	30%	11%	4%	5%
South Carolina	36,790	25%	33%	16%	20%	6%
South Dakota	3,876	34%	25%	18%	11%	12%
Tennessee	71,342	32%	29%	15%	19%	5%
Texas	205,802	21%	30%	21%	20%	8%
Utah	12,604	32%	26%	21%	14%	7%
Vermont	3,842	52%	27%	13%	3%	5%
Virginia	45,331	27%	26%	15%	13%	19%
Washington	58,277	42%	29%	19%	4%	6%
West Virginia	21,111	52%	21%	12%	10%	5%
Wisconsin	28,336	40%	31%	15%	5%	9%
Wyoming	3,853	31%	27%	15%	18%	9%

^aDefault estimates for HCV prevalence (for the year 2015) were obtained from a recently published work¹⁰ that leverages multiple data sources and advanced statistical models to estimate the prevalence of current HCV infection in each state. In the *Hep C State Policy Simulator*, users can change the default prevalence value (from -50% to +200% of the default value).

^bEstimates for HCV prevalence in state prisons are obtained from the Hep Corrections website (www.HepCorrections.org). For non-incarcerated population, estimates of the breakdown of HCV prevalence by insurance status were based on a recent CDC analysis. This analysis incorporates evidence on frequency of seeking medical care among persons with diagnosed HCV¹⁵ and those with opioid abuse/dependence¹⁶ (a proxy for probable recent HCV infections) as well as state-level data for 2012–2015 from a variety of data sources⁴⁴⁻⁴⁸ (Table A.2) to estimate the number of patients with HCV in each insurance category. If users choose to change the default value for HCV prevalence (reported in column “HCV Prevalence, No. of Viremic People”), then the estimated breakdown by subpopulation (i.e., Medicaid, Medicare, privately insured, uninsured, and incarcerated) is applied to the updated prevalence value.

Table A.2. Data Sources for Inpatient, Emergency Rooms, and Ambulatory Care Visits, United States

State	HCV-Related Visits ^a			Opioid-Related Visits ^b		
	Ambulatory Care ^c	Inpatient Care ^d	Emergency Room Care ^e	Ambulatory Care ^c	Inpatient Care ^d	Emergency Room Care ^e
Alabama	census region	census division	census region	census region	census division	census region
Alaska	census region	census division	census region	census region	census division	census region
Arizona	state level	state level	state level	census region	state level	state level
Arkansas	census region	state level	state level	census region	state level	state level
California	state level	state level	census region	state level	state level	census region
Colorado	census region	state level	census region	census region	state level	census region
Connecticut	census region	census division	census region	census region	census division	census region
District of Columbia	census region	census division	census region	census region	census division	census region
Florida	state level	state level	state level	state level	state level	state level
Georgia	state level	census division	census region	state level	state level	census region
Hawaii	census region	state level	state level	census region	state level	state level
Illinois	census region	state level	census region	census region	state level	census region
Indiana	census region	state level	census region	census region	state level	census region
Iowa	census region	state level	state level	census region	state level	census region
Kansas	census region	state level	census region	census region	state level	census region
Kentucky	census region	state level	state level	census region	state level	state level
Louisiana	census region	census division	census region	census region	census division	census region
Maine	census region	state level	census region	census region	state level	census region
Maryland	census region	state level	state level	census region	state level	state level
Massachusetts	census region	state level	state level	census region	state level	state level
Michigan	census region	state level	census region	census region	state level	census region
Minnesota	census region	state level	state level	census region	state level	state level
Mississippi	census region	census division	census region	census region	census division	census region
Missouri	census region	state level	census region	census region	state level	census region
Montana	census region	census division	census region	census region	census division	census region
Nebraska	census region	state level	state level	census region	state level	state level
Nevada	census region	state level	state level	census region	state level	state level
New Hampshire	census region	census division	census region	census region	census division	census region
New Jersey	census region	state level	state level	census region	state level	state level
New Mexico	census region	state level	census region	census region	state level	census region
New York	census region	state level	census region	census region	state level	census region
North Carolina	census region	state level	state level	census region	state level	state level
North Dakota	census region	state level	census region	census region	state level	census region
Ohio	census region	census division	census region	census region	census division	census region
Oklahoma	census region	state level	census region	census region	state level	census region
Oregon	census region	state level	census region	census region	state level	census region
Pennsylvania	census region	census division	census region	census region	census division	census region
Rhode Island	census region	state level	state level	census region	state level	state level

HCV-Related Visits ^a			Opioid-Related Visits ^b		
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State	Ambulatory Care ^c	Inpatient Care ^d	Emergency Room Care ^e	Ambulatory Care ^c	Inpatient Care ^d	Emergency Room Care ^e
South Carolina	census region	state level	state level	census region	state level	state level
South Dakota	census region	census division	census region	census region	census division	census region
Tennessee	census region	state level	census region	census region	state level	census region
Texas	state level	state level	census region	census region	state level	census region
Utah	census region	state level	census region	census region	state level	census region
Vermont	census region	state level	state level	census region	state level	state level
Virginia	census region	census division	census region	census region	census division	census region
Washington	state level	state level	census region	state level	state level	census region
West Virginia	census region	state level	census region	census region	state level	census region
Wisconsin	state level	state level	census region	census region	state level	census region
Wyoming	census region	state level	census region	census region	state level	census region

^aHCV-related visits are defined as those with ICD-9ⁱ diagnosis codes for acute HCV (ICD-9 codes 070.41, 070.51^{15,49-51}), chronic HCV (ICD-9 codes 070.44, 070.54^{15,49-51}), and unspecified HCV (ICD-9 codes 070.70, 070.71, V02.62^{15,49-51}) noted as the principal or any of 29 secondary diagnoses.

^bOpioid-related visits were used as a proxy for new Hepatitis C infections among persons who inject drugs who might have not yet been diagnosed. Opioid-related visits are defined as those with ICD-9 diagnosis codes for overdose (ICD-9 codes 965.00- 965.02, 965.09^{49,52} or E850.0-E850.2^{49,52}), opioid dependence (ICD-9 codes 304.00-304.02, 304.70-304.72⁴⁹), opioid abuse (ICD-9 codes 305.50-305.52⁴⁹), and opiates or opiate antagonists causing adverse therapeutic effects (ICD-9 codes 970.1; E935.0-E935.2, E940.1⁴⁹), where such codes were noted as the principal or any of 29 secondary diagnoses. Patient records with ICD-9 codes for both HCV and Opioids were classified only as HCV visits.

^cEstimates of ambulatory care visits were based on data from the National Ambulatory Medical Care Survey (NAMCS),⁴⁴ from the National Center for Health Statistics (NCHS). State-level estimates were used where available (2012-2015 data for California, Florida, Georgia, Texas, and Wisconsin; 2014-2015 data for Arizona and Washington). Alternatively, we used 2014-2015 data to obtain estimates at the census region level, and applied the appropriate census region level value to each jurisdiction.

^dEstimates of inpatient visits were based on data for January-September of 2015 from the Healthcare Cost and Utilization Project (HCUP). For states that allow the release of their data for public use, we used data from HCUPnet (<https://hcupnet.ahrq.gov>) online query system.⁴⁵ For all other jurisdictions, we used data from the National Inpatient Sample (NIS)⁴⁶ to obtain estimates at the census division level, and applied the appropriate census division level value to each jurisdiction.

^dEstimates of emergency room visits were based on HCUP data for January-September of 2015. For states that allow releasing their data for public use, we used data from the State Emergency Department Databases (SEDD).⁴⁷ For all other jurisdictions, we used data from the National Emergency Department Sample (NEDS)^{48,53} to obtain estimates at the census region level, and applied the appropriate census region level value to each jurisdiction.

Data Sources:

NAMCS:⁴⁴

- For the years of 2012-2015, NAMCS includes a random sample of 25,000-28,000 unweighted visits to nonfederally employed office-based physicians primarily engaged in direct patient care. NAMCS provides estimates of the use of ambulatory care at the national level and at the state level for the most populous states (ranging from 34 states in 2012 to 16 states in 2015).

HCUPnet:⁴⁵

- HCUPnet is an on-line query system that includes state-level health care statistics for hospital inpatient settings. HCUPnet is based on the State Inpatient Databases (SID)⁵⁴ — an HCUP's dataset that contains all inpatient care

ⁱ For this analysis, we used only ICD-9 codes and did not use ICD-10 codes. According to a recent study by Heslin et al. (2017; DOI: <https://doi.org/10.1097/MLR.0000000000000805>), the transition to ICD-10-CM codes, effective October 2015, could result in substantial changes in the number of visits with the same medical condition. For instance, in October-December 2015, the number of inpatient visits involving opioid abuse and poisoning decreased by 21.1% and 12.4%, respectively, compared to July-August 2015, with the greatest decreases observed in Medicare-eligible populations. Since the impact of the ICD-10-CM codes transition on other medical conditions is not well understood, we excluded records for October-December 2015 and focused on the time periods that used ICD-9 codes only (January 2012-September 2015).

records from community hospitals in 48 participating states, of which 36 states allow releasing their data for public use.

NIS:⁴⁶

- NIS randomly samples 20% of SID visits and contains approximately 7 million unweighted observations per year.

SEDD:⁴⁷

- SEDD contains all ER visits that do not result in an admission from 36 participating states, of which 16 states released their data for public use.

NEDS:^{48,53}

- Sampled from SEDD and SID, NEDS represents a 20-percent sample of US hospital-based ER visits and contains 30-31 million unweighted visits per year.

Table A.3. Number of Reported Acute HCV Cases by State and Year, United States

State	2008	2009	2010	2011	2012	2013	2014	2015	2016
Alabama	13	10	7	23	24	30	35	70	32
Alaska	2	2	2	3	4	5	5	6	7
Arizona	21	21	21	28	42	49	49	56	70
Arkansas	1	2	1	0	5	30	13	2	0
California	30	43	32	48	63	72	73	59	60
Colorado	14	28	20	28	42	21	33	40	35
Connecticut	19	53	37	47	34	25	25	29	17
District of Columbia	3	3	3	4	6	7	7	4	25
Delaware	2	1	2	3	4	5	5	6	7
Florida	32	53	56	64	107	134	93	126	236
Georgia	16	31	32	53	82	48	57	84	93
Hawaii	4	4	4	6	9	10	10	11	14
Idaho	3	7	11	12	11	14	6	4	7
Illinois	10	6	1	6	26	37	27	31	21
Indiana	13	22	27	84	110	175	122	138	146
Iowa	0	11	0	0	3	22	22	25	31
Kansas	1	1	2	8	16	17	28	22	15
Kentucky	68	64	109	142	178	226	176	119	103
Louisiana	9	9	4	7	11	19	22	24	5
Maine	3	2	2	12	8	8	31	30	25
Maryland	22	23	24	35	39	53	42	38	35
Massachusetts	13	10	13	23	37	174	228	249	424
Michigan	129	35	45	32	76	74	78	83	107
Minnesota	22	15	16	17	32	47	40	37	51
Mississippi	9	9	9	12	18	21	21	24	30
Missouri	2	0	6	8	4	6	6	8	24
Montana	6	1	4	9	9	16	13	15	20
Nebraska	2	3	2	2	3	2	2	8	2
Nevada	22	5	7	10	12	9	6	12	16
New Hampshire	4	4	4	5	8	9	9	11	13
New Jersey	61	7	28	53	71	106	113	130	122
New Mexico	5	6	14	14	21	12	16	40	18
New York	43	53	50	52	93	131	126	121	179
North Carolina	46	24	39	60	63	79	111	144	82
North Dakota	0	2	0	0	0	4	0	0	1
Ohio	40	26	10	6	7	116	105	122	187
Oklahoma	20	27	41	53	80	40	45	35	32
Oregon	23	19	19	20	37	14	15	13	19
Pennsylvania	27	39	26	35	66	81	69	129	225
Rhode Island	10	10	10	13	20	23	23	27	33
South Carolina	4	1	1	1	1	0	4	5	10

State	2008	2009	2010	2011	2012	2013	2014	2015	2016
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South Dakota	3	3	3	3	5	6	6	7	20
Tennessee	28	33	46	83	129	98	123	173	150
Texas	59	36	35	37	44	28	47	48	40
Utah	12	6	10	10	17	11	38	30	76
Vermont	1	1	2	6	6	3	4	1	5
Virginia	8	10	13	25	76	41	54	52	43
Washington	25	22	25	41	54	63	82	63	62
West Virginia	22	31	21	46	55	58	62	63	94
Wisconsin	3	3	10	15	26	40	49	64	103
Wyoming	0	0	0	2	3	4	4	5	6

Data from 2007 to 2016 are downloaded from the [CDC website](#).¹⁸ Where state-level estimates are not available (i.e., Alaska, Arizona, Delaware, Hawaii, Iowa, Mississippi, New Hampshire, North Dakota, South Carolina, South Dakota, and Wyoming), the national rate was applied to the state population to generate a state estimate.

Data Source: Viral Hepatitis: Statistics and Surveillance, Centers for Disease Control and Prevention.¹⁸

Table A.4. Projected Acute HCV Cases by State for Years 2017–2030, United States

State	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029+
Alabama	52	57	61	66	71	76	81	85	90	95	100	105	105
Alaska	7	8	9	9	10	10	11	12	12	13	14	14	14
Arizona	69	74	80	85	91	97	102	108	113	119	125	130	130
Arkansas	11	11	12	13	14	15	16	17	18	19	20	21	21
California	68	70	72	75	77	79	82	84	86	89	91	93	93
Colorado	40	42	44	47	49	51	53	55	57	60	62	64	64
Connecticut	17	17	17	17	17	17	17	17	17	17	17	17	17
District of Columbia	15	16	17	19	20	22	23	25	26	28	29	31	31
Delaware	7	8	8	9	10	10	11	11	12	13	13	14	14
Florida	196	214	233	252	271	290	309	328	347	365	384	403	403
Georgia	97	105	113	121	130	138	146	154	163	171	179	187	187
Hawaii	14	15	16	17	18	19	21	22	23	24	25	26	26
Idaho	9	9	10	10	10	10	10	11	11	11	11	12	12
Illinois	32	35	37	40	43	45	48	50	53	55	58	61	61
Indiana	186	205	223	241	260	278	296	315	333	352	370	388	388
Iowa	31	34	38	41	45	48	52	55	59	62	66	69	69
Kansas	27	30	32	35	38	41	44	47	49	52	55	58	58
Kentucky	187	199	211	223	235	247	259	271	283	295	306	318	318
Louisiana	19	20	22	23	25	26	27	29	30	31	33	34	34
Maine	31	34	38	41	45	48	52	55	58	62	65	69	69
Maryland	49	51	54	57	60	63	66	69	72	75	78	80	80
Massachusetts	350	392	435	477	519	561	604	646	688	730	772	815	815
Michigan	81	82	83	84	86	87	88	89	90	91	92	93	93
Minnesota	49	52	55	59	62	65	68	72	75	78	82	85	85
Mississippi	28	30	32	34	36	38	40	42	44	46	48	50	50
Missouri	15	17	18	20	21	23	25	26	28	29	31	32	32
Montana	20	22	24	26	28	30	32	34	36	38	40	42	42
Nebraska	4	5	5	5	5	6	6	6	7	7	7	7	7
Nevada	11	11	11	11	11	11	11	11	11	11	11	11	11
New Hampshire	13	14	15	16	17	18	19	20	21	22	23	24	24
New Jersey	129	138	147	156	165	175	184	193	202	211	220	229	229
New Mexico	29	31	34	36	39	41	44	46	49	51	54	56	56
New York	169	184	198	213	228	242	257	271	286	300	315	329	329
North Carolina	127	139	150	161	172	183	194	205	216	227	238	249	249
North Dakota	1	1	1	1	1	1	1	2	2	2	2	2	2
Ohio	157	174	191	208	225	242	258	275	292	309	326	343	343
Oklahoma	44	45	45	46	46	46	47	47	48	48	48	49	49
Oregon	19	19	19	19	19	19	19	19	19	19	19	19	19
Pennsylvania	166	183	199	216	233	250	267	284	300	317	334	351	351
Rhode Island	33	36	38	41	44	47	49	52	55	58	60	63	63
South Carolina	6	7	8	8	9	10	10	11	12	12	13	14	14
South Dakota	13	14	16	17	18	19	21	22	23	25	26	27	27

State	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029+
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Tennessee	179	196	212	228	245	261	277	293	310	326	342	358	358
Texas	40	40	40	40	40	40	40	40	40	40	40	40	40
Utah	53	58	64	70	75	81	87	92	98	104	109	115	115
Vermont	5	5	5	5	5	5	5	5	5	5	5	5	5
Virginia	66	72	77	83	89	95	101	107	113	119	125	131	131
Washington	82	88	95	102	108	115	121	128	135	141	148	154	154
West Virginia	89	96	104	111	119	126	134	141	149	156	164	172	172
Wisconsin	87	97	108	118	128	138	148	158	169	179	189	199	199
Wyoming	6	7	8	9	9	10	11	12	12	13	14	15	15

These estimates are modeled based on CDC data on the reported acute HCV cases for the period of 2007-2016¹⁸ (see Table A.3). For the years between 2017 and 2028, we assumed HCV incidence continues to increase at the rate observed between 2006 and 2016. From 2029 onwards, we assumed that incidence rates stabilize and remain flat.

Table A.5. Percentage of HCV-Infected People Aware of Their Disease Status, United States, 2015

Age	Awareness Rate by Insurance Status ¹⁹	
	Insured	Uninsured
<40	18%	6%
40-49	60%	20%
50-59	55%	16%
>60	35%	6%

The likelihood of persons living with HCV infection who are aware of their infection depends on their insurance status and age. ¹⁹ Table A.5 summarizes this information and presents the age- and insurance-specific HCV awareness rates used in HEP-SIM.

Table A.6. SVR Rates by Treatment, Genotype, Treatment History, and Fibrosis State, United states

Treatment History and Fibrosis State	GT1	GT2	GT3	GT4-6
PEG+RBV				
Treatment naïve				
F0-F3	0.54	0.82	0.70	0.58
F4	0.36	0.64	0.49	0.32
Contraindicated with modifiable reasons				
F0-F2	-	0.66	0.56	0.46
F3	0.43	0.66	0.56	0.46
F4	0.28	0.51	0.40	0.26
Failed PEG+RBV: relapse				
F0-F3	0.27	0.71	0.66	0.31
F4	0.13	0.56	0.52	0.24
Failed PEG+RBV: partial response				
F0-F3	0.18	0.69	0.64	0.31
F4	0.10	0.55	0.51	0.24
Failed PEG+RBV: null response				
F0-F3	0.10	0.54	0.50	0.31
F4	0.05	0.42	0.39	0.24
BOC/TEL+PEG+RBV (GT1 only)				
Treatment naïve				
F0-F3	0.75	-	-	-
F4	0.62	-	-	-
Contraindicated with modifiable reasons				
F0-F2	-	-	-	-
F3	0.5	-	-	-
F4	0.36	-	-	-
Failed PEG+RBV: relapse				
F0-F2	0.87	-	-	-
F3	0.85	-	-	-
F4	0.84	-	-	-
Failed PEG+RBV: partial response				
F0-F2	0.72	-	-	-
F3	0.56	-	-	-
F4	0.56	-	-	-
Failed PEG+RBV: null response				
F0-F2	0.41	-	-	-
F3	0.39	-	-	-
F4	0.14	-	-	-
DAA non-NS5A*				
Treatment naïve				
F0-F3	0.9	0.9	0.85	0.9
F4	0.8	0.8	0.6	0.8

GT1	GT2	GT3	GT4-6
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Treatment History and Fibrosis State				
Contraindicated with modifiable and non-modifiable reasons				
F0-F3	0.9	0.9	0.9	0.9
F4	0.7	0.7	0.6	0.7
Failed PEG+RBV: relapse				
F0-F3	0.9	0.9	0.85	0.9
F4	0.8	0.7	0.6	0.75
Failed PEG+RBV: partial and null response				
F0-F3	0.9	0.9	0.85	0.9
F4	0.75	0.7	0.6	0.75
Failed first-generation PI				
F0-F3	0.9	-	-	-
F4	0.7	-	-	-
Failed DAA NS5A (during 2015-2018)				
F0-F3	-	-	-	-
F4	0.8	0.8	0.6	0.8
DAA NS5A**				
Treatment naïve, contraindicated, failed PEG+RBV, failed BOC/TEL+PEG+RBV (GT1 only), failed DAA non-NS5A, failed DAA nonNS5A				
F0-F3	0.95	0.99	0.95	0.99
F4	0.9	0.99	0.9	0.99
DAA NS5A-next generation***				
All conditions				
F0-F3	0.95	0.99	0.95	0.99
F4	0.9	0.99	0.9	0.99

*DAA1 non-NS5A includes the following drug combinations: SOF+IFN+/-RBV, SOF+/-RBV, SOF+SMV+/-RBV, and SMV+IFN+/-RBV.

**DAA1 NS5A includes the following drug combinations: SOF+LDV+/-RBV, SOF+DCV, DCV+IFN+/-RBV, OBV/PTV/r+DSV+/-RBV, OBV/PTV/r+/-RBV, EBR+GZR, and SOF+VEL.

***DAA2 NS5A includes the next wave of potential drug combinations such as SOF/VEL/VOX, grazoprevir/ruzasvir/uprifosbuvir, glecaprevir/pibrentasvir, and odalasvir+AL-335+/-SMV

Abbreviations: GT, genotype; PEG, peginterferon; RBV, ribavirin; F0, no fibrosis; F1, portal fibrosis without septa; F2, portal fibrosis with few septa; F3, numerous septa without cirrhosis; F4, cirrhosis; BOC, boceprevir; TEL, telaprevir; DAA, direct-acting antiviral; NS5A, nonstructural protein 5A; PI, protease inhibitor; SOF, sofosbuvir; IFN, interferon; SMV, simeprevir; LDV, ledipasvir; DCV, daclatasvir; OBV, ombitasvir; PTV, paritaprevir; r, ritonavir; DSV, dasabuvir; EBR, elbasvir; GZR, grazoprevir; VEL, velpatasvir; VOX, voxilaprevir

Data Source: All estimates in this tables are adapted from Chhatwal et al.²