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Awareness of Hepatitis C Virus Seropositivity and Chronic Infection in the Hispanic Community Health Study/Study of Latinos (HCHS/SOL)

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Abstract

Few population-based studies have assessed awareness of hepatitis C virus (HCV) seropositivity and chronic infection. We report awareness of HCV seropositivity and chronic infection and correlates of awareness in a multi-city (Bronx, Miami, Chicago, and San Diego) community-dwelling population sample of United States (US) Hispanics/Latinos recruited during 2008–2011. Included were 260 HCV-seropositive participants, among whom 190 had chronic HCV. Among those with chronic HCV, 46% had been told by a doctor that they had liver disease and 32% had been told that they had HCV-related liver disease. Among those with chronic HCV who also lacked health insurance (37% of those with chronic HCV), only 8% had been told that they had HCV-related liver disease. As compared with the uninsured, those with insurance were over five times more likely to be aware of having HCV-related liver disease (44%). Sex, age, education, city of residence, and birthplace were not associated with HCV awareness. Less than half of Hispanics/Latinos were aware of their HCV chronic infection. Lack of health insurance may be an important barrier to HCV awareness in this population.

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Keywords

Hepatitis C virus; Hispanic; Latino; United States; Awareness

Introduction

Until very recently most people with chronic hepatitis C virus (HCV) infection could not be successfully treated due to shortcomings in treatment options. Available therapeutic regimens had low efficacy and high side effect profiles and were prescribed to only a small subset of HCV patients who presented for clinical care [1]. In the past several years, however, a series of highly efficacious and tolerable direct acting antiviral (DAA) HCV therapies have entered clinical practice. Costs of DAA therapy may be prohibitively high in some settings, but this will likely improve with additional DAA alternatives on the way. With DAA therapy, >90% of HCV patients can eradicate virus and achieve an HCV cure [2].

Given the availability of efficacious DAA therapies, there is now widespread interest in engaging people with chronic HCV infection and facilitating their entry into appropriate clinical care. Unfortunately, it is difficult to engage many people with chronic HCV infection because many HCV-positives are not aware of their infection. For example, in the National Health and Nutrition Examination Surveys (NHANES) conducted in the United States (US) from 2001 through 2008, only half (50%) of HCV-seropositives knew they had been infected with HCV prior to receiving their NHANES test results [3].

Birth cohort screening, as recommended by the US Centers for Disease Control and Prevention (CDC) and US Preventive Services Task Force (USPSTF) [4;5] is an important strategy to increase awareness of HCV among those who are infected. However, engagement between infected populations and the healthcare system is a prerequisite for the success of birth cohort and other screening strategies such as universal screening or targeted screening of patients with HCV transmission risk factors. It is well recognized that a substantial fraction of individuals in the US including many in racial/ethnic minority and immigrant communities have limited engagement with the healthcare system [6].

Aside from NHANES [3], there are to our knowledge no other population-based assessments of awareness of HCV seropositivity and chronic infection in US populations nor any studies of HCV awareness focused exclusively on US racial/ethnic minority populations. Our group recently reported prevalence of HCV seropositivity and chronic infection in a population-based study of 11,964 predominantly low-income Hispanics/Latinos recruited from four US communities as a part of the Hispanic Community Health Study/Study of Latinos (HCHS/SOL) [7]. We now report on awareness of HCV seropositivity and chronic infection and their correlates to provide insight into whether additional strategies beyond birth cohort screening may be needed to increase awareness of HCV infection among US Hispanics/Latinos.

Materials and Methods

Study Population

HCHS/SOL is a study of 16,415 Hispanic/Latino adults recruited from four US communities (Bronx, Miami, Chicago, and San Diego) during 2008-2011 [8;9]. The objective of HCHS/SOL is to describe the frequency of impaired health in US Hispanics/Latinos, the likely causes associated with this impaired health and the measures needed to promote the health of the US Hispanic/Latino population. The HCHS/SOL study population was recruited using population-based survey methodology and is representative of the Hispanic/Latino populations residing in the four US communities. Participants completed physical examinations, in-person interviews, and provided blood samples. The HCHS/SOL protocol was approved by each local institutional review board, and participants provided informed consent including consent for HCV testing. The current report represents a secondary analysis of HCHS/SOL data.

Our prior report describes laboratory methods along with prevalence and correlates of HCV antibody and HCV RNA in the 11,964 HCHS/SOL participants who underwent HCV testing [7]. Briefly, HCV seroprevalence – defined as prevalence of detectable HCV antibody – was 2.0% in HCHS/SOL (95% CI, 1.6–2.4) and seroprevalence varied significantly by age, sex, study site and Hispanic/Latino background group. Hispanic/Latino background, sex and age were the primary determinants of HCV seroprevalence (e.g., seroprevalence was highest in Puerto Ricans, males, and individuals 50-59 years of age). HCHS/SOL interviews did not include questions related to important HCV risk factors, including drug use, sexual behaviors and blood transfusions prior to 1994. In the current study we define HCV seropositivity as detectable HCV antibody and chronic HCV infection as detectable HCV RNA in HCV-seropositives.

Questionnaire Assessment of HCV Awareness

The process of developing, translating and implementing study questionnaires was overseen by the HCHS/SOL coordinating center and local field centers. All interviewers received training and certification in interviewing techniques and were familiar with the medical terminology used in questionnaires. All centers had an on-site physician or nurse available to assist with obtaining accurate questionnaire responses and to provide clinical referral for participants discovered to have hepatitis virus infection. As a part of the in-person HCHS/SOL interview, participants were asked in the language of their preference: “*Has a doctor ever said that you have liver disease?*” Those who responded “*Yes*” were subsequently asked: “*What type of liver disease? Hepatitis?*” If the participant again responded “*Yes*”, the participant was asked: “*What type [of hepatitis]? (A, B, C, Don't know)*”. These questionnaires were conducted prior to the availability of study test results. The section of the HCHS/SOL questionnaires in English and Spanish that includes these questions is shown as Figure 1.

Based on participant responses to these questions we defined awareness of HCV seropositivity and chronic infection in three ways, reflecting a range from most specific to least specific knowledge about their condition. Option 1: Respondent was aware of having

liver disease, and knew that their disease was HCV-related; Option 2: Respondent was aware of having liver disease from “hepatitis” but did not identify the type of hepatitis as HCV-related; Option 3: Respondent was aware of having liver disease but without awareness that their disease was known as “hepatitis” and/or was due to infection with one of the hepatitis viruses.

Statistical Methods

The goal of the statistical analyses was broadly to identify correlates of HCV awareness in the HCHS/SOL population. We therefore considered in these exploratory statistical analyses a wide range of demographic, behavioral and clinical characteristics that in the opinion of the study team might be associated with HCV awareness. Clinical characteristics included non-invasive assessments of insulin resistance (HOMA-IR) and liver fibrosis (FIB-4) calculated using published formulas [10;11]. We initially conducted bivariate analyses of HCV seropositivity and chronic HCV infection status by demographic, behavioral and clinical characteristics using chi-square tests (categorical variables) and t-tests (continuous variables).

For those characteristics with statistically significant associations in bivariate analyses, we then used a series of nested multivariable Poisson regression models with robust variance estimation with progressively greater numbers of adjustment factors (covariates) to determine independent associations with HCV awareness. Poisson regression provides estimates of prevalence ratios (PRs) rather than odds ratios (ORs) – ORs overestimate the true exposure-phenotype association when the phenotype of interest (i.e., HCV awareness) is not rare [12]. All analyses accounted for the complex survey design of HCHS/SOL and were conducted using SAS-Callable SUDAAN 11.0 (Research Triangle Park, NC). Data analysis was conducted in 2014–2015.

Results

Among the 260 HCHS/SOL participants who were HCV-seropositive, less than half (42%) recalled having been told by a doctor that they had liver disease. Among 190 participants with chronic HCV infection (defined as those with detectable HCV RNA), 46% of participants reported being told by a doctor that they had liver disease and 32% reported being told that they had HCV-related liver disease (Table 1).

Among HCV-seropositives, having self-reported health insurance coverage and a higher number of medical visits in the past year were significantly associated with greater awareness of HCV (for all three definitions of HCV awareness: health insurance status ($P < 0.01$), number of medical visits ($P = 0.06$)) in bivariate analyses (Table 2). Other demographic, behavioral and clinical characteristics including age, sex, recruitment site, Hispanic/Latino background, education, household income, nativity, interview language, alcohol use, HOMA-IR and FIB-4 were not associated with awareness of HCV regardless of whether more or less specific definitions of HCV awareness were considered.

Among participants with chronic HCV infection, variables associated with higher awareness included being born in the 50 US states (vs. born outside the US), having health insurance

coverage and a higher number of medical visits in the past year (Table 3). Thirty seven percent of those with chronic HCV lacked health insurance, and in this group only 8% - 25% were aware of their HCV, depending on the definition of HCV awareness used (Table 3).

To understand more completely the statistically significant bivariate associations observed among participants with chronic HCV infection, we considered health insurance, the number of medical visits in the past year and nativity in multivariable models with adjustment for age, sex, recruitment site and Hispanic/Latino background. In these analyses, regardless of the definition of HCV awareness that was used, only self-reported health insurance remained independently associated with awareness of HCV (versus uninsured, prevalence ratios (PRs) for insured: 3.0 – 14.0; p-values: 0.02 – 0.0002) (Table 4).

Discussion

Awareness of HCV seropositivity and chronic infection in a large population-based study of Hispanics/Latinos recruited from four US communities during 2008-2011 is similar to awareness of HCV in the general non-institutionalized US population (50%) [3]. In HCHS/SOL, 46% of participants with chronic HCV infection recalled being told by a doctor that they had liver disease and 32% reported being told that they had HCV-related liver disease. However, a striking and important finding is that awareness of HCV varied significantly by health insurance status. Only 8% of participants with chronic HCV infection who lacked health insurance as compared to 44% with health insurance had been told by a doctor that they had HCV-related liver disease – a >5-fold difference in awareness.

The prior study of HCV awareness in NHANES 2001-2008 also observed a significant association between health insurance status and awareness of HCV infection [3]. The current investigation confirms this important finding in populations particularly vulnerable to health inequity. Unlike the NHANES 2001-2008 report, our study did not find differences in awareness of HCV across age groups, nor were there any other correlates of awareness of HCV after adjustment for health insurance status in the HCHS/SOL population.

Birth cohort screening as recommended by the US CDC and USPSTF [4;5] is already being implemented in large healthcare systems and is likely to increase awareness of HCV among those who are infected. However, birth cohort screening may be comparatively ineffective among US populations without health insurance and/or a source of regular medical care. Using sampling weights to derive descriptive statistics that reflect the underlying populations, we estimated that 37% of Hispanic adults with chronic HCV infection in the HCHS/SOL communities lacked health insurance. This highlights the need to evaluate carefully the birth cohort screening strategy in the US Hispanic/Latino population.

Undocumented immigrants in the US, the majority of whom are believed to be Hispanic/Latino, are excluded from obtaining health insurance under the Affordable Care Act (ACA), including expanded Medicaid as well as the new health benefit exchanges, or marketplaces. While HCHS/SOL baseline interviews did not include questions related to citizenship or migration status, nationwide estimates suggest that 79% of the 11.2 million undocumented immigrants living in the US are Hispanic/Latino [13]. Undocumented immigrants access the

medical system at lower rates than those with documentation and undocumented immigrants without health insurance have the lowest healthcare utilization rates of any group [14]. Furthermore, even if uninsured individuals with chronic HCV infection gain access to HCV screening, it is unclear how these individuals would access efficacious DAA therapies which in the US are prohibitively expensive for those without health insurance.

HCV screening and referral into appropriate clinical care may be particularly important for Hispanics/Latinos with chronic HCV infection because data from HCHS/SOL suggest that obesity including severe obesity is common in the US Hispanic/Latino population [15]. In the setting of chronic HCV infection, visceral obesity is associated with steatosis which in turn is associated with accelerated progression of liver fibrosis [16;17].

Several limitations should be considered in the interpretation of these data. First, HCHS/SOL interviews did not include questions related to important HCV risk factors, including drug use, sexual behaviors and blood transfusions prior to 1994 that might be important to consider in analyses of HCV awareness. Second, we cannot exclude the possibility that some HCHS/SOL participants were recently HCV infected and thus would not have had much time to become aware of their HCV infection. This said, most HCV-seropositives in HCHS/SOL were older than 40 years age and so could have become infected years or decades prior to enrollment. Third, the study conclusions are generalizable only to the four urban areas from which HCHS/SOL participants were recruited, albeit the study used a population-based sampling approach which allowed us to apply weighting and non-response adjustment to the study data. Finally, the data in this report may not completely capture awareness of HCV infection in the HCHS/SOL population because interview questions (Figure 1) assessed awareness of liver disease and whether this liver disease was related to hepatitis and HCV rather than directly assessing awareness of HCV infection as in the NHANES study [3]. HCV infection can be clinically silent for years or even decades after infection and not all HCV-infected persons develop liver enzyme elevations or other biochemical abnormalities that are consistent with hepatic inflammation and progressive liver disease. However, awareness of HCV infection may also have been incompletely captured in the NHANES study – only 43% of HCV-infected NHANES participants provided data related to HCV awareness with racial/ethnic minority participants and those without health insurance being less likely to contribute data [3].

In conclusion, less than half of Hispanics/Latinos residing in four large US urban communities were aware of their HCV seropositivity or chronic infection. Lack of health insurance may an important barrier to HCV awareness in this population. It is unclear whether birth cohort screening strategies will be sufficient to improve awareness of HCV among those Hispanics/Latinos without health insurance. Additional strategies for diagnosis and treatment of HCV infection in US Hispanics/Latinos may be warranted because DAA therapies are believed to be cost-effective for anyone with chronic HCV infection regardless of liver disease stage [18].

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18. Has a doctor ever said that you have liver disease?			
	No	0 ☐	→ GO TO QUESTION 19
	Yes	1 ☐	
What type of liver disease?			
18a. Hepatitis	No	0 ☐	→ GO TO QUESTION 18c
	Yes	1 ☐	
18b. What type?	Type A	1 ☐	
	Type B	2 ☐	
	Type C	3 ☐	
	Don't know	4 ☐	
18c. Cirrhosis	No	0 ☐	
	Yes	1 ☐	
18d. Other	No	0 ☐	
	Yes	1 ☐	

18. ¿Alguna vez le ha dicho un doctor que usted tiene una enfermedad del hígado?			
	No	0 ☐	→ GO TO QUESTION 19
	Sí	1 ☐	
¿Qué tipo de enfermedad del hígado?			
18a. Hepatitis	No	0 ☐	→ GO TO QUESTION 18c
	Sí	1 ☐	
18b. ¿Qué tipo?	Hepatitis A	1 ☐	
	Hepatitis B	2 ☐	
	Hepatitis C	3 ☐	
	No sabe	4 ☐	
18c. Cirrosis	No	0 ☐	
	Sí	1 ☐	
18d. Otra	No	0 ☐	
	Sí	1 ☐	

Figure 1.
HCHS/SOL questionnaire items related to liver disease and hepatitis.

Table 1
Awareness of HCV infection among HCHS/SOL Hispanics/Latinos^{a,b}

	Among HCV seropositives (n=260)		Among those with chronic HCV (n=190)	
	N	%	n	%
Option 1 (most specific)	86	28%	70	32%
Option 2	102	35%	83	40%
Option 3 (least specific)	119	42%	96	46%

^aAll values (except n) are weighted to account for the complex HCHS/SOL survey design.

^bOption 1: Respondent was aware of having liver disease, and knew that their disease was HCV-related; Option 2: Respondent was aware of having liver disease from “hepatitis” but did not identify the type of hepatitis as HCV-related; Option 3: Respondent was aware of having liver disease but without awareness that their disease was known as “hepatitis” and/or was due to infection with one of the hepatitis viruses (also see Methods and Figure 1).

Table 2
Awareness of HCV infection among HCHS/SOL participants with HCV seropositivity (N=260)^a

	Option 1 (most specific) ^b Aware of HCV (n=86)			Option 2 ^b Aware of HCV (n=102)			Option 3 (least specific) ^b Aware of HCV (n=119)		
	n	% (95% CI)	p ^c	N	% (95% CI)	p ^c	n	% (95% CI)	p ^c
Sex			0.90			0.52			0.33
Men	55	29 (18, 42)		67	37 (28, 47)		78	45 (35, 56)	
Women	31	28 (20, 38)		35	32 (21, 45)		41	37 (25, 50)	
Age group			0.24			0.16			0.78
18-29	0	0		0	0		1	15 (2, 62)	
30-39	7	42 (21, 68)		7	42 (21, 68)		8	46 (23, 71)	
40-49	24	30 (19, 44)		33	45 (31, 60)		35	48 (34, 62)	
50-59	38	27 (18, 38)		43	34 (23, 46)		49	40 (28, 53)	
60-69	16	23 (12, 41)		18	26 (13, 44)		24	42 (22, 65)	
70-74	1	23 (3, 72)		1	23 (3, 72)		2	39 (10, 79)	
Recruitment Site			0.25			0.29			0.39
Bronx	57	33 (24, 44)		68	41 (31, 52)		80	49 (38, 60)	
San Diego	14	23 (11, 42)		13	37 (19, 61)		14	39 (20, 62)	
Miami	4	12 (4, 32)		6	22 (11, 40)		8	33 (17, 55)	
Chicago	11	26 (12, 48)		15	29 (14, 51)		17	32 (16, 54)	
Background			0.30			0.32			0.58
Mexican	17	11 (3, 36)		19	32 (16, 53)		21	35 (19, 55)	
Central American	2	10 (2, 37)		3	42 (11, 80)		3	42 (11, 80)	
Cuban	4	17 (6, 40)		5	23 (8, 48)		8	49 (22, 77)	
Dominican	3	25 (12, 46)		3	11 (3, 36)		5	20 (6, 51)	
Puerto Rican	57	32 (23, 43)		68	40 (31, 50)		77	46 (36, 56)	
South American	0	0		0	0		1	18 (2, 70)	
Mixed/other	3	82 (41, 97)		4	90 (56, 98)		4	90 (56, 98)	
Interview language			0.40			0.35			0.40
Spanish	48	26 (18, 36)		56	33 (24, 43)		68	40 (30, 51)	
English	38	32 (22, 44)		46	40 (29, 52)		51	46 (35, 58)	

	Option 1 (most specific) ^b Aware of HCV (n=86)			Option 2 ^b Aware of HCV (n=102)			Option 3 (least specific) ^b Aware of HCV (n=119)		
	n	% (95% CI)	p ^c	N	% (95% CI)	p ^c	n	% (95% CI)	p ^c
Education			0.31			0.28			0.68
< High school	32	22 (14, 32)		39	29 (19, 40)		49	38 (27, 51)	
High school grad	26	36 (22, 52)		31	43 (30, 57)		34	46 (33, 60)	
> High school	27	29 (17, 44)		31	37 (23, 54)		35	45 (29, 62)	
Nativity			0.12			0.16			0.22
Outside US 50 states	53	24 (17, 33)		62	32 (23, 41)		75	39 (29, 50)	
In US 50 states	33	37 (24, 51)		40	43 (30, 57)		44	50 (37, 62)	
Household income			0.61			0.47			0.83
\$20,000	27	26 (19, 37)		33	39 (26, 54)		36	43 (29, 58)	
<\$20,000	51	31 (19, 46)		59	32 (24, 43)		71	41 (31, 52)	
Health insurance			<0.01			<0.01			<0.01
Yes	75	38 (28, 48)		87	45 (35, 55)		100	53 (43, 63)	
No	10	9 (4, 18)		14	18 (10, 30)		18	23 (14, 36)	
Alcohol use			0.16			0.71			0.76
Current	30	16 (5, 40)		39	35 (23, 48)		45	41 (28, 55)	
Former	51	35 (25, 45)		56	38 (29, 49)		65	45 (35, 56)	
Never	5	24 (15, 38)		7	28 (11, 55)		9	35 (15, 63)	
Number of medical visits in past year ^d			0.01			0.06			0.04
Q1 (range 0)	3	8 (2, 24)		7	17 (7, 37)		9	24 (11, 44)	
Q2 (range 1)	6	12 (5, 29)		9	29 (13, 53)		11	31 (14, 54)	
Q3 (range 2-3)	17	37 (19, 60)		19	43 (24, 64)		21	50 (29, 71)	
Q4 (range 4-99)	21	43 (25, 63)		27	54 (35, 72)		30	65 (43, 81)	
	Median (IQR)			Median (IQR)			Median (IQR)		
HOMA-IR	85	4.1 (1.6-6.2)	0.07	101	3.6 (1.7-6.0)	0.24	118	3.1 (1.7-6.0)	0.25
FIB-4	84	1.6 (1.0, 2.6)	0.26	99	1.6 (1.0, 2.6)	0.52	116	1.7 (1.1, 2.9)	0.05

^a All values (except n) are weighted to account for the complex HCHS/SOL survey design.

Option 1: Respondent was aware of having liver disease, and knew that their disease was HCV-related; Option 2: Respondent was aware of having liver disease from “hepatitis,” but did not identify the type of hepatitis as HCV-related; Option 3: Respondent was aware of having liver disease but without awareness that their disease was known as “hepatitis” and/or was due to infection with one of the hepatitis viruses.

^c *P*-values calculated using chi-square tests for categorical variables and t-tests for continuous variables

^d Data related to the number of medical visits in the past year were missing for n=110 participants; Q1 - Q4 are quartiles 1 – 4

Table 3
Awareness of HCV infection among HCHS/SOL participants with chronic HCV infection (N=190)^a

	Option 1 (most specific) ^b Aware of HCV (N=70)			Option 2 ^b Aware of HCV (N=83)			Option 3 (least specific) ^b Aware of HCV (N=96)		
	n	% (95% CI)	p ^c	n	% (95% CI)	p ^c	n	% (95% CI)	p ^c
Sex			0.45			0.89			0.85
Men	45	30 (20, 41)		55	39 (29, 51)		64	46 (35, 58)	
Women	25	37 (22, 55)		28	41 (25, 59)		32	44 (27, 63)	
Age group			0.47			0.17			0.34
18-29	0	0		0	0		0	0	
30-39	7	50 (25, 75)		7	50 (25, 75)		8	54 (27, 79)	
40-49	19	35 (21, 52)		27	54 (37, 69)		29	57 (41, 73)	
50-59	29	27 (17, 41)		32	34 (21, 49)		37	40 (26, 56)	
60-69	14	25 (12, 47)		16	28 (13, 50)		20	38 (18, 63)	
70-74	1	23 (3, 72)		1	23 (3, 72)		2	39 (10, 79)	
Recruitment Site			0.19			0.44			0.27
Bronx	48	39 (28, 52)		56	47 (35, 60)		66	55 (42, 68)	
San Diego	7	20 (8, 44)		9	39 (17, 66)		10	40 (18, 68)	
Miami	4	17 (6, 41)		6	31 (12, 58)		7	35 (15, 61)	
Chicago	11	25 (9, 51)		12	28 (12, 54)		13	31 (14, 57)	
Background			0.29			0.25			0.33
Mexican	13	24 (10, 48)		15	32 (15, 56)		16	35 (17, 59)	
Central American	2	15 (3, 52)		3	59 (16, 92)		3	59 (16, 92)	
Cuban	4	21 (7, 49)		5	29 (10, 59)		6	35 (13, 65)	
Dominican	3	11 (3, 36)		3	11 (3, 36)		5	20 (6, 51)	
Puerto Rican	45	39 (28, 52)		53	48 (36, 60)		61	55 (43, 67)	
South American	0	0		0	0		1	21 (2, 81)	
Mixed/other	3	82 (41, 97)		4	90 (56, 98)		4	90 (56, 98)	
Interview language			0.38			0.24			0.31
Spanish	43	29 (19, 41)		50	36 (25, 48)		60	42 (30, 55)	
English	27	37 (24, 52)		33	47 (33, 62)		36	52 (38, 67)	

	Option 1 (most specific) ^b Aware of HCV (N=70)			Option 2 ^b Aware of HCV (N=83)			Option 3 (least specific) ^b Aware of HCV (N=96)		
	n	% (95% CI)	p ^c	n	% (95% CI)	p ^c	n	% (95% CI)	p ^c
Education			0.37			0.42			0.64
< High school	27	26 (16, 40)		32	33 (21, 48)		39	41 (27, 57)	
High school grad	23	40 (25, 57)		27	48 (32, 64)		30	52 (35, 67)	
> High school	19	27 (14, 45)		23	38 (22, 58)		26	43 (25, 63)	
Nativity			0.04			0.02			0.05
Outside US 50 states	47	25 (17, 35)		54	33 (23, 44)		65	39 (29, 51)	
In US 50 states	23	47 (30, 65)		29	57 (40, 73)		31	61 (44, 76)	
Household income			0.95			0.7			0.93
\$20,000	20	32 (18, 50)		25	42 (26, 59)		27	45 (28, 62)	
<\$20,000	44	32 (22, 44)		50	37 (26, 50)		60	46 (33, 59)	
Health insurance			<0.01			<0.01			<0.01
Yes	62	44 (33, 56)		71	52 (40, 63)		80	57 (45, 69)	
No	7	8 (3, 18)		11	18 (9, 34)		15	25 (14, 41)	
Alcohol use			0.12			0.46			0.52
Current	26	28 (16, 45)		34	40 (25, 56)		38	43 (28, 59)	
Former	41	39 (28, 52)		45	44 (32, 56)		52	51 (39, 64)	
Never	3	11 (3, 36)		4	22 (6, 55)		6	32 (10, 66)	
Number of medical visits in past year ^d			0.02			0.04			0.07
Q1 (range 0)	3	10 (3, 29)		7	22 (9, 45)		9	29 (13, 54)	
Q2 (range 1)	5	12 (4, 31)		6	24 (8, 54)		8	26 (9, 55)	
Q3 (range 2-3)	13	43 (20, 69)		15	51 (27, 74)		17	59 (33, 81)	
Q4 (range 4-99)	16	49 (27, 71)		21	64 (40, 83)		22	66 (41, 85)	
	Median (IQR)			Median (IQR)			Median (IQR)		
HOMA-IR	69	4.1 (2.0, 6.2)	0.06	82	4.1 (1.9, 6.0)	0.17	95	3.8 (2.0, 6.1)	0.10
FIB-4	69	1.8 (1.0, 2.8)	0.63	81	1.8 (1.0, 2.8)	0.94	94	1.9 (1.1, 3.0)	0.22

^a All values (except n) are weighted to account for the complex HCHS/SOL survey design.

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Option 1: Respondent was aware of having liver disease, and knew that their disease was HCV-related; Option 2: Respondent was aware of having liver disease from „hepatitis,” but did not identify the type of hepatitis as HCV-related; Option 3: Respondent was aware of having liver disease but without awareness that their disease was known as „hepatitis” and/or was due to infection with one of the hepatitis viruses.

P-values calculated using chi-square tests for categorical variables and t-tests for continuous variables

d Data related to the number of medical visits in the past year were missing for n=82 participants; Q1 - Q4 are quartiles 1 – 4

Table 4
Independent associations with awareness of HCV among HCHS/SOL participants with chronic HCV infection

	Option 1 (most specific) ^a				Option 2 ^d				Option 3 (least specific) ^d			
	PR	95% CI	P		PR	95% CI	P		PR	95% CI	P	
Model 1: Included in the multivariable model are health insurance and nativity (n=187) ^b												
No health insurance	Ref				Ref				Ref			
Health insurance	5.0	2.1-12.2	0.0004		2.6	1.3-5.1	0.01		2.2	1.2-3.9	0.01	
Born outside the 50 US states	Ref				Ref				Ref			
Born in the 50 US states	1.6	1.0-2.6	0.06		1.6	1.0-2.4	0.04		1.4	0.9-2.1	0.10	
Model 2: Included in the multivariable model are health insurance and nativity plus age, sex, recruitment center, and Hispanic/Latino background (n=186) ^b												
No health insurance	Ref				Ref				Ref			
Health insurance	7.1	2.4-20.9	0.0001		3.3	1.6-6.9	0.001		2.4	1.3-4.7	0.009	
Born outside the 50 US states	Ref				Ref				Ref			
Born in the 50 US states	1.2	0.8-1.9	0.36		1.3	0.9-2.1	0.19		1.3	0.8-1.9	0.25	
Model 3: Included in the multivariable model are health insurance, nativity and the number of medical visits in the past year plus age, sex, recruitment center, and Hispanic/Latino background (n=107) ^{b,c}												
No health insurance	Ref				Ref				Ref			
Health insurance	14.0	3.5-55.9	0.0002		5.5	2.2-13.5	0.0003		3.0	1.2-7.4	0.02	
Born outside the 50 US states	Ref				Ref				Ref			
Born in the 50 US states	1.1	0.7-1.9	0.69		1.4	0.8-2.4	0.25		1.39	0.8-2.4	0.24	
Number of medical visits in the past year ^c	1.1	1.0-1.1	0.12		1.0	1.0-1.1	0.25		1.0	1.0-1.1	0.30	

PR: Prevalence Ratio; 95% CI: 95% Confidence Interval

^aOption 1: Respondent was aware of having liver disease, and knew that their disease was HCV-related; Option 2: Respondent was aware of having liver disease from "hepatitis" but did not identify the type of hepatitis as HCV-related; Option 3: Respondent was aware of having liver disease but without awareness that their disease was known as "hepatitis" and/or was due to infection with one of the hepatitis viruses.

^bAll variables are considered simultaneously in a single multivariable Poisson regression model weighted to account for the complex HCHS/SOL survey design

^cData related to the number of medical visits in the past year were missing for n=82 participants; shown are tests for trend across quartiles 1-4