



Linkage-to-Care Following Community-Based HBV and HCV Screening Among Immigrants from the Washington–Baltimore Metropolitan Area, 2016–2019

Daisy Le^{1,4} · Annie Coriolan Ciceron¹ · Jane Pan² · Hee-Soon Juon³ · Carla J. Berg⁴ · T. Angeline Nguyen² · Hai Chi Le² · Y. Tony Yang^{1,4}

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Abstract

Understanding characteristics that impact linkage-to-care (LTC) among individuals living with HBV and/or HCV can enhance public health efforts to provide tailored care services to prevent and treat viral hepatitis among immigrants. Using HBV/HCV screening and LTC data from immigrants (2016–2019), descriptive and logistic regression analyses were conducted to assess (1) the relationship between LTC and sociodemographic factors and (2) factors associated with HBV/HCV LTC. About 87% of those positive HBsAg had LTC and 52% had LTC among those with HCVAB and confirmed PCR. Access to care was an important LTC predictor for HBV–LTC: those who had neither health insurance nor primary care provider (PCP) were more likely to have HBV–LTC than those who had either health insurance or PCP (aOR = 2.95, 95% CI = 1.32–6.59). It is essential to equally provide HBV/HCV LTC support to all immigrants from countries with high prevalence regardless of access to care.

Keywords Asian Americans · African Americans · Emigrants and immigrants · Health disparities · Liver diseases

Background

Hepatocellular carcinoma (HCC), the most common type of primary liver cancer, ranks second worldwide in cancer deaths [1]. Chronic hepatitis B virus (HBV) or hepatitis C virus (HCV) infections contribute to approximately 78.0% of these cases, with worldwide prevalence of HBV and HCV infections estimated at 257 million and 71 million, respectively [2]. Death from chronic liver disease occurs in 15.0–25.0% of individuals living with chronic hepatitis B (CHB), while 20.0–30.0% may develop severe sequelae,

such as cirrhosis, liver failure, or HCC [3]. Incidence of HCC is currently the 5th leading cause of cancer-related death in the United States (US) [4] and projected to rapidly increase to rank 3rd by 2030 [5]. In the US, there are currently up to 5.7 million people who are living with a HBV or HCV infection.

Among US immigrants living with HBV infection, an estimated 58.0% and 11.0% individuals are from Asia and sub-Saharan Africa, respectively [6]. Since most infected individuals show little to no symptoms until their liver disease is well advanced, about 65.0% of CHB-infected adults are unaware of their condition [7]. In combination with cultural, linguistic, and financial barriers, this knowledge gap can increase HBV infection rates—particularly for high-risk groups such as immigrants [6]. With insufficient knowledge of liver cancer prevention and treatment [6], and low rates of HBV screening among adults [6], immigrants are often diagnosed with late-stage cancer, resulting in low survival rates and high mortality rates [6].

Fortunately, therapies are now available to inhibit HBV replication and to prevent or cure HCV infection, thus significantly reducing the risk of liver cancer related deaths. The Centers for Disease Control and Prevention (CDC) [8]

✉ Daisy Le
daisyle@gwu.edu

¹ School of Nursing, The George Washington University, 1919 Pennsylvania NW, Suite 500, Washington, DC 20006, USA

² Hepatitis B Initiative of Washington DC (HBI-DC), Washington, DC, USA

³ Department of Medical Oncology, Thomas Jefferson University, Philadelphia, PA, USA

⁴ Milken Institute School of Public Health, The George Washington University, Washington, DC, USA

recommends HBV vaccination and screening for high-risk individuals, including all immigrants from regions where HBV prevalence is greater than 2.0% (endemic area), to treat and prevent new infections. For acute HCV infection, treatment should only be considered if HCV RNA persists after 6 months. Individuals with chronic HCV infection can be cured with 8–12 weeks of oral therapies [9].

In their study, Ramirez et al. found that only 44.0% of HBV and HCV infected individuals were linked-to-care [10]. *Linkage-to-care* (LTC) was defined as having at least one medical visit documented post-diagnosis [11]. This is thought to be mainly attributed to insufficient counseling at diagnosis, unfamiliarity and difficulty navigating the US health care system, limited English proficiency, transportation, lack of health insurance coverage, and other competing priorities faced by this population [12]. Despite the availability of effective therapies, it is unclear whether treatment-eligible patients in the Washington–Baltimore Metropolitan area are willing to seek and receive treatment, and much is not known about the factors that affect their decision to seek follow-up treatment.

In this study, immigrants were screened for chronic hepatitis at community-based events in the Washington–Baltimore metropolitan area, from 2016 to 2019. Individuals who had tested positive were additionally offered LTC services. While widespread screening may be the first step in liver cancer prevention, understanding the associated characteristics and trends that impact LTC of those living with HBV and HCV can further enhance current public health efforts to provide tailored care services to prevent and treat viral hepatitis among immigrants.

Methods

Recruitment and Data Collection

The data for this study were collected by the Hepatitis B Initiative of Washington, DC (HBI-DC), a nonprofit organization that aims to prevent liver disease caused by viral hepatitis in high-risk groups of immigrants. Cumulatively over the past 4 years, HBI-DC has provided no-cost HBV and HCV testing, vaccination, and treatment LTC services for impacted populations at over 245 community events (e.g., churches, mosques, health fairs and community centers) through strategic collaborations and culturally targeted strategies. This study used cross-sectional data from 8730 immigrants (born outside the US or any of the US territories, age > 18 years), residing in the Washington–Baltimore metropolitan area screened between January 2016 and December 2019. This research was approved by the George Washington University Institutional Review Board (NCR191911).

The HBI-DC partnered with community members to develop recruitment approaches by adopting community-based participatory research standards. Local ethnic radio stations and newspapers, and culturally and linguistically oriented flyers displayed at prominent community locations were used to promote the scheduled screening events. At each screening events, health educators, bilingual volunteers, and representatives from community partner organizations were present to provide further information on chronic hepatitis infection and to promote the importance of screening, vaccination, and prompt follow-up treatment care. All consenting adults were asked to complete a standardized intake form providing basic demographics (e.g., date of birth, gender, country of birth, primary language, year of arrival in the US, health care access status) information.

HBV and HCV Screening

Upon intake form completion, the trained phlebotomists proceeded to administer free on-site HBV and HCV screening. Statuses of hepatitis B surface antigen (HBsAg), hepatitis B surface antibody (anti-HBs), and hepatitis C antibody (anti-HCV) serologies were obtained through blood draw and submitted to LabCorp for analysis. Within 48–72 h, the results were extracted from LabCorp's online portal and entered into the health electronic system. Individuals were then notified of their results over the phone within 24 h and via mail within 2–3 weeks. For HCV screening, individuals positive for anti-HCV were additionally tested for reflex quantitative HCV RNA through a reverse transcription polymerase chain reaction assay. The HCV RNA sensitivity threshold was 15 IU/mL. From 2016 and part of 2017, confirmatory tests were not performed for all clients who had a positive HCV antibody test.

Linkage-to-Care

The HBI-DC team reviewed the screening results with the participants over the phone, using a standardized flow chart and cascade of questions (see Supplemental File), before mailing it out to them. Individuals who had tested positive for chronic hepatitis, or had no immunity to HBV, were considered *referred to care* if they were additionally contacted by a care coordinator and referred to programs for either medical follow-up care or locations where the complete vaccination series were being offered at no-cost to the patient. Participants were referred to care through their primary care provider (PCP) for treatment—if they had insurance—or to a provider for discounted services on a sliding scale if they were able to pay out-of-pocket. As needed, care coordinators also assisted participants with scheduling their first appointment.

Measures

HBV and HCV Serologic Testing Results

Participant HBV serologic testing results were categorized into one of the following three groups: (1) HBV infected (positive HBsAg), (2) HBV vulnerable (negative HBsAg and negative anti-HBs), or (3) protected (negative HBsAg and positive anti-HBs). For HCV screening, participant results were classified as follows: (1) HCV exposed (positive anti-HCV), and (2) negative (negative anti-HCV).

Linkage-to-Care Status

LTC status was ascertained through follow-up with partnering clinics or self-report during follow-up calls that were conducted 6 months after a participant's initial results counseling call. Regardless of insurance or PCP status, the team attempted to follow up with each participant who opted to receive care and treatment up to three times to confirm that participants have indeed attended their first appointment, calling at varying the days and times. A participant was considered *linked to care* if they attended at least one HBV-directed medical appointment following initial HBV or HCV diagnosis. LTC outcomes were noted in an encrypted Excel database, and used to categorize participants as referred, linked, or not linked to care (participants they were unable to contact).

Control Variables

Demographic information included in the analysis were age (derived from the date of birth), gender (0 = male; 1 = female), region of birth (0 = Asia; 1 = Africa), having health insurance (0 = yes; 1 = no), and having a PCP (PCP; 0 = yes; 1 = no).

Analysis

Three sets of analyses were conducted. First, descriptive analyses were performed to provide background information on the sample. Second, we reported the prevalence of HBV and HCV infection by region of birth using the Pearson's chi-square test. Finally, we conducted logistic regression analysis to examine factors associated with LTC for HBV and HCV infection. All analyses were performed using IBM SPSS Statistics for Windows, version 26 (IBM Corp., Armonk, N.Y., USA).

Results

Demographic and Health-Related Characteristics

The mean (standard deviation) age of participants was 52.5 (15.6) years. Most participants were women (60.8%). Seventy percent were of Asian background, and 22.6% of African background. About one-third of the participants had been in the US less than 10 years. Forty-four percent of the participants reported that English was not their primary language. Approximately two-third of the participants were uninsured (65.7%) and did not have a regular PCP (65.4%) (see Table 1).

Table 1 Background characteristics of study population from the hepatitis screening in the community, 2016–2019 (n = 8730)

Characteristics	N (%)
Sex at birth	
Female	5312 (60.8)
Male	3418 (39.2)
Age, years (mean ± SD), range	52.54 ± 15.55, (18–103)
Ethnicity	
African immigrant	1970 (22.6)
Asian immigrant	6125 (70.2)
Black	139 (1.6)
Hispanic	463 (5.3)
White	9 (0.1)
Unknown	24 (0.3)
Birth region	
Africa	1955 (22.4)
Asia	6117 (70.1)
Europe	47 (0.5)
North America	460 (5.3)
South America	151 (1.7)
Years in the US	
< 1	573 (6.6)
1–9	2089 (23.9)
10–19	1555 (17.8)
20+	1443 (16.5)
Unknown	3070 (35.2)
Primary language	
English	2861 (32.8)
Non-English	3836 (43.9)
Unknown	2033 (23.3)
Current health insurance	
Yes	3347 (34.2)
No	6431 (65.7)
Current health provider	
Yes	3379 (34.5)
No	6399 (65.4)

HBV and HCV Serologic Testing Results

From 2016 to 2019, 8429 immigrants were screened for HBV infection. Among them, 4.5% (n = 378) were found to be chronically infected and referred to follow-up care. Among the Asian-born subpopulation, 4.8% (n = 286) had a chronic HBV infection, 36.4% (n = 2177) were vulnerable, and 58.8% (n = 3522) were protected. Among the African-born subpopulation, 4.8% (n = 90) were chronically infected, 39.9% (n = 752) were vulnerable, and 55.3% (n = 1411) were protected (see Table 2).

From 2017 to 2019, HBI-DC also provided HCV testing to 6410 clients across a total of 194 screening events. Among the 6410 participants who were screened for HCV infection, 3.2% (n = 204) were HCVAb-positive. Within the Asian-born subpopulation, 3.9% (n = 169) were

exposed to HCV, versus 2.1% (n = 33) among the African-born subpopulation ($p < 0.001$) (see Table 2). Those who were HCVAb-positive with known LTC status had follow-up PCR testing to confirm HCV RNA presence.

Linkage-to-Care

Among the 378 individuals who had a positive HBsAg test, 87.0% (n = 329) received follow-up care, 12.2% (n = 46) were referred to care but it is unknown whether they attended their first appointment following initial HBV screening, and 0.8% (n = 3) could not be located or had no record of follow-up care (see Fig. 1). In the regression analysis, region of birth and having health insurance were marginally associated with LTC for HBV infection ($p < 0.10$). Since having health insurance and a regular PCP were highly

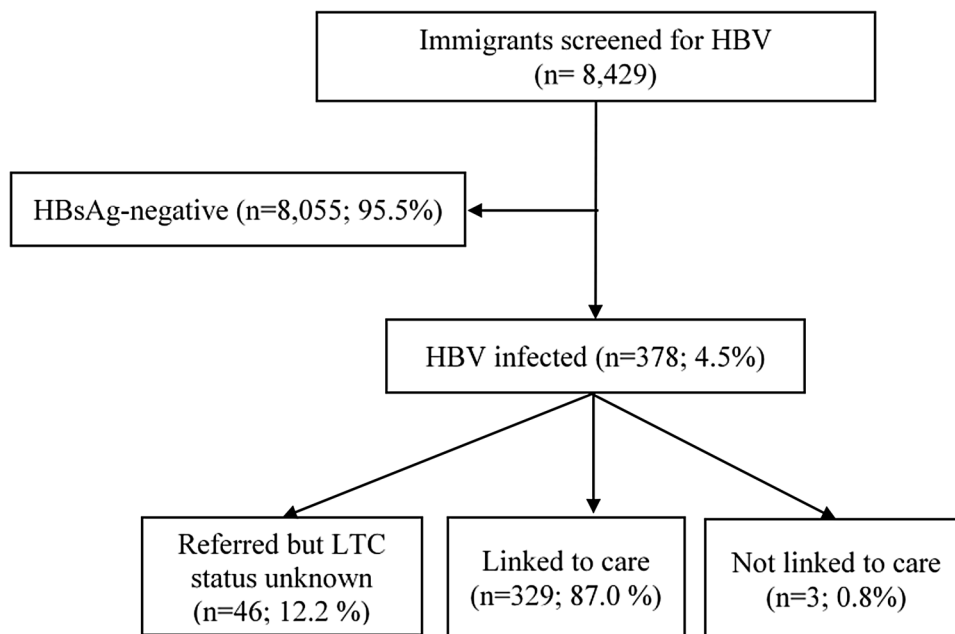
Table 2 Prevalence of HBV and HCV infection among HBI-DC clients, serviced sites from 2016 to 2019

	Total screened N (%)	Region of birth					
		Africa N (%)	Asia N (%)	Europe N (%)	North America N (%)	South America N (%)	
HBV infection status ^a	N = 8429	N = 1883	N = 5985	N = 42	N = 387	N = 132	.000
Infected	378 (4.5)	90 (4.8)	286 (4.8)	0 (0)	1 (0.3)	1 (0.8)	
Protected	4717 (56.0)	1041 (55.3)	3522 (58.8)	16 (38.1)	96 (24.8)	42 (31.8)	
Vulnerable	3334 (39.5)	752 (39.9)	2177 (36.4)	26 (61.9)	290 (74.9)	89 (67.4)	
HCV infection status ^b	N = 6410	N = 1572	N = 4380	N = 37	N = 318	N = 103	.000
HCV exposed	204 (3.2)	33 (2.1)	169 (3.9)	0 (0)	2 (0.6)	0 (0)	

^a2016–2019

^b2017–2019

Fig. 1 Immigrants screened for HBV infection over a 4-year time period, 2016–2019, in the Washington–Baltimore metropolitan area



associated ($p < 0.001$), a new variable was constructed into three group (e.g., neither health insurance nor PCP, either, both). In multivariate regression analysis, those who had neither insurance nor PCP were more likely to have LTC for HBV infection than those who had either (aOR = 2.95, 95% CI: 1.32–6.59). African-born immigrants were less likely to have LTC for HBV infection than Asian-born immigrants (aOR = 0.54, 95% CI: 0.28–1.05, $p = 0.069$) (see Table 3).

Among the 192 individuals who were HCVAb-positive with known LTC status ($n = 192$), 52.1% ($n = 100$) had undetected HCV RNA (i.e., “resolved”) and 47.9% ($n = 92$) had PCR-confirmed HCV RNA presence. Of those with confirmed HCV RNA, 52% ($n = 48$) were linked to care (see Fig. 2). In multivariate logistic regression, gender was associated with LTC-HCV: females were less likely to LTC-HCV than males (aOR = 0.39, 95% CI: 0.16–0.97) (see Table 3).

Discussion

Viral hepatitis infections such as HBV and HCV continue to affect many around the world, and has become a major public health issue. While there are certain regions that are more affected than others, certain subpopulations in the US

also carry this burden of disease with significant morbidity and mortality [13–15]. Immigrants originating from HBV and HCV endemic countries (with a prevalence of 2.0% or more) are at a higher risk for HBV infection [6, 16] and HCV infection [17]. Early screening, timely LTC follow-up, and routine monitoring of people at increased risk for chronic HBV and HCV infection can further enhance current public health efforts to provide tailored care services to prevent and treat viral hepatitis among immigrants [11]. Because most chronically infected individuals have no symptoms, the only reliable method to diagnose CHB is with a serologic test for HBsAg. Likewise, the only way to ensure that an individual is protected against HBV is with a serologic test for anti-HBs. The availability of those screenings does not guarantee that they are used by those who would benefit the most (i.e., high-risk populations).

Many factors, such as lack of understanding or familiarity with the US health-care system, language barriers, cultural beliefs, and financial scarcity prevent immigrants from fully grasping the implications of their infection and receiving treatment. Foreign-born individuals diagnosed with chronic HBV infection often go years without follow-up treatment after their initial screening. While treatment for HBV and HCV are available, only a small proportion of

Table 3 Logistic regression model for LTC for HBV and HCV infection from 2016 to 2019

	LTC for HBV infection ($n = 376$) ^{a,c} (87% LTC; 13% no LTC)		LTC for HCV infection ($n = 92$) ^{b,c} (52% LTC; 48% no LTC)	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Age	.99 (.97–1.02)	.99 (.97–1.02)	.98 (.95–1.02)	.98 (.94–1.02)
Gender				
Female	1.38 (.75–2.52)	1.40 (.76–2.59)	.36 (.15–.88)*	.39 (.16–.97)*
Male	1.00	1.00	1.00	1.00
Region of birth				
Africa	.55 (.29–1.05) ^d	.54 (.28–1.05) ^d	1.30 (.43–3.95)	1.13 (.31–4.18)
Asia	1.00	1.00	1.00	1.00
Having PCP				
No	1.55 (.82–2.93)	N/A	1.46 (.47–4.50)	.55 (.14–2.10)
Yes	1.00		1.00	1.00
Having health insurance				
No	1.78 (.96–3.30) ^d	N/A	1.50 (.32–7.11)	1.87 (.23–12.49)
Yes	1.00		1.00	1.00
PCP*health insurance				
Neither	2.90 (1.31–6.42)*	2.95 (1.32–6.59)*	N/A	N/A
Either of PCP or insurance	1.00	1.00		
Both	1.77 (.72–4.35)	1.87 (.75–4.71)		

* $p < .05$

^aHBV LTC data only available from 2016 to 2019

^bHCV LTC data only available from 2017 to 2019

^cNot included those from Europe and Americas ($n = 2$)

^d $p < .10$

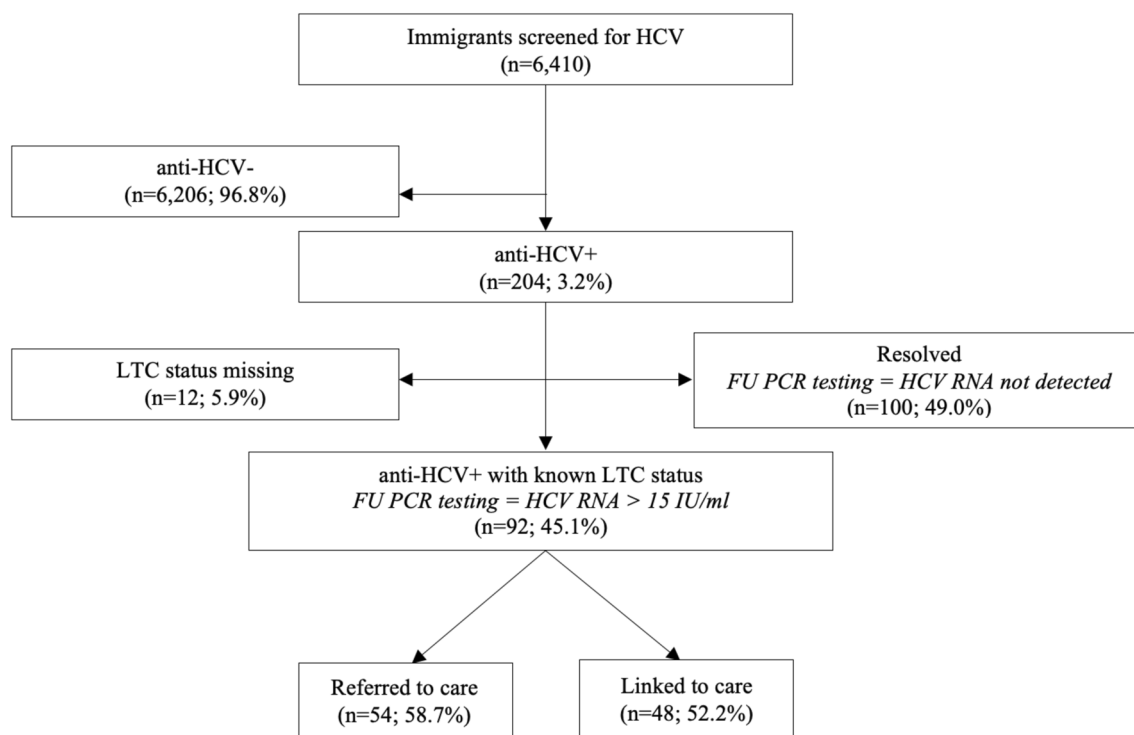


Fig. 2 Immigrants screened for HCV infection over a 3-year time period, 2017–2019, in the Washington–Baltimore metropolitan area

individuals with HBV or HCV infection receive treatment. In the primary care setting, management of patients following diagnosis is not optimal, as many PCPs are not familiar with the management and treatment of HBV and HCV [18–20]. Moreover, although they may be referred, patients frequently do not see a specialist [13]; and unfortunately, not all patients who qualify for treatment can begin treatment.

Early detection of chronic hepatitis infection by screening, with prompt and timely LTC, and strong surveillance infrastructure has the potential to prevent the infection from worsening. HBI-DC implemented the CDC’s HBV screening and services recommendations [8] to link to care 87.0% and 52.2% of clients with chronic HBV infection and HCV infection, respectively. Crucial to the needs of the majority of their clients—who did not have health insurance or access to a PCP—these services included community screening events, patient navigation, use of electronic medical records, and provider education and feedback. Implementing a range of concurrent strategies was vital to HBI-DC ability to effectively reach and provide appropriate and affordable care to the different immigrant populations that they served [21]. Results from the present study are comparable to, if not exceed, the proportion of LTC among refugees with CHB after first diagnosis in the US as described in prior studies which ranged from 29 to 53% [10, 12, 21–28].

Aligning with findings and recommendations from prior studies [10], a key facilitator to HBI-DC’s success in

implementing a screening and LTC program that yielded the aforementioned high screening and LTC rates was the engagement of bilingual care navigators. Immigrants require providers, services, and resources that are culturally- and linguistically-competent in order to ensure that they are successfully linked to care [10]. The HBI-DC care navigators’ cultural understanding and linguistic skills, along with their ties to public health services, allowed them to tackle challenges such as fear and confusion about the health care system. Successful screening and referral for LTC alone was not sufficient, immigrants required guidance and assistance to ensure that referrals resulted in scheduled and completed appointments. Care navigators made numerous attempts to contact and persistently engaged in communications with individuals with no access to care to ensure that they are linked to care by arranging transportation, rescheduling appointments, and providing support and/or referring the clients as needed. This shows the value of bilingual and culturally-competent providers in helping community members understand the importance of follow-up treatment and address obstacles to receiving care. Another key component of HBI-DC’s successful program is the provision of testing, vaccination, and treatment for hepatitis B and C through an existing network of health care providers [10].

As demonstrated by our findings, these services were well utilized by individuals who did not have access to care: they were more likely to be linked to care. On the other hand,

individuals who indicated that they had a PCP or health insurance were less likely to be linked to care. Individuals with access to care are encouraged to make an appointment with their PCP for follow-up. This underscores the importance of providing these LTC services to all immigrants regardless of their access to care. Our finding contributes to the current body of evidence suggesting that HBV/HCV screening in the community setting and subsequent patient navigation can enhance progression through the hepatitis care continuum.

Limitations

There are several limitations to our study. From 2016 and part of 2017, confirmatory tests were not performed for all clients who had a positive HCV antibody test; therefore, the presumptive HCV infection rate was used instead of the confirmed HCV infection rate. The data being presented was collected from individuals who are residents of a major metropolitan area; specific challenges may exist when attempting to provide LTC services in more rural areas. The intake form used to collect demographic information about clients was not consistent from year to year, therefore, not all data points were collected from all participants (e.g., primary language). Individuals who were lost during follow-up may have also become more mobile and less likely to be linked to treatment. Still, had these individuals actually received care (whether it was within or outside of the Washington–Baltimore metropolitan area), an additional challenge was not being able to track and document LTC activities among some of these individuals who may have changed their contact information post-screening.

New Contribution to the Literature

Early screening, timely LTC follow-up, and routine monitoring of people at increased risk for chronic HBV and HCV infection can result in better liver cancer outcomes for impacted populations nationwide. Our analysis provides further understanding of the associated characteristics that impact LTC among those living with HBV and HCV. To enhance current public health efforts to prevent and treat viral hepatitis among immigrants, it is essential to equally provide HBV and HCV LTC support to all immigrants from endemic countries regardless of their access to care.

Conclusion

Effective LTC services depend on access to safe, accessible healthcare, which is important for improving outcomes in the US for individuals with chronic hepatitis infections. Our

findings showed that lack of health insurance or a PCP were *not* found to be barriers to linking HBV and HCV patients to care. Access to care was an important predictor for LTC and notably, individuals with *no* PCP or health insurance were *more* likely to be linked to care. This adds to the body of evidence suggesting that it is essential to equally provide HBV and HCV LTC support to all immigrants from countries with high prevalence regardless of access to care. Furthermore, study findings also reinforced that optimal HBV and HCV screening and LTC can be achieved through targeted interventions, and geographically-focused collaborations with health departments, community-based organizations, and local clinics.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s10903-022-01327-7>.

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Declarations

Conflict of interest All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

Ethical Approval All human participants were treated in accord with the Principles of the Ethical Practice of Public Health of APHA, gave their informed consent to participate, and the study was approved by the George Washington University Institutional Review Board (NCR191911).

Informed Consent Informed consent was obtained from all individual participants included in the study.

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