Registry Match:

Chronic Hepatitis B, Hepatitis C Infection and HIV

2010

San Francisco, California

San Francisco Department of Public Health
Communicable Disease Control Unit
Communicable Disease Control and Prevention Section
101 Grove St, Room 408
San Francisco, CA 94102
http://www.sfcdcp.org

Susan E. Fernyak, MD, MPH, Director
Communicable Disease Control and Prevention Section

Tomás J. Aragón, MD, DrPH, Health Officer
Director, Population Health & Prevention

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This report summarizes the efforts of collaboration between the Chronic Viral Hepatitis Registry Project, Communicable Disease Control and Prevention Section (CDCP) of the San Francisco Department of Public Health (SFDPH) and the HIV Epidemiology Section of the SFDPH to link their respective databases. This report was written by Sue Shallow, MPH, with major contributions from Melissa Sanchez, PhD, MA and Sandra Huang, MD. We would like to thank Susan Scheer, PhD, MPH; Ling Hsu, MPH; and Sharon Pipkin, MPH from the HIV Epidemiology Section for their participation in this collaboration. We thank the CDCP Chronic Hepatitis Team as well as the HIV Epidemiology Section Team who collected the data and maintained their respective databases. Finally, we thank the California Emerging Infections Program and the Division of Viral Hepatitis, Centers for Disease Control and Prevention for their financial and technical support of the San Francisco Chronic Viral Hepatitis Registry Project.

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Contents of Report

Introduction

In the United States (U.S.), an estimated 1.1 million persons are chronically infected with hepatitis B virus (HBV) (1), an estimated 3.2 million persons are chronically infected with hepatitis C virus (HCV) (2), and an estimated 1.1 million persons are infected with human immunodeficiency virus (HIV) (3). Co-infection with HBV or HCV among HIV-infected individuals is common as all three viruses share similar modes of transmission including sexual practices among men who have sex with men (MSM), injection drug use (IDU) and other percutaneous exposures to infected blood. While the estimated prevalence of chronic HBV in the general U.S. population is 0.3% (1), the estimated prevalence among HIV-infected persons is 6-14% (4, 5, 6, 7, 8). The estimated prevalence of HCV in the general population of the U.S. is estimated at 1.3% (2) and among HIV-infected persons is estimated at 16.1% (9). Rates of co-infection with chronic HBV or HCV and HIV vary by risk group, type of exposure, and efficiency of transmission. Co-infection with HBV and HIV is most commonly linked to MSM sexual practices, while co-infection with HCV and HIV is most commonly linked to IDU. Currently, there are limited data on the epidemiology of co-infection with HBV and HIV or with HCV and HIV either in San Francisco or in the U.S. as a whole.

With the goal of describing the epidemiology of individuals who are co-infected with either chronic HBV or HCV infection and HIV, the Chronic Viral Hepatitis Registry Project, Communicable Disease Control and Prevention Section (CDCP) of the San Francisco Department of Public Health (SFDPH) collaborated with the HIV Epidemiology Section of the SFDPH to link their respective databases. This linkage offered a unique opportunity to look at the epidemiology of persons living in San Francisco who are co-infected with HBV or HCV and HIV.

Methods

Memorandum of Understanding

A Memorandum of Understanding (MOU) was established between the CDCP and the HIV Epidemiology Sections with the goal of linking their respective registries. This MOU guarantees that all linked data are managed under the stringent data confidentiality requirements of both the CDCP and the HIV Epidemiology Sections.

Data Linkage

Data linkage was conducted using a sequential algorithm. The first match was an identical match between full name and full date of birth. Additional matches were performed using partial date of birth, soundex (a phonetic algorithm for indexing names by sound), and social security number. Any matches made after the identical match were manually examined to confirm matches.

Hepatitis Reporting

Reporting of chronic hepatitis B and past or present hepatitis C infection is primarily through passive laboratory-based surveillance. Laboratories and providers are mandated by the Title 17, California Code of Regulations, Section 2500 and 2505, to report positive laboratory results for hepatitis B and hepatitis C. Most cases are reported by laboratories, not providers. Although test results consistent for infection with hepatitis B did not become laboratory reportable until May 1995, some laboratories voluntarily reported these tests to the SFDPH. Since 1984, a database that contains limited information from the first

reported laboratory marker of chronic hepatitis B has been maintained. Test results consistent with markers of HCV infection became reportable by laboratories in July 2007, but some laboratories were voluntarily reporting positive laboratory tests for HCV to SFDPH prior to July 2007. Since July 2001, SFDPH has registered limited information from the first reported laboratory marker for HCV infection. Since October 2005, a longitudinal person-based registry has been maintained by CDCP for cases with positive laboratory markers for chronic hepatitis B and/or with positive markers for infection with HCV. All positive test results for each case are entered into this database. The Centers for Disease Control and Prevention (CDC)/Council for State and Territorial Epidemiologists (CSTE) laboratory criteria for diagnosis are applied to identify persons who meet the laboratory criteria for either probable or confirmed chronic hepatitis B (10) or infection with HCV (11). Persons infected with chronic HBV included in this report met the CDC/CSTE laboratory criteria for either probable or confirmed hepatitis B and were reported between January 1, 1984 and April 22, 2010. Persons with HCV infection included in this report met the CDC criteria for a past or present infection with HCV and were reported between July 1, 2001 and April 22, 2010. Because surveillance for chronic hepatitis B and HCV infection is passive and laboratory-based, data on race, ethnicity, risk factors and county of residence are limited.

HIV/AIDS Reporting

San Francisco HIV/AIDS cases are reported primarily through laboratory–initiated, active surveillance. Case report forms are completed by SFDPH staff through review of laboratory reports, pathology reports, and medical records. Cases are also identified through passive surveillance, including reports received from health care providers and confidential testing sites, review of death certificates, hospital billing records, other disease registries, and reports from other health departments. AIDS cases included in this report cover the entirety of the HIV epidemic from 1981 to April 2010. As understanding of HIV epidemiology improved and it became clear that AIDS data alone do not provide a comprehensive profile of the HIV epidemic for prevention and care planning, AIDS reporting evolved to include reporting of persons with HIV whose disease has not progressed to AIDS. Confidential reporting of AIDS cases by name began in March 1981; coded, non-name HIV reporting was implemented on July 1, 2002; and, on April 17, 2006, HIV reporting became name-based (12). Through intensive active surveillance, HIV and AIDS surveillance data are very complete (13).

Data Sources and Data Grouping

For the purposes of this linkage, data obtained through HIV/AIDS surveillance were used as the source for race, ethnicity, risk factors and county of residence. Persons were included in this match if they were residents of San Francisco at the time of either their HIV or AIDS diagnosis. For the majority of cases, risk factor data were obtained by chart review. Data for certain race and ethnicity categories have been grouped. Persons of Latino origin, regardless of race, were grouped in the “Latino” category. Thus, “White”, “Black” and “Asian” race categories are all non-Latino. The “Other” category includes racial/ethnic categories where the number of persons in that particular group is small and/or does not represent significant trends (e.g., Native Americans and people of mixed race). Risk categories were also grouped into the “Other” category when the number of persons in that group was small. “Other” may include transfusion recipients, hemophiliacs, heterosexuals, persons acquiring HIV through perinatal transmission, or persons of unidentified risk.

Data Limitations

Chronic Hepatitis Data

The CDCP's Chronic Hepatitis Registry totals do not represent an estimate of the prevalence of chronic hepatitis B or of HCV infection in San Francisco residents. The hepatitis data in this report reflect only the number of people infected with either HBV or HCV who were tested and whose positive test was reported to the SFDPH since 1984 for hepatitis B and since 2001 for hepatitis C. Some persons infected with HBV or HCV are not tested, and others were tested before consistent reporting to SFDPH was established. In addition, some persons who were tested anonymously may not have been reported to SFDPH. Finally, people who were included in the registry may not live in San Francisco either because their address information was not provided or because they have moved. The data presented in this report very likely underestimate the number of persons who are chronically infected with viral hepatitis in the county. Furthermore, prevalence estimates based on HBV or HCV tests reported in this period would not be valid and thus are not calculated.

HCV Infection

The HCV infection data presented in this report potentially overestimate the number of reported persons who have chronic HCV infection. No single laboratory test can distinguish between acute, resolved, or chronic HCV infection (14). Distinguishing between acute, chronic, and resolved infections requires public health follow up with clinicians and/or patients to collect symptom and additional laboratory test results. Due to the large volume of reports and limited resources for follow-up, SFDPH was limited to conducting HCV surveillance based on HCV test results that are required to be reported to public health and could only define infected persons as having past or present HCV infection.

Risk Factor Data

Risk factor data in this report represent risk factors for HIV infection, not for infection with HBV or HCV. Data on risk factors were collected by review of the HIV-infected cases' medical records, and accuracy of this data is reliant on providers having taken thorough and unbiased patient histories and then accurately and completely recording these histories in the patients' charts. The risk factor data were not validated against patient interview and may be biased by either the patient not giving a complete risk factor report or by the provider either not ascertaining all risks or not recording all risks.

Results

Overview of Match between the Chronic Hepatitis Registry and the HIV Registry

This match included 31,997 persons infected with HBV who were reported to CDCP between January 1, 1984 and April 22, 2010; 10,121 persons infected with HCV who were reported between July 1, 2001 and April 22, 2010; and 34,551 persons with HIV/AIDS who were identified by the SFDPH HIV Epidemiology Section between January 1, 1981 and April 22, 2010. Of the HBV cases, 6.3% were co-infected with HIV and of the HCV cases, 12.6% were co-infected with HIV. Of the 504 cases infected with both HBV and HCV, 20% also had HIV (Table 1).

Table 1. Percentage of HBV, HCV, or HBV/HCV persons co-infected with HIV

	Surveillance start date	Surveillance end date	Cumulative cases in the registry	Cases co-infected with HIV	% of cases co-infected with HIV
HBV	1/1/1984	4/22/2010	31,997	2,018	6.3%
HCV	7/1/2001	4/22/2010	10,121	1,278	12.6%
HBV/HCV	HBV - 1/1/1984; HCV - 7/1/2001	4/22/2010	504	101	20.0%

Co-infection with HBV and HIV

Demographics of HBV and HIV co-infected persons

Of the 2,018 HBV and HIV co-infected cases, most were male (96.5%), 62.2% were White, 18.7% were Black and 11.9% were Latino. Of the 1,948 male cases, 63.4% were White, 17.4% were Black and 12.0% were Latino. Of the 70 female cases, 54.3% were Black, 27.1% were White, and 10% were Latino (Table 2).

Table 2. Demographic characteristics of HBV and HIV co-infected persons

Characteristic	Male n (%)	Female n (%)	Total n (%)
Race			
White	1236 (63.4%)	19 (27.1%)	1255 (62.2%)
Black	339 (17.4%)	38 (54.3%)	377 (18.7%)
Latino	234 (12.0%)	7 (10.0%)	241 (11.9%)
Asian	98 (5.0%)	3 (4.3%)	101 (5.0%)
Other	41 (2.1%)	3 (4.3%)	44 (2.2%)
Total	1948 (96.5%)	70 (3.5%)	2018 (100%)

Risk categories of male persons co-infected with HBV and HIV

Among males, 91.5% reported MSM as a risk factor for acquisition of HIV (including men who report IDU and MSM); 68.8% reported MSM but not IDU and 22.7% reported MSM and IDU. IDU without MSM was reported in only 7.1% of males but varied by race: 20.6% of Black males, compared to 5.6% of Latino males and 4.1% of White males reported IDU as their only risk factor (Table 3).

Table 3. Risk categories of male HBV and HIV co-infected persons, by race

Characteristic	MSM not IDU n (%)	IDU not MSM n (%)	Heterosexual, not MSM or IDU n (%)	MSM and IDU n (%)	Other/ Unknown n (%)	Total n (%)
Race						
White	885 (71.6%)	51 (4.1%)	2 (0.2%)	289 (23.4%)	9 (0.7%)	1236 (63.4%)
Black	167 (49.3%)	70 (20.6%)	4 (1.2%)	95 (28.0%)	3 (0.9%)	339 (17.4%)
Latino	180 (76.9%)	13 (5.6%)	4 (1.7%)	37 (15.8%)	0 (0%)	234 (12.0%)
Asian	88 (89.8%)	2 (2.0%)	1 (1.0%)	5 (5.1%)	2 (2.0%)	98 (5.0%)
Other	20 (48.8%)	3 (7.3%)	1 (2.4%)	17 (41.5%)	0 (0%)	41 (2.1%)
Total	1340 (68.8%)	139 (7.1%)	12 (0.6%)	443 (22.7%)	14 (0.7%)	1948 (100%)

Risk categories of female persons co-infected with HBV and HIV

Among the 70 co-infected females, the majority reported IDU as a risk factor with 94.7% of Whites, 73.7% of Blacks, and 71.4% of Latinos reporting IDU as the risk factor for infection for HIV. However, greater than 20% of Black and Latino females reported heterosexual contact but not IDU as their only risk factor for HIV acquisition (Table 4).

Table 4. Risk categories of female HBV and HIV co-infected persons, by race

Characteristic	IDU n (%)	Heterosexual, not IDU n (%)	Other/ Unknown n (%)	Total n (%)
Race				
White	18 (94.7%)	1 (5.3%)	0 (0%)	19 (27.1%)
Black	28 (73.7%)	8 (21.1%)	2 (5.3%)	38 (54.3%)
Latino	5 (71.4%)	2 (28.6%)	0 (0%)	7 (10.0%)
Asian	1 (33.3%)	1 (33.3%)	1 (33.3%)	3 (4.3%)
Other	2 (66.7%)	1 (33.3%)	0 (0%)	3 (4.3%)
Total	54 (77.1%)	13 (18.6%)	3 (4.3%)	70 (100%)

Co-infection with HCV and HIV

Demographics of persons co-infected with HCV and HIV

Of the 1,278 HCV and HIV co-infected cases, 86.7% were male and 13.3% female; 56.6% were White, 26.3% were Black and 12.0% were Latino. Of the 1,108 male cases, 58.7% were White, 23.5% were Black and 12.5% were Latino. Of the 170 co-infected females, 44.7% were Black and 42.9% were White (Table 5).

Table 5. Demographic characteristics of HCV and HIV co-infected persons

Characteristic	Male n (%)	Female n (%)	Total n (%)
Race			
White	650 (58.7%)	73 (42.9%)	723 (56.6%)
Black	260 (23.5%)	76 (44.7%)	336 (26.3%)
Latino	138 (12.5%)	15 (8.8%)	153 (12.0%)
Asian	42 (3.8%)	1 (0.6%)	43 (3.4%)
Other	18 (1.6%)	5 (2.9%)	23 (1.8%)
Total	1108 (86.7%)	170 (13.3%)	1278 (100%)

Risk categories of male persons co-infected with HCV and HIV

Among males, 62.6% reported IDU (including 43.9% who reported MSM and IDU) and 35.6% reported MSM but not IDU as their only risk factor. Reporting MSM but not IDU as the risk for acquisition of HIV varied by race: 59.5% of Asians, 50.7% of Latinos, 39.5% of Whites and only 15% of Blacks reported MSM but not IDU (Table 6).

Table 6. Risk categories of male HCV and HIV co-infected persons, by race

Characteristic	MSM not IDU n (%)	IDU not MSM n (%)	Heterosexual, not MSM or IDU n (%)	MSM and IDU n (%)	Other/ Unknown n (%)	Total n (%)
Race						
White	257 (39.5%)	83 (12.8%)	2 (0.3%)	300 (46.2%)	8 (1.2%)	650 (58.7%)
Black	39 (15.0%)	103 (39.6%)	4 (1.5%)	110 (42.3%)	4 (1.5%)	260 (23.5%)
Latino	70 (50.7%)	15 (10.9%)	0 (0%)	52 (37.7%)	1 (0.7%)	138 (12.5%)
Asian	25 (59.5%)	3 (7.1%)	0 (0%)	13 (31.0%)	1 (2.4%)	42 (3.8%)
Other	3 (16.7%)	3 (16.7%)	1 (5.6%)	11 (61.1%)	0 (0%)	18 (1.6%)
Total	394 (35.6%)	207 (18.7%)	7 (0.6%)	486 (43.9%)	14 (1.3%)	1108 (100%)

Risk categories of female persons co-infected with HCV and HIV

Of the 170 HCV and HIV co-infected females, 90.6% reported IDU as their risk factor for infection with HIV (Table 7).

Table 7. Risk categories of female HCV and HIV co-infected persons, by race

Characteristic	IDU n (%)	Heterosexual, not IDU n (%)	Other/ Unknown n (%)	Total n (%)
Race				
White	68 (93.2%)	2 (2.7%)	3 (4.1%)	73 (42.9%)
Black	65 (85.5%)	10 (13.2%)	1 (1.3%)	76 (44.7%)
Latino	15 (100%)	0 (0%)	0 (0%)	15 (8.8%)
Asian	1 (100%)	0 (0%)	0 (0%)	1 (0.6%)
Other	5 (100%)	0 (0%)	0 (0%)	5 (2.9%)
Total	154 (90.6%)	12 (7.1%)	4 (2.4%)	170 (100%)

Co-Infection with HBV, HCV and HIV

Demographics of persons co-infected with HBV, HCV and HIV

Of the 101 cases co-infected with HBV, HCV and HIV, most were male (91.1%); 59.4% were White and 25.7% were Black. Of the 92 males, 58.7% were White and 26.1% were Black. Of the 9 co-infected females, 66.7% were White and 22.2% were Black (Table 8).

Table 8. Demographic characteristics of HBV, HCV and HIV co-infected persons

Characteristic	Male n (%)	Female n (%)	Total n (%)
Race			
White	54 (58.7%)	6 (66.7%)	60 (59.4%)
Black	24 (26.1%)	2 (22.2%)	26 (25.7%)
Latino	8 (8.7%)	1 (11.1%)	9 (8.9%)
Asian	5 (5.4%)	0 (0%)	5 (5.0%)
Other	1 (1.1%)	0 (0%)	1 (1.0%)
Total	92 (91.1%)	9 (8.9%)	101 (100%)

Risk categories of male persons co-infected with HBV, HCV and HIV

Among males triply infected with HBV, HCV, and HIV, 64.1 reported IDU (including those reporting both MSM and IDU) and 33.7% reported MSM but not IDU (Table 9). Given the small number of triply-infected females (n=9), a risk factor table for females is not presented; however, it is worth noting that all co-infected females were IDU.

Table 9. Risk categories of male HBV, HCV and HIV co-infected persons, by race

Characteristic	MSM not IDU n (%)	IDU not MSM n (%)	Heterosexual, not MSM or IDU n (%)	MSM and IDU n (%)	Other/ Unknown n (%)	Total n (%)
Race						
White	18 (33.3%)	3 (5.6%)	0 (0%)	31 (57.4%)	2 (3.7%)	54 (58.7%)
Black	4 (16.7%)	11 (45.8%)	0 (0%)	9 (37.5%)	0 (0%)	24 (26.1%)
Latino	4 (50.0%)	1 (12.5%)	0 (0%)	3 (37.5%)	0 (0%)	8 (8.7%)
Asian	5 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	5 (5.4%)
Other	0 (0%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)	1 (1.1%)
Total	31 (33.7%)	15 (16.3%)	0 (0%)	44 (47.8%)	2 (2.2%)	92 (100%)

Discussion

This linkage analysis showed that San Franciscans co-infected with HBV and HIV are more likely to be male (96.5%) and White (62.2%). Although co-infected cases were mostly White, Blacks were disproportionately affected. While Black males comprise only 6.6% of the San Francisco male population, they comprise 17.4% of the HBV and HIV co-infected male population from this registry match (15). Moreover, Black females comprise 7% of the San Francisco female population but 54.3% of the co-infected female population from this match (15). Over 90% of this co-infected population reported MSM as their risk factor for infection with HIV. This finding is consistent with several studies of HBV infection among HIV-infected sub-populations in Western Europe and the U.S. (4, 5, 6, 7).

The greatest burden of co-infection among San Franciscans with HCV and HIV was among White males. Similar to our findings among the San Francisco HBV and HIV co-infected population, Blacks are disproportionately affected; Black males comprise 23.5% of the population of the HCV and HIV co-infected males from this registry match; Black females comprise 44.7% of co-infected females from this match. IDU was the most frequently reported risk factor for acquisition of HIV infection among this co-infected population; however, it is important to note, in San Francisco, among HCV and HIV co-infected males, 35.6% reported MSM but not IDU. This high percentage of co-infected, non-IDU, MSM supports the consideration that sexual transmission was a prominent mode of HCV infection among this HIV-infected, non-IDU, male population. While sexual transmission is not considered an efficient mode of transmission of HCV, several case studies suggest that high risk sexual behaviors such as having multiple

sexual partners and receptive anal fisting increase the risk for infection (16, 17). Findings of this data linkage are consistent with those from several studies done in Western Europe and the U.S. of HCV infection among sub-populations infected with HIV (4, 8, 9, 10).

Of San Franciscans co-infected with HBV, HCV and HIV, most were male and White. Blacks were again disproportionately affected, comprising 25.7% of all triply-infected cases but only 6.6% of the population of San Francisco. The majority of cases reported MSM and IDU. However, 33.7% reported MSM but not IDU. This high percentage of males who reported MSM but not IDU and were triply infected with HBV, HCV and HIV reinforces the consideration that sexual transmission is a significant mode of HCV infection among the HIV-infected, non-IDU, male population.

This collaboration offered several unique opportunities. Firstly, it introduced an opportunity to establish an agreement on sharing and linking data that meets the stringent confidentiality requirements of both the SFDPH Communicable Disease Control and Prevention Section and the SFDPH HIV Epidemiology Section. Secondly, this collaboration enabled us to begin to describe the epidemiology of the viral hepatitis-HIV syndemic in San Francisco. Finally, this information may be used by viral hepatitis and HIV screening, prevention, and treatment programs to target and prioritize their activities.

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