• ORIGINAL STUDIES •

Feasibility of Collecting Biologic Specimens in Population-based Surveys: Experiences from the *Epidemiology of Hepatitis C in the Household, Adult Population of Puerto Rico* Study

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The Behavioral Risk Factor Surveillance System (BRFSS) collects data on preventive health practices and risk behaviors that are linked to chronic diseases, injuries, and preventable infectious diseases that affect the adult population in all states and territories in the US. The BRFSS is currently the only survey conducted annually in Puerto Rico in the population aged 18 years and older; however, prevalence estimates are based on self-reports and therefore are subject to reporting errors. Although surveillance data are useful for the purpose of evaluation, program planning and health policy, surveys that collect biological specimens and clinical data provide a more accurate assessment of prevalence and a comprehensive picture of disease distribution and their risk factors. This article summarizes the methodology employed in a population-based study to estimate the seroprevalence of hepatitis C and other viral infections in Puerto Rico and shows the feasibility of combining different modes of data collection in population-based surveys that collect biologic specimens. [*P R Health Sci J 2010;1:18-25*]

Key words: Viral hepatitis, HIV, HSV-2, Seroprevalence

Disease burden in Puerto Rico has traditionally relied upon surveillance systems and household surveys including the Behavioral Risk Factor Surveillance System (BRFSS), a telephone survey that collects data on preventive health practices and risk behaviors that are linked to chronic diseases, injuries, and preventable infectious diseases that affect the adult population (1). The BRFSS is currently the only household survey conducted annually in the population aged 18 years and older in Puerto Rico; however, prevalence estimates are based on self-reports and therefore are subject to reporting errors.

Although surveillance data are useful for the purpose of evaluation, program planning and health policy, surveys that collect biological specimens and clinical data provide a more accurate assessment of prevalence estimates and a comprehensive picture of disease distribution and their risk factors. To start addressing the challenges facing the field of survey research, the BRFSS has held biannual expert panel meetings to improve the system, ensure the data quality and validity, and reduce the potential for bias in its estimates (2). For example, BRFSS is currently surveying cellular telephones users to meet the challenge posed by the growing number of cellular-telephone-only households. This system is also piloting an approach for collection of direct health measurements to validate key interview questions and assess the feasibility of collecting physical measure data on an ongoing basis.

In Puerto Rico, several household surveys have been conducted in the past to estimate the burden of cardiovascular disease (3), asthma (4), psychiatric disorders (5-15), radiographic vertebral fractures (16), and metabolic syndrome (17). Others have provided estimates of the burden of health conditions and health care utilization in the general population (18) and in the elderly population (19) of Puerto Rico. In the United States (US), the National Health and Nutrition Examination Survey (NHANES) is a complex sample survey that collects biological specimens

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and clinical data to assess the health and nutritional status of the household population (20). Although NHANES has established national prevalence estimates of diseases, medical conditions, and health indicators among US Whites, African-Americans, and Hispanics, Puerto Rico is excluded from this survey. Moreover, epidemiological studies employing biological specimens as an adjunct to population surveys have been less commonly used in Puerto Rico.

Collecting biological specimens and clinical data adds to the logistical and ethical complexity of surveys and could increase refusal rates by placing additional burden on respondents. This is especially true when collecting sensitive information such as sexual practices and drug use behaviors and biological samples such as hair, urine, and saliva to validate drug use self-reports. Newer methods to collect self-reports of sensitive behaviors have been developed including computer-assisted personal interviewing (CAPI), computer-assisted self-interviewing (CASI), audio computer assisted self-interviewing (ACASI), telephone ACASI and handheld computers. These methods are useful to collect sensitive stigmatized and sensitive behaviors, and some of these appear to be feasible alternatives in developing countries (21-25). However, some investigators argue that it may still be necessary to combine biological measures with self-reports to assure reasonable accuracy of these behaviors.

Despite the availability of disease burden estimates derived from surveillance systems and household surveys in Puerto Rico, the burden and impact of viral hepatitis is practically unknown in this population. The only seroprevalence survey conducted among randomly selected non-institutionalized adults aged 21-64 years in San Juan, Puerto Rico in 2001-2002 revealed that 6.3% were positive for HCV antibodies (26). Public health surveillance in this area is of particular relevance as chronic hepatitis caused by hepatitis B and hepatitis C viruses is a leading cause of cirrhosis and hepatocellular carcinoma, a condition whose incidence and mortality rates continue to increase in the US, particularly among middle-aged Black, Hispanic and White men (27). Thus, the lack of population-based surveillance data on viral hepatitis in Puerto Rico complicates the planning of adequate evidence-based preventive interventions against these infections and the capacity of monitoring their effectiveness to control these infections (28). Given the challenges involved in the data collection of population-based surveys, particularly in those involving the collection of sensitive information, this article describes the various processes involved in the planning and execution of a population-based household survey that collected biological specimens to measure the national seroprevalence of hepatitis C and other viral infections including hepatitis A, hepatitis B, HIV and herpes simplex type 2.

Sampling Procedures

The study *Epidemiology of Hepatitis C in the Adult Population of Puerto Rico* targeted non-institutionalized adults aged 21-64 years old residing in Puerto Rico at the time of the survey (2005-2008). Due to the absence of a sampling frame of the homeless population in Puerto Rico, this segment of the population was excluded, in spite of the high prevalence of HCV infection in this group (29).

To define the sampling frame, Puerto Rico was stratified on the basis of AIDS incidence rates among injecting drug users (IDUs) and adult population density in order to improve the precision of the prevalence estimates. Four strata were derived corresponding to municipalities with above and at or below median AIDS incidence rates among IDUs (9.9/100,000 population reported in 2002) and above and at or below median population density (486 per square mile). The configuration of the sample strata assumed that HCV seroprevalence would vary systematically across the four strata. Statistics provided by the Puerto Rico AIDS Surveillance System (30) were used to determine the incidence rate of AIDS among IDUs in each municipality in Puerto Rico during 2002. The resulting stratification scheme is shown in Figure 1. The sample size required to estimate HCV seroprevalence was determined based on the following parameters: expected prevalence of HCV of 6.3% (26), 95% confidence level and precision level of 3%. Thus, the estimated sample size was 2,000 adults randomly selected using a stratified sampling design with strata of equal sizes (31-32). The sampling frame was defined by the census block groups, and for each census block group, the following information was gathered: population aged 18-64 years, median age, number of occupied households (Summary File 1) and median value for all owner-occupied households (Summary File 3) (33).

Household individuals within each stratum were selected in four stages as shown in Figure 2. In the first stage, a systematic random selection of census block groups was made weighted by the estimated number of household segments that could be allocated. The census block groups were previously sorted by median age and median housing value for all owner-occupied households according to the Census 2000. The second stage consisted of a random selection of one census block within each selected census block group and identified using Tiger Files of the Census 2000 and Google Earth. Field managers visited every selected census block to enumerate all households and determine its occupancy. In addition, a map was drawn detailing the boundaries of each block. Commercial buildings and other structures not intended as living quarters were not enumerated. In the third stage, segments of approximately 25 consecutive households were numbered in each census block, and one was randomly selected. All persons residing in each household were enumerated, and one individual aged 21-64 years old was randomly selected in the final stage.

Recruitment Procedures

Two field managers visited every occupied household at different times of the day and different days of the week. The field managers made, on average, 10-15 positive contacts

within each visit. Field managers used the following strategies for recruitment of participants: (1) display of an identification card and use of an official vehicle of the Medical Sciences Campus in every field visit, (2) delivery of a letter introducing the nature of the study, sampling procedures, data collection methods, procedures to ensure confidentiality of the information gathered, potential benefits derived from the study, and contact information, (3) answering any queries about the study, (4) collection of household composition information including name, sex, age, phone, address, type of household and availability, and (4) replacement of subjects from households that were not eligible (out of age range or non-Spanish speakers) or were not contacted after three consecutive visits. These subjects were replaced with a person randomly selected from adjacent households.

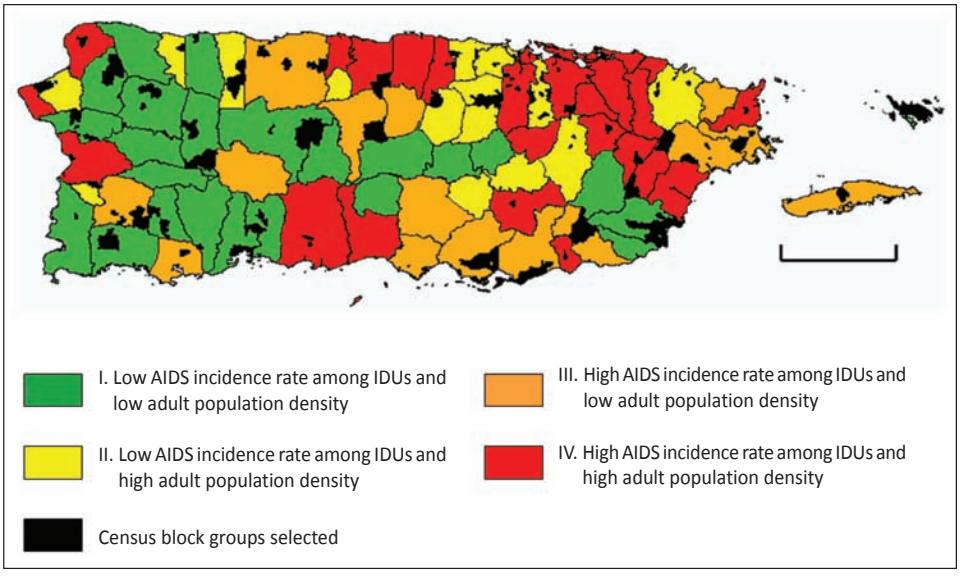

Figure 1. Epidemiology of Hepatitis C in the Adult Population of Puerto Rico: Stratification Scheme

Research staff arranged appointments for eligible individuals that agreed to participate at a date and time that suited them, including evenings and weekends. Participants were scheduled to visit a mobile examination unit located in the vicinity of their homes, a similar methodology employed in NHANES to collect biological specimens and clinical data (20). Arrangements were made with community leaders to select an appropriate location for the mobile examination units. Subjects' appointments were arranged after 5:00 p.m. during working days and after 10:00 a.m. during weekends. An average of 10 individuals was scheduled in every visit. Phone reminders to participants were made two days prior to the appointment. The study personnel made intensive efforts to reschedule participants who failed to show up to the appointment at the mobile examination unit.

Questionnaire Design

To maximize comparability of data across time and population subgroups, we modeled our questionnaires after those used in household surveys previously conducted in Puerto Rico (1, 34). Specific questions to assess drug use practices, drug related risk behaviors, sex behaviors, history of sexual abuse, and self-reported history of sexually transmitted infections were obtained from the questionnaire developed by the ARIBBA (Alliance for Research in El Barrio, New York and Bayamón) Project, a National Institute on Drug Abuse (NIDA) funded study of individual, environmental, and cultural factors that influence risk behaviors among Puerto Rican injection drug users both in the island and in New York City (34).

Staff Training

An interviewer's training manual was designed to facilitate research staff training of the full study protocol. This manual provided instructions on the procedures that an interviewer should follow during the administration of the face-to-face interview, as well as strategies interviewers could use when encountering difficulties. Moreover, research staff completed online minicourses on HIV/AIDS sponsored by EngenderHealth (35), and Hepatitis C, sponsored by the Department of Veterans Affairs Hepatitis C Resource Centers (36). Staff was also certified by the Florida/Caribbean AIDS Education and Training Center and the Puerto Rico Department of Health to provide HIV pre- and post-test counseling following CDC revised guidelines (37). After completing the training of interviewers, the entire survey process was piloted before initiation of data collection.

Data Collection Procedures

Data collection process consisted of five components completed in the following sequence:

1. Informed consent: Eligible participants completed the informed consent in a private room within the mobile examination unit. Participants were provided with information of all study procedures, including blood drawing for antibody detection and toxicologic tests to detect recent drug use.

2. Pre-test counseling: Participants were offered pre-test counseling about the meaning of HIV test results. To reduce the potential for social desirability bias, counseling about HIV/AIDS transmission and prevention were performed after the interviews were completed but prior to collection of biological specimens.

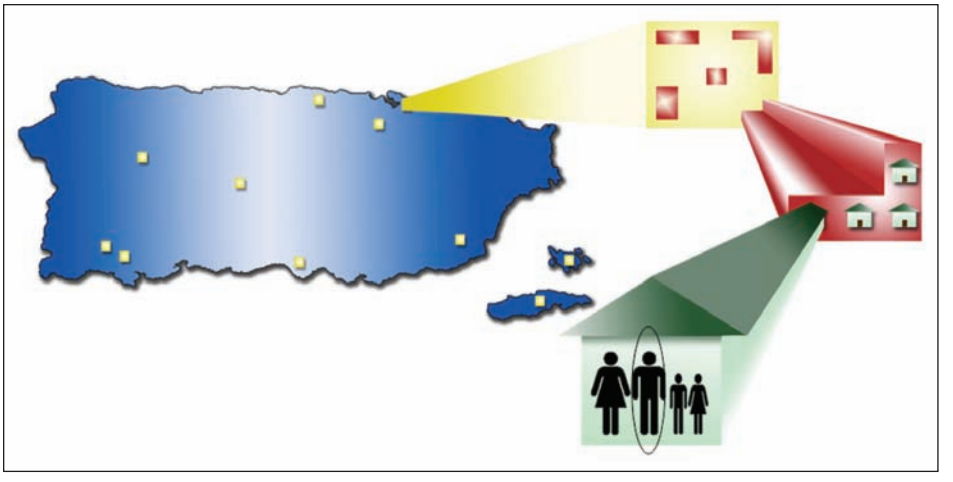

Figure 2. Epidemiology of Hepatitis C in the Adult Population of Puerto Rico: Stages of Sampling Procedure

3. Interviews: Face-to-face interviews and ACASI were employed to collect the data of interest. Face-to-face interviews, conducted in a private room by trained interviewers, collected socio-demographic characteristics plus extensive information on medical history, tattooing and body piercing practices, state of knowledge about transmission routes and prevention of viral infections under study, and self-reports of hepatitis A and hepatitis B vaccination coverage. ACASI, conducted in a private room without the interviewer being present, was employed to collect sensitive information including drug use practices, sex-related risk behaviors, and history of incarceration. The last section of ACASI queried participants regarding their experience with the interview mode (face-to-face versus ACASI) and location of the interview (mobile examination unit versus participant's home). To enhance study participation, subjects could opt to undergo data collection procedures at their homes.

4. Collection of biologic specimens: After completion of the ACASI interview, a spot urine sample and a blood specimen of 15-ml of venous blood was drawn from each participant by a certified phlebotomist. The mobile units housed all of the state-of-the-art equipment necessary for the interviews and collection of biologic specimens including air conditioning, electrical power generator with 110V/220V receptacles, restroom area, laboratory areas, interview rooms to assure the privacy of participants, freezers, and a centrifuge. These units met the Occupational Safety and Health Administration and the Puerto Rico Department of Health standards for the handling, packaging and preservation of blood samples. Blood specimens were processed, stored and shipped to a Clinical Laboratory Improvement Amendments (CLIA) approved laboratory, where samples were tested with the following assays: (1) anti-HCV (ADVIA Centaur®, Chemiluminiscent Immunoassay, Siemens Healthcare Diagnostics, Inc., Deerfield, IL); (2) anti-HCV confirmation by RIBA (Enzyme Immunoassay, Laboratory Corporation of America® Holdings, Tampa, FL); (3) HBsAg, anti-HBs, and anti-HBc (IMMULITE® 2000, Chemiluminiscent Immunoassay, Siemens Healthcare Diagnostics, Inc., Los Angeles, CA); (4) anti-HAV Total (ADVIA Centaur®, Chemiluminiscent Immunoassay, Siemens Healthcare Diagnostics, Inc., Deerfield, IL); (5) HIV-1 antibody (Evolis™, Enzyme immunoassay, Bio-Rad Laboratories, Inc., Hercules, CA); (6) HIV-1 confirmation (Western blot, Laboratory Corporation of America® Holdings, Tampa, FL); and (7) HSV-2 specific IgG (Enzyme immunoassay, Laboratory Corporation of America® Holdings, Tampa, FL). Urinalyses were conducted using cannabinoid, cocaine metabolite (benzoylecgonine), and opiate enzyme immunoassays (Lin-Zhi International, Inc., Sunnyvale, CA). Samples exceeding the assay cutoff values (cannabinoid, 50 ng/mL; benzoylecgonine, 300 ng/mL; opiate, 300 ng/mL) were confirmed by gas chromatography-mass spectrometry.

5. Closure: Upon completion of study procedures, participants received educational materials on prevention of blood-borne infections and a monetary compensation ($50.00) for some of their time and effort. Approximately one month after examination, participants received a written report summarizing their laboratory test results. Detailed locating information was collected from each participant to facilitate the delivery of test results.

6. Post-test counseling: A health educator certified in HIV counseling visited households to provide a notification letter, laboratory test results, post-test counseling and referrals for follow-up medical evaluation, and support services to participants whose test results were positive to any of the viral infections under study. Previous arrangements were made with the Puerto Rico Department of Health to refer seropositive individuals to HIV, HCV, HBV or HSV-2 who reported lack of health coverage to the Immunology Clinics, also known as Centers for the Prevention and Treatment of Transmissible Diseases, for further evaluation.

Data management and quality assurance

Data records were brought to the University of Puerto Rico Medical Sciences Campus central facility every day and processed by the data manager. A database was programmed using Epi-Info 6.04d. The data managers were responsible for data entry (recruitment forms, personal information, personal interview, and laboratory test results) and for doing periodic backups of all the data files. The data collected from each participant was stored in databases using the anonymous

unique identification numbers assigned. None of the databases contained personal identifying information. A project unique identification number was used so that data records were merged without the need of personal identifying information. All subsequent data analyses used these databases to protect the privacy and confidentiality of the survey participants. Only the principal investigator and the data managers retained permission to access participant's identifiers. The databases stored in Epi-Info 6.04d and ACASI were merged using Stata 10 software (Stata Corporation, College Station, TX). A quality control verification protocol was also programmed to check and report on incongruent response patterns, missing data, and other indicators of interest. After cleaning and editing of the data were completed, quality assurance reports were prepared quarterly.

Results

Recruitment

The data collection phase began in May 2005 and ended in February 2008, yielding a national sample of 108 household segments randomly selected from 2,438 census block groups in Puerto Rico. Research staff included one study coordinator, two field managers, and 18 interviewers that participated in the data collection process. A team composed of one field manager and three to four interviewers were in charge of visiting every household segment.

The number of households visited was 3,591, of which, 90 (2.5%) were uninhabited. In 446 (12.4%) inhabited households a member could not be contacted. Households were replaced from adjacent households when the residents were not contacted after three visits at different days (446) or did not meet eligibility criteria (413 age-ineligible and 2 non-Spanish speakers). The total number of persons residing in the 3,501 contacted households was 6,432. Of these, 4,020 (62.5%) were eligible to participate in this study. Among eligible individuals, a total of 2,123 (52.8%) were randomly selected (one per household). From each segment visited, 37.2 individuals, on average, were eligible to participate in the study; of these, 19.7 subjects, on average, were selected.

A total of 1,654 participants were recruited, yielding an overall participation rate of 77.9%. An average of 15.3 individuals was finally recruited from each household segment. The response rates were similar ($p>0.05$) across the four geographic strata. Of the participants, 1,237 (74.8%) reported to have completed a high school education, 624 (37.7%) were unemployed at the time of the interview, 66.2% reported a family income below the poverty level, and 11% did not have health care coverage (data not shown). The age distribution of the study sample was similar to that reported by the Census 2000; however, slight differences in the sex distribution were seen in strata I, III and IV (Table 1). For example, 57.2% of the study group in Stratum I were females, a figure slightly higher than that observed in the Census 2000 (51.8%). These variations were also observed in the sex distribution in Strata III and IV. However, the age distributions across all strata were similar. We assessed the comparability of interviewed individuals and those who refused to be interviewed with respect to age and sex in each geographic stratum. The age distribution of the interviewed individuals was similar to those who were not interviewed across all strata; however, significant ($p<0.05$) sex differences were observed only in strata I and IV (data not shown).

Table 1. Comparison of age and sex distribution of the study group with the Census 2000

	Variable n (%)	Study Group N (%)	Census 2000
Overall	Sex		
	Female	933 (56.4)	1, 106,974 (52.7)
	Male	721 (43.6)	992,100 (47.3)
	Total	1,654 (100.0)	2,099,074 (100.0)
	Age group (years)		
	21-29	367 (22.2)	508,103 (24.2)
	30-49	835 (50.5)	1,011,608 (48.2)
	50-64	452 (27.3)	579,363 (27.6)
	Total	1,654 (100.0)	2,099,074 (100.0)
Stratum I			
	Sex		
	Female	246 (57.2)	193,126 (51.8)
	Male	184 (42.8)	179,366 (48.2)
	Total	430 (100.0)	372,492 (100.0)
	Age group (years)		
	21-29	96 (22.3)	89,735 (24.1)
	30-49	204 (47.5)	181,069 (48.6)
	50-64	130 (30.2)	101,688 (27.3)
	Total	430 (100.0)	372,492 (100.0)
Stratum II			
	Sex		
	Female	215 (51.6)	222,420 (52.7)
	Male	202 (48.4)	199,492 (47.3)
	Total	417 (100.0)	421,912 (100.0)
	Age group (years)		
	21-29	95 (22.8)	98,499 (23.3)
	30-49	222 (53.2)	209,862 (49.7)
	50-64	100 (24.0)	113,551 (27.0)
	Total	417 (100.0)	421,912 (100.0)
Stratum III			
	Sex		
	Female	228 (57.3)	127,384 (51.8)
	Male	170 (42.7)	118,608 (48.2)
	Total	398 (100.0)	245,992 (100.0)
	Age group (years)		
	21-29	78 (19.6)	60,835 (24.7)
	30-49	205 (51.5)	116,541 (47.4)
	50-64	115 (28.9)	68,616 (27.9)
	Total	398 (100.0)	245,992 (100.0)
Stratum IV			
	Sex		
	Female	244 (60.0)	564,044 (53.3)
	Male	165 (40.0)	494,634 (46.7)
	Total	409 (100.0)	1,058,678 (100.0)
	Age group (years)		
	21-29	98 (23.9)	259,034 (24.5)
	30-49	204 (49.9)	504,136 (47.6)
	50-64	107 (26.2)	295,508 (27.9)
	Total	409 (100.0)	1,058,678 (100.0)

Data Collection

The time required to complete all survey components took approximately 1 to 2 hours. Participants spent, on average, 24±10.7 minutes (range: 10 minutes-98 minutes) on the face-to-face interview and 33.8±9.3 minutes (range: 30 minutes–60 minutes) on the ACASI. All subjects in this study agreed to provide blood samples. While urine samples were being collected, 532 participants were recruited; of these, 523 provided suitable urine samples (98.3%), 4 refused to provide urine, 4 provided inadequate amounts (<10 mL), and 1 was handicapped and was not asked to provide a urine sample.

Post-test counseling

Despite intensive efforts to provide post-test counseling and laboratory test results to all participants, the research team was not able to contact 134 (8.1%) participants, of which, only one was HIV positive. Some had moved, changed or disconnected their phones numbers, or did not answer the messages sent by the study staff using different communication strategies. Information regarding whether subjects who accepted referral to medical care were actually linked to health-care and prevention services was unavailable.

Participant's Perception of the Interview Modes

The majority of respondents (93.5%) reacted in a positive fashion during the face-to-face interview and ACASI. Nearly 95% of respondents indicated they were able to answer all questions without any problems. Although 50.4% of participants reported that both interview modes (face-to-face and ACASI) were equally acceptable, 34.5% of the interviewees preferred ACASI whereas 14.6% favored the face-to-face interview. More females preferred ACASI than males (36.9% versus 31.5%, p=0.02). The interview process was also reported to be more at ease in the mobile examination unit (62.8%) than in their homes (37.2%). The preference for the interview location (mobile examination unit versus participant's home) differed by sex ($p<0.05$), with more than two-thirds (69.2%) of males preferring the mobile examination unit compared to 57.8% of females. However, preference did not vary by age group, education, family income, medical insurance status, history of lifetime injection drug use or tattooing practices of the participants ($p>0.05$).

Sampling Weights

As with any complex probability sample, sample weights need to be taken into consideration in the analysis to produce unbiased seroprevalence estimates of hepatitis C and other viral infections under study. Estimates have to be weighted to match the age and sex distribution according to the 2010 Census estimated population aged 21-64 years of Puerto Rico. These weights reflect the probability of participation in each household block and the inverse of the probability of selection according to the households' blocks, sex and geographic strata.

Conclusions

The overall findings of this study underscore the feasibility of combining different data collection modes in a household survey that collects biological specimens in a mobile examination unit. Collection of biological specimens did not appear to have made the sample prone to attrition, indicating that the request for blood and urine samples had little effect on survey response. In fact, the overall participation rate observed in this study (77.9%) is comparable to other household surveys that have employed a similar methodology such as the National Human Exposure Assessment Survey (NHEXAS), 1995-1997 (71.9% in the population aged ≥15 years) (38); the National Survey of Family Growth (NSFG), 2002-2003 (79.0% in the population aged 15 to 44 years) (39); the National Health and Nutrition Examination Survey (NHANES), 2005-2006 (80.5% for interviews and 77.4% for physical exams in all ages) (40); Hispanic Health and Nutrition Examination Survey (HHANES), 1982-1984 (76.0% in the population aged 6 months to 74 years) (41); National Health Interview Survey (NHIS), 2006 (70.8% in the population aged ≥17 years) (42); and the National Nutrition Survey (NNS), 1999 in Mexico (82.3% in the population aged ≤49 years) (43). The participation rate achieved in this study was also similar to our household survey previously conducted in the municipality of San Juan (27) but lower than in various household surveys previously conducted in Puerto Rico (4-6, 11, 44-45); however, these surveys employed structured interviews without the collection of biological specimens. Although collection of additional data regarding non-interviewed individuals of this study was not feasible, the distribution of selected socioeconomic indicators in our study sample resembles that of other household surveys performed in the adult population of Puerto Rico (17).

Achieving a high response rate is fundamental in survey research, but a variety of factors can influence response rates. Factors that may have influenced the response rate of this study included provision of educational materials, copy of laboratory test results, pre- and post-test counseling, referrals for follow-up medical evaluations and support services, use of ACASI, use of a mobile examination unit, monetary incentive for some of the participant's time and effort, and repeated callbacks for refusal conversion. In addition, the study benefited from the assistance of community leaders in promoting the survey, particularly in some rural areas where additional recruitment efforts were needed, identifying an appropriate location for the mobile examination unit, and gaining access to gated residential communities. Nonetheless, perceived social stigma and discrimination associated with hepatitis C, HIV and other infectious diseases might have been a barrier to participation (46-47).

The ACASI methodology was a useful tool for collecting sensitive risk behavioral data. Our data showed that the vast majority of adults easily accepted ACASI, probably due to increased privacy in reporting sensitive issues. The fact that more

males accepted to be interviewed in the mobile examination unit was probably because they felt at risk and wanted a higher degree of confidentiality. However, the home interview option was a useful strategy to maximize participation for people who felt more privacy, confidentiality or comfort in their households or for those who were too busy or unwilling to schedule the entire data collection process at the same time. This is in agreement with findings in the US, where ACASI is becoming increasingly popular in survey research of sensitive behaviors (21-25).

More than 90% of study participants received their test results, a rate significantly higher to those reported previously from HIV testing conducted in outreach and other community settings (48-50). However, future studies should include improved strategies that increase the proportion of study participants who receive their results and accept referral to medical care. CDC is currently evaluating the use of a confirmatory algorithm with a combination of rapid tests rather than Western blot test to confirm preliminary positive HIV results. This practice would allow clients to receive a preliminary positive HIV test result and a confirmed test result rapidly and be linked to health-care and prevention services the same day (48-50).

The experience gained in this study clearly points to the potential value of designing household surveys that incorporate more comprehensive data collection strategies in our efforts to better understand health outcomes in Puerto Rico. The logistics employed in this study have been shown to be effective in a Hispanic site, in particular, the utilization of a mobile examination unit to conduct the data collection procedures. Future population-based studies should consider using similar methodologies in order to improve accuracy in the estimation of disease burden in Puerto Rico. These initiatives will help guide the development of appropriate disease prevention and control efforts in Puerto Rico.

Resumen

El Sistema de Vigilancia de Factores del Comportamiento recoge información sobre prácticas preventivas de salud y conductas riesgosas relacionadas con enfermedades crónicas, lesiones y enfermedades infecciosas prevenibles en la población adulta de todos los estados y territorios de Estados Unidos. Este sistema representa actualmente la única encuesta realizada en Puerto Rico anualmente en la población de 18 años o más. Sin embargo, la estimación de prevalencia obtenida de esta encuesta está basada en la información proporcionada por el participante, y por tanto, podría estar sujeta a error. A pesar de que los datos obtenidos de los sistemas de vigilancia son útiles para propósitos de evaluación, planificación de programas y políticas de salud, encuestas que incorporan mediciones biológicas proveen una mayor precisión en la estimación de prevalencia y un cuadro más comprensivo de la distribución de las enfermedades y sus factores de riesgo. Este artículo resume la metodología utilizada en un estudio poblacional para estimar la prevalencia de anticuerpos contra el virus de hepatitis C y otras infecciones virales en Puerto Rico y demuestra la viabilidad de combinar diferentes estrategias para la recopilación de datos en encuestas poblacionales en las que se obtienen muestras biológicas.

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