The Role of the State Health Laboratories in Advancing Health Equity

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ABSTRACT

While laboratories play an important and recognized role in many public health programs that require surveillance of disease spread or monitoring of environmental conditions, the role of public laboratories in assessing and advancing health equity is not well understood. Yet, public laboratories collect, provide or generate much of the data used to determine health equity status and monitor heath equity trends in multiple settings and disciplines. RI State Health Laboratories, a division of the RI Department of Health, operates programs that help measure and address health disparities. Health equity themes are present in laboratory programs that measure environmental determinants of health and assure equal access to laboratory screening and diagnostic services. This article will review the role of laboratory programs in advancing health equity in the state. Specific examples of laboratory contributions to health equity programs will be provided and examined. Future trends and unmet needs will also be discussed.

KEYWORDS: state health laboratories, health equity, health disparities

INTRODUCTION

The Rhode Island State Health Laboratories (RI-Labs) of the Rhode Island Department of Health (RIDOH) provide scientific expertise and comprehensive laboratory test data for multiple public health, environmental protection, and criminal justice programs throughout the state. Laboratory-provided test results and associated data inform core public health functions, including infectious disease outbreak designation and response, surveillance of the spread of sexually transmitted diseases, including HIV; and diagnosis of and response to vaccine-preventable diseases such as pertussis, mumps and measles. RI-Labs help assure safe drinking water and food by testing public and private water supplies for a variety of potential contaminants, and by testing food samples when bacterial or chemical contamination is suspected. These examples illustrate uses of laboratory data that are clearly defined and usually well understood by healthcare providers and the general public. However, the role of data generated by RI-Labs in helping to reduce health disparities, a priority for RIDOH, is not as well recognized. RI-Labs has a prominent role in at least two important aspects of addressing health disparities: providing reliable data to determine the extent of health disparities and to monitor trends in health disparities; and maintaining unique laboratory programs to address recognized disparities by assuring access to care or services otherwise inaccessible or unavailable to underserved populations.

ENVIRONMENTAL DETERMINANTS OF HEALTH

It is well known that physical environment affects health. Access to clean water, air and food, safe housing, workplaces, and neighborhoods all promote good health. Laboratories in the Center for Environmental Sciences at RI-Labs provide analytical services to support programs that assess environmental conditions for individuals and communities that may be disproportionately impacted by poor quality air, water and food.

Air Pollution Monitoring

In collaboration with the Rhode Island Department of Environmental Management, RI-Labs' Air Pollution Monitoring Laboratory characterizes ambient air quality in representative parts of the state, with special attention directed toward areas inhabited by people especially susceptible to air pollution, such as children with asthma. Six of the State's network of eight air pollution monitoring sites are located in the most densely populated areas of the state. Five-year population distribution assessments are used to determine if a change in the location of population-oriented monitoring sites is warranted, to better characterize air quality in those areas with the highest population of susceptible people. Rhode Island's population is heavily concentrated in Providence County, which accounts for approximately 60% of the State's residents. The rate of emergency room visits for childhood asthma is considerably higher in Rhode Island's core cities – Providence, Pawtucket, Central Falls and Woonsocket (15.9 per thousand children)—than in the State as a whole (9.5 per thousand children). The rate of pediatric asthma hospitalizations is also elevated in the core cities, as compared to the state average (2.7 versus 1.9 hospitalizations per thousand children).[1] Recently, a Rhode Island "near-road" site was established on the east side of Interstate Route 95 near downtown Providence, to monitor the effects of traffic on air pollution in adjacent neighborhoods. Monitoring for several

air pollutants began at that site in April 2014 and, in the first year of operation, maximum daily one-hour concentrations near Route 95 were, on average, about twice as high as those in other urban neighborhoods. (Monitoring sites used for comparison were located at Brown University, in Providence, Rhode Island and in East Providence, Rhode Island). These differences were especially pronounced in the warmer months, and illustrate the disparate levels of exposure that residents experience as a result of residing in less expensive, but more noisy and polluted areas.

Drinking Water Quality

Drinking water from private wells is not regulated by the state or federal government, and private well owners and consumers of untreated groundwater are at an increased risk as compared to users supplied with water from public water systems. Approximately 15% of Rhode Islanders, mostly those living in the rural areas of the state, depend on private wells for drinking water. RI-Labs collaborates with the Private Well Owners Program, with the University of Rhode Island *Well A*Syst* Program, and with municipalities in which a significant number of private wells are located. Through this collaborative effort, workshops are scheduled in communities where many homeowners depend on private wells for drinking water. At the workshops, drinking water sampling kits are provided and instructions are given on how to collect samples without contaminating them. Private well owners are instructed that testing must be conducted by RIDOH certified laboratories. The workshops arrange for a coordinated sample pick-up at a central location in the community and a courier to deliver the water samples to RI-Labs (or other certified laboratories) for analysis and reporting. The Center for Environmental Sciences at RI-Labs analyzes private well water samples using approved methods and criteria. Copies of *Certificates of Analysis* are transmitted electronically to RIDOH's Private Well Program, which in turn helps private well owners understand test results and to take action if a contaminant is found to exceed safe criteria.

Children's Exposure to Lead

Lead poisoning is a persistent concern for Rhode Island citizens, especially for children under six years of age. Lead-poisoned children are likely to suffer life-long consequences, as exposure to even small amounts of lead can have a negative effect on a child's development and can cause serious health problems, including learning disabilities, loss of IQ, and reduced attention span. While the rates of lead poisoning in Rhode Island have declined significantly, geographic and socioeconomic disparities exist and are well established. (See RIDOH's lead poisoning webpage[2] for more information.) RI-Labs provides laboratory tests in support of universal lead screening requirements for all children in the State and provide prompt notification of all elevated lead results to trigger comprehensive case management. These efforts, combined with strict regulations requiring environmental testing and proper clean-up of lead-contaminated properties, is widely credited with helping lower the rates of lead poisoning among Rhode Island children. While the overall percentage of children in Rhode Island with elevated blood lead levels (>5 ug/dl) in Rhode Island have declined from 25% in 2002 to 4 % in 2015, the incidence rates for "core cities" (municipalities with >15% of families with children have incomes at or below the poverty level) was 5.7%. The results of screening tests performed by the Blood Lead Laboratory are available to health care providers and to the Childhood Lead Poisoning Program for surveillance and planning.

ASSURING EQUAL ACCESS TO QUALITY CLINICAL LABORATORY SERVICES

RI-Labs' Center for Biological Sciences helps assure that all patients have access to high quality, affordable clinical laboratory services. (**See Table 1**.) This goal coincides with the mission of the state's community health centers, which aim to provide comprehensive healthcare to residents in underserved geographic locations, especially those who are uninsured or underinsured. RI-Labs maintains agreements with these health centers to provide tests for diseases of public health significance, such as HIV and other sexually transmitted infections (STI), and childhood lead poisoning at no cost to patients. RI-Labs also maintains testing capabilities for intestinal parasites, which is accessed from time to time according to need.

Institutionalized populations at the Adult Correctional Institution (ACI) and the Rhode Island Training School are also served by RI-Labs. These populations are considered to be at especially high risk for HIV, STI and hepatitis infections. Nationally, Hepatitis-C (HCV) is 9-10 times more prevalent in correctional facilities than in the population at large, and the prevalence of diagnosed HIV among inmates of correctional facilities remains 4-5 times higher than the prevalence in the general population. It is estimated that over half the inmates infected with HIV are also infected with HCV.[3]

A significant amount of testing is also performed for patients receiving care at Planned Parenthood, a provider of reproductive health services and education, helping to reduce the rates of STI among populations served by this organization, including a focus on LGBTQ patients.

Table 1. Services rendered to community partner agencies by the State Health Laboratories of the Rhode Island Department of Health.

Partner Organization	HIV	STI	Hepatitis	Lead
Community Health Centers	8691	26,784	0	5395
ACI	1707	569	1316	0
RI Training School	160	695	163	0
Planned Parenthood	1617	6312	0	0

HELPING VICTIMS OF SEXUAL ASSAULT

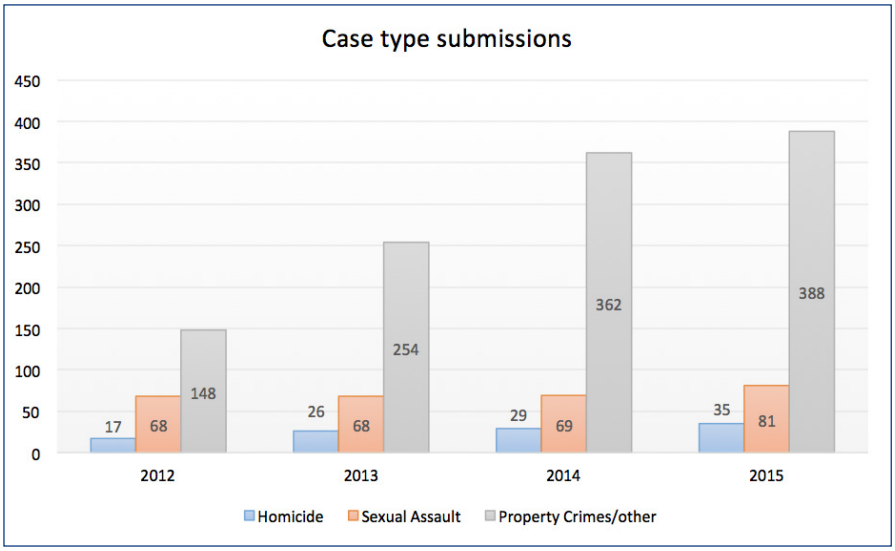
RI-Labs' Forensic Biology/DNA/CODIS laboratory at the Center for Forensic Sciences examines evidence in homicides, sexual assaults, burglaries, and other violent crimes. This includes clothing, weapons, tissues, fluids, and debris as sources of DNA that can be compared to a potential suspect, or for entry into CODIS, the National DNA database. RI-Labs' scientists provide consultations and training, as well as expert courtroom testimony, in the areas of body fluid identification and DNA.

Every two minutes, somewhere in America, someone is sexually assaulted, with no deference to socioeconomic status, age, gender, or geographical location. In Rhode Island, it is estimated that one in eight women have been sexually assaulted at some point during their lifetime. However, more than 59% of all sexual assaults are not reported to law enforcement agencies. Among people with developmental disabilities, as many as 83% of females and 32% of males are victims of sexual assault.[4] Sexual assaults comprise a significant portion of cases submitted for forensic biology examinations and DNA testing. (**See Figure 1**.)

Despite a notable increase in case submissions in recent years, there is no backlog of sexual assault cases in the DNA laboratory. Sexual assault evidence collection kits (SAECKS) are most often received directly from hospitals throughout the state, and are held by the laboratory until notified of a criminal complaint by law enforcement authorities. Once notified, the SAECK is then processed for bodily fluids and/or other sources of DNA. Once a source is identified, the resultant DNA profile is uploaded into CODIS. The CODIS database, maintained by the FBI, has a network made up of 198 state and local laboratories, including Washington, DC and the Army. All participants upload profiles of convicted offenders, arrestees, forensic unknowns (casework samples), missing persons, and relatives of missing persons on a weekly basis. As of July 2016, the National DNA Index (NDIS) contained over 12,471,006 offender profiles, 2,429,723 arrestee profiles, and 720,873 forensic (casework) profiles. Ultimately, the success of the CODIS program is measured by the crimes it helps to solve. CODIS's primary metric, "Investigations Aided," tracks the number of criminal investigations where CODIS has added value to the investigative process. As of July 2016, CODIS had produced over 339,702 "hits" (identifications), assisting in more than 325,798 investigations.[5]

In an effort to address the disparity of victimization, the Rhode Island Statewide Task Force to Address Adult Sexual Assault, in which RI-Labs staff actively participate, has authored a pamphlet with sexual assault FAQ's and related resources for wide distribution, including colleges and universities throughout the state. In addition, there is an impetus underway to train medical personnel at all hospitals throughout the state, including facilities that treat patients who have limited or no health insurance. For those without insurance, the pamphlet addresses the mechanism for compensation via the Victim's Compensation fund. *Day One*, Rhode Island's sexual assault resource and trauma center, assists with specially trained advocates who can assist victims with this process.

Figure 1. Cases submitted to the Forensic Biology/DNA/CODIS Laboratory of the Rhode Island Department of Health for forensic biology examinations and DNA testing.



FUTURE TRENDS

RI-Labs will continue to provide quality laboratory services for at-risk populations, and produce accurate and precise environmental testing data to determine status and trends in health disparities. In addition to identifying environmental factors that affect health, it is expected that RI-Labs will have a greater role in directly assessing population exposures through biomonitoring. Biomonitoring involves testing human specimens for environmental pollutants. It allows more direct determination of actual exposures than measures of the concentration of pollutants in the environment at large. Biomonitoring studies performed so far at RI-Labs have demonstrated racial and socioeconomic disparities. For example, a study of mercury, cadmium and lead concentrations in umbilical cord blood revealed that non-Hispanic black mothers had a 9.6 higher chance of having an elevated mercury concentration than women of other racial or ethnic background. While the reasons for this disparity are not known, this approach illustrates a new avenue for laboratory investigations of inequalities in environmental exposures.[6]

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