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RHODE ISLAND  
MEDICAL JOURNAL

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SPECIAL SECTION  
**HEALTH EQUITY**

GUEST EDITOR: NICOLE ALEXANDER-SCOTT, MD, MPH

NOVEMBER 2016

VOLUME 99 • NUMBER 11

ISSN 2327-2228



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**On the cover**

RI Department of Health Director Dr. Nicole Alexander-Scott, right, joined Providence Mayor Jorge O. Elorza, U.S. Senator Jack Reed, RI Department of Human Services Director Melba De Peña-Affigne, left, and other local partners and representatives to kick off Providence's participation in the federal Summer Food Service Program (Summer Meals) in July 2016 at Dexter Park in Providence.

## Building a Stronger, More Equitable Rhode Island

NICOLE ALEXANDER-SCOTT, MD, MPH

All Rhode Islanders, all people, deserve an equal opportunity to harness their talents, share their gifts, and achieve their dreams, no matter their race, ethnicity, sexuality, gender, gender orientation, or level of education or income. One of the most effective ways to ensure this movement towards equity is to address the inequity of social and environmental factors that contribute to health disparities. We have made some gains in this area in our state and across the country, but our work is ongoing.

In Rhode Island, for example, men are at significantly greater risk of dying of drug overdose; non-high school graduates have a life expectancy seven years shorter than graduates; African Americans experience double the infant mortality of Caucasians; and more than half of Native American children (54%) live in poverty.

We should not accept these kinds of disparities, because together they represent a profound form of social injustice. And we should not accept these kinds of disparities because we don't have to accept them. Once we understand the importance to health of social and environmental factors, health disparities are preventable, if we work smarter, if we better organize our social capital, and if we seek new opportunities to promote health equity for all communities.

We can work smarter by incorporating continuous quality improvement into everything we do, and by engaging academia in major public health initiatives. To this end, the Rhode Island Department of Health (RIDOH) was an early adopter of the Lean Government Initiative, a continuous quality improvement program introduced by Gov. Gina M. Raimondo to eliminate waste and backlogs and to increase agency efficiency. We have also developed the RIDOH Academic Center and are entering into dynamic academic partnerships with colleges and universities throughout the state to enhance information sharing, teaching, public health research, and evaluation.

We can better organize our social capital by encouraging communities to define the health issues they experience, and then to assist these communities as they enact the responses they have designed. What does this look like? One example is RIDOH's Health Equity Zone (HEZ) Initiative, which provides communities with frameworks to achieve health equity by eliminating health disparities through place-based



strategies. Currently, RIDOH is supporting 10 statewide HEZs in their work to prevent chronic diseases, improve birth outcomes, and improve the social and environmental conditions of their neighborhoods. Each HEZ is led by a backbone organization that is coordinating with residents, municipal leaders, educators, law enforcement officials, business people, healthcare providers, people in public health, and many more.

We can seek new opportunities to promote health equity by stretching outside the limitations of federal or categorical funding so that we can diversify our capacity to

address public health issues in all their complexity. This is happening through the HEZ Initiative, as RIDOH has taken this "braided" approach of funding from several categorical sources to increase the collective impact of our public health work, such as increasing access to healthy food as a means to address diabetes risk, and improving the safety of neighborhood environments to increase the physical activity of residents.

### Contributions

This special health equity section of the *Rhode Island Medical Journal* includes a number of articles that describe health disparities in Rhode Island, as well as approaches to mitigate those disparities.

Bertrand, Chan, Howe, *et al.* explore issues of disparate exposure to HIV, as well as access to HIV-related healthcare, in "**Health Equity, Social Justice, and HIV in Rhode Island: A Contemporary Challenge.**" Their paper focuses on the significantly higher risk of HIV burden among African Americans, Hispanics, and gay, bisexual, and other men who have sex with men.

Barkley, Julian, Viveiros, *et al.* explore the special vulnerabilities of young children, older adults, people with chronic conditions, and pregnant women to foodborne illnesses such as Listeriosis and Salmonellosis in "**Preventing Foodborne and Enteric Illnesses Among At-Risk Populations in the United States and Rhode Island.**" They also describe disparities in the risk of illnesses related to health characteristics and cultural preferences, such as higher-than-average consumption of fresh, Mexican-style soft cheese in Rhode Island's Hispanic communities.

In **“Statewide Assessment of Cost-Related Healthcare Access Barriers in Rhode Island,”** Moore, Long, Dexter, *et al.* explore health disparities related to insurance and access to healthcare. Their analysis reveals a correlation between the magnitude of co-payments and deductibles defined by one’s health insurance and the use of essential healthcare services.

An unfortunate paradox is illustrated in **“Diabetes and BMI: Health Equity through Early Intervention on Dysglycemia, and How Providers Can Help,”** by Dumont, Baker, George, and Sutton: the reduction of a serious health disparity as the health of all groups worsens.

Finally, King, Vanner, Leibovitz, and Smith describe the manifold ways in which Rhode Island’s State Health Laboratory supports the cause of health equity (**“The Role of the State Health Laboratories in Advancing Health Equity”**), and

Patriarca and Ausura (**“Introducing Rhode Island’s Health Equity Zones”**) introduce RIDOH’s HEZ initiative and provide background on this multi-year program to reduce health disparities and achieve health equity in Rhode Island.

At RIDOH, we look forward to continuing to partner with all communities in the state to address the disparities highlighted in these articles. Working together, we can achieve health equity and give everyone the chance to make it in Rhode Island.

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# Health Equity, Social Justice, and HIV in Rhode Island: A Contemporary Challenge

THOMAS BERTRAND, MPH; PHILIP A. CHAN, MD, MS; KATHARINE HOWE, MPH; JAIME COMELLA, MPH; THEODORE MARAK, MPH; UTPALA BANDY, MD, MPH

## ABSTRACT

From its beginning, HIV has primarily affected marginalized populations, such as injection drug users, gay, bisexual and other men who have sex with men (GBMSM), and minority racial and ethnic groups. HIV is a disease that, from the start, has been strongly influenced by issues related to social justice and health equity due to its intersection with behaviors among at-risk populations. While some of the risks associated with HIV have been successfully mitigated through social justice initiatives related to needle exchange programs and routine HIV testing of pregnant women, Rhode Island remains confronted with the health equity challenges of preventing HIV transmission and ensuring access to HIV care/treatment, especially for Black/African Americans, Hispanics, and GBMSM.

**KEYWORDS:** HIV, Social Justice, Health Equity, Rhode Island

## HIV IN A SOCIAL CONTEXT

In 1981, human immunodeficiency virus (HIV) was first identified in the United States among non-immunosuppressed injection drug users and gay men who were diagnosed with a rare form of pneumonia caused by *Pneumocystis jirovecii*. Prior to this time, *Pneumocystis* infections were only known to occur in people with compromised immune systems. Untreated, HIV leads to acquired immune deficiency syndrome (AIDS) and death. Since its emergence in 1981, the HIV/AIDS pandemic has had a major impact on morbidity and mortality across the world.

Even though HIV/AIDS is an infectious disease, it has had a remarkable impact on politics, education, the media, social movements, the entertainment industry, and professional sports in a manner unlike any other disease in modern history. Its societal impact has evolved in response to its shifting epidemiology, as well as advances in medicine and technology that have made HIV testing more accessible and new medications that are highly effective in managing – and most recently preventing – the disease

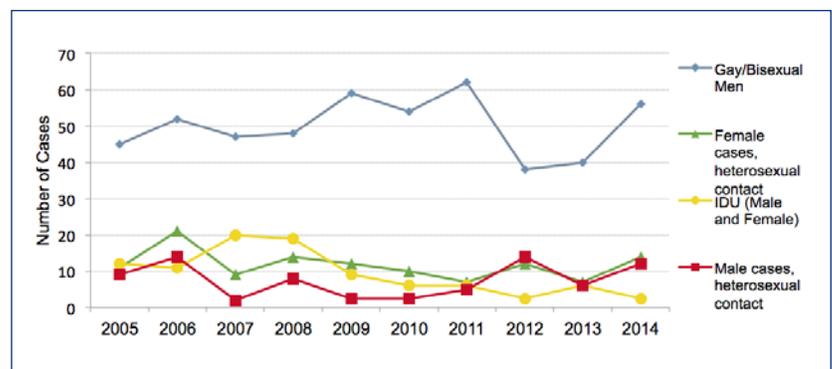
(pre-exposure prophylaxis or PrEP).

What makes HIV/AIDS historically stand apart from other diseases is its impact on a diverse subset of specific populations, including persons who inject drugs, gay, bisexual, and other men who have sex with men (GBMSM), minority racial and ethnic populations, children born to HIV-positive mothers, incarcerated populations, hemophiliacs, and foreign-born individuals from endemic countries. These groups have historically experienced societal marginalization, discrimination, and isolation that directly contributes to their disproportionate burden of HIV. (See Figure 1.)

Commenting on the HIV epidemic among African Americans, Dr. Jonathan Mermin, director of the CDC's Division on HIV/AIDS Prevention, stated that "there is nothing biological that has caused African Americans to have such a disproportionate rate of HIV infection. It's the social, it's the economic, and it's the epidemiological environment in which people live."<sup>1</sup>

As an outgrowth of the HIV epidemic, both nationally and internationally, many groups have mobilized social movements to advocate not only for affordable access to HIV treatment and care, but also for housing, employment, and education to help stem the incidence of HIV within their communities. Such groups include AIDS Coalition to Unleash Power (ACT UP), National Association for the Advancement of Colored People (NAACP), Black Church and HIV, and the Joint United Nations Programme on HIV/AIDS (UNAIDS). Often framing their advocacy through a social justice lens, these groups frequently include a focus on improving conditions related to social determinants of health for the communities they represent.

Figure 1. Newly-Diagnosed Cases of HIV by Exposure Mode, Rhode Island, 2005–2014



## HIV AND SOCIAL DETERMINANTS OF HEALTH

Social determinants of health are typically defined as a person's social environment, physical environment, and their access to health services.<sup>2</sup> These factors cannot be changed with differences in behavior, but can greatly affect the individual's environment, and their health outcomes. Some of the most salient social determinants of health include poverty, homelessness, unequal access to healthcare, incarceration, lack of education, stigma, homophobia, sexism and racism.

Socioeconomic status and HIV are closely linked. Socioeconomic status can affect HIV status, and vice versa. Individuals who have low socioeconomic resources are more likely to practice riskier behaviors, which may make them more susceptible to HIV. Some of these riskier behaviors may include earlier sexual debut and inconsistent condom use. It has been observed that the most substantial social determinants of health in relation to HIV/AIDS are education, employment, housing, income and insurance status. While all of these factors are significant predictors of HIV status, research indicates that education and housing status are the strongest predictors.<sup>3</sup> It has been demonstrated that those who experience unstable housing are more likely to have condomless sex, use drugs, and share syringes.

An HIV diagnosis may negatively impact someone's socioeconomic status by diminishing their capacity to work and earn income. The percentage of HIV-positive individuals who are unemployed is high compared to their seronegative counterparts. This is partially due to work responsibilities competing with healthcare needs, as well as difficulty in maintaining typical work hours due to fatigue.<sup>4</sup>

## HIV SUCCESSES IN RHODE ISLAND: HIV TESTING OF PREGNANT WOMEN AND NEEDLE EXCHANGE PROGRAMS

While many social determinants of health represent significant barriers toward reducing HIV risk, two public health interventions have proven successful as HIV prevention strategies in Rhode Island and in other jurisdictions across the nation: routine HIV testing of pregnant women and syringe exchange programs for injecting drug users.

In 1994 it was discovered that the administration of zidovudine (AZT) during pregnancy and childbirth reduced the chance of a child being born HIV positive to an infected mother by two-thirds. In 1999, the Institute of Medicine recommended "adoption of a national policy of universal HIV testing, with patient notification, as a routine component of prenatal care."<sup>5</sup>

In accordance with Rhode Island General Laws 23-6.3-3, enacted in 2009, HIV opt-out screening is incorporated into prenatal testing for all pregnant women as early and often as appropriate during each pregnancy.<sup>6</sup> Newborns are tested as soon as possible after delivery if the mother's HIV status is not documented (the mother's consent is not needed).

In Rhode Island, there has been only one case of mother-to-child transmission of HIV in the last five years.

Needle exchange programs, also known as "syringe services" programs, generally provide a full spectrum of services to individuals who inject drugs, including exchange of used syringes for clean ones, naloxone distribution, counseling, condoms, rapid HIV and hepatitis C testing, and referrals to mental health and social services. Since the inception of the needle exchange program in Rhode Island in 1994, there has been a precipitous drop in new cases of HIV identified among injecting drug users, with fewer than six cases reported annually from 2009–2014.

AIDS Care Ocean State (ACOS) operates Rhode Island's needle exchange program, which started as one fixed site in Providence in 1994. In 2002, ACOS expanded their services to include mobile sites in Woonsocket and Newport, then expanded their services to street outreach in 2008, and home delivery in 2012. In total, ACOS provides services through three fixed sites, a mobile/street-based exchange unit, and home delivery in five cities: Providence, Woonsocket, Newport, Pawtucket, and Central Falls.<sup>7</sup> Clean syringes can also be bought without prescription at retail pharmacies in Rhode Island.

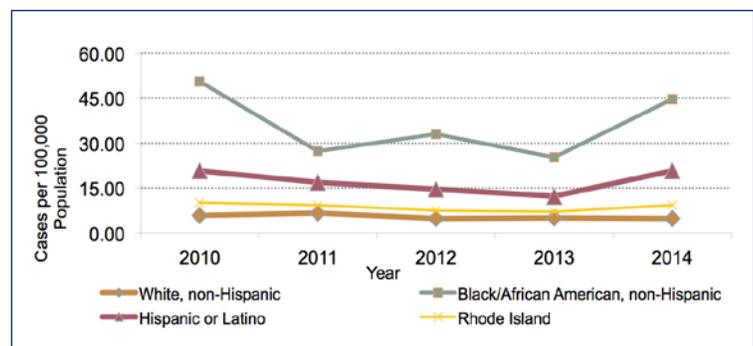
## HIV EPIDEMIOLOGY AND RACE/ETHNICITY

In a state with a population that is between 75% and 80% White, the rates of Black/African American males living with an HIV diagnosis is five times that of white males. Further, Black/African American females have rates that are 17 times that of their white counterparts. Black Americans represent only 12% of the United States population, but they account for 44% of individuals living with HIV.<sup>8</sup> In Rhode Island, the rate of HIV in the Black/African American population is roughly 10 times that of White, non-Hispanic individuals. The rate for Hispanic or Latino individuals is five times that of non-Hispanic Whites. (See Figure 2.)

## HIV EPIDEMIOLOGY AND SEXUAL ORIENTATION

According to the Centers for Disease Control and Prevention, GBMSM comprised 83% of new HIV diagnoses among

**Figure 2.** Rates of Newly-Diagnosed Cases of HIV by Race/Ethnicity, Rhode Island, 2010–2014



males age 13 and older in 2014. Furthermore, it is estimated in the United States that 15% of all GBMSM are HIV-infected.<sup>9</sup> A major barrier to testing and screening globally is that one-third of countries around the world criminalize same-sex conduct, thus restricting the rights of GBMSM and the lesbian/gay/transgender community. In these countries, GBMSM are less likely to access services, fearing prosecution.

The South (Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia) is home to 37% of the United States population, but more than 50% of newly-diagnosed HIV cases.<sup>10</sup> There are many contributing factors to this disproportionate epidemic in the South, including poverty, stigma, racism, and homophobia. Further contributing to these factors is “abstinence-only” education in schools, as well as limited Medicaid expansion by these Southern states.<sup>11</sup> Social stigma related to the GBMSM population is further exacerbated by race, as African American GBMSM are stigmatized not only because of sexual preference, but also due to race.<sup>12</sup>

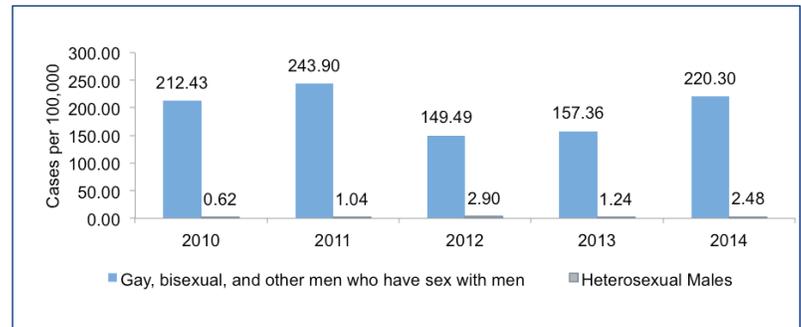
The rate of new HIV infections in 2014 in Rhode Island was 89 times higher in GBMSM than heterosexual men. While most of the cases of HIV among GBMSM in years past have been concentrated in men in ages 30–49, there has been a recent shift toward younger men (in their 20s). The majority of GBMSM diagnosed with HIV reside in Providence County. (See Figure 3.)

A recent advancement in addressing HIV prevention among GBMSM is PrEP. Taken once a day by HIV-negative individuals, PrEP can effectively prevent HIV infection. Studies suggest that PrEP is >90% effective in preventing HIV. Currently, The Miriam Hospital STD Clinic has prescribed PrEP to more than 200 patients and is taking referrals.

### ACHIEVING HEALTH EQUITY IN RHODE ISLAND

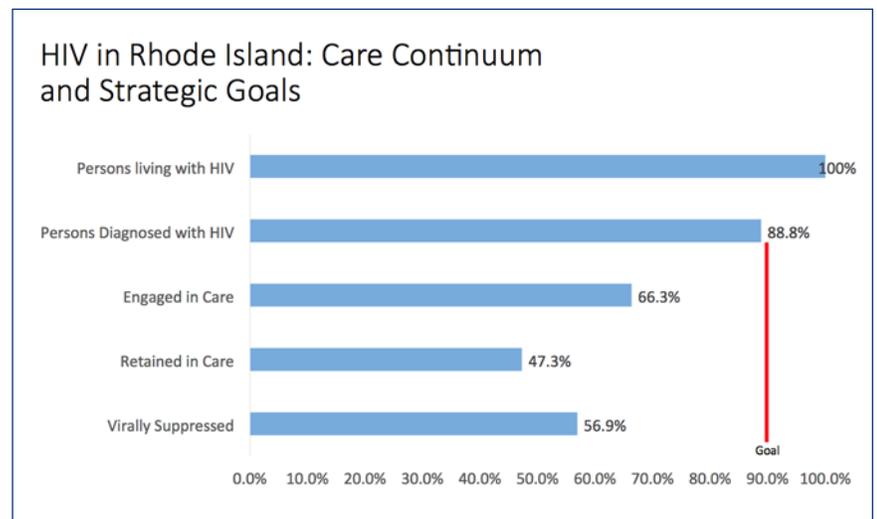
With the goal of scaling up HIV testing and treatment efforts and achieving health equity for individuals at-risk for – and impacted by – HIV, Rhode Island officially adopted the UNAIDS “90-90-90” initiative at the Rhode Island Statehouse *World AIDS Day* event in December 2015. The goals of this global initiative for the year 2020 include: 1) 90% of people living with HIV know their HIV status; 2) 90% of people who know their HIV-positive status access treatment; and 3) 90% of people in treatment have suppressed viral loads. Figure 4 illustrates Rhode Island’s progress towards these targets.

**Figure 3.** Rates of Newly-Diagnosed HIV among Males\* by Sexual Orientation, Rhode Island, 2010–2014



\*Denominator data to estimate the GBMSM population is derived from the Rhode Island Behavioral Risk Factor Surveillance System and Lieb et al., “Statewide Estimation of Racial/Ethnic Population of Men Who Have Sex with Men in the U.S.” *Public Health Reports* 126(2011): 60-72

**Figure 4.** Rhode Island’s Progress towards reaching set targets.



The cornerstone of Rhode Island’s 90-90-90 initiative is a commitment not only to address the medical needs of individuals at-risk for and living with HIV, but also their social and economic needs, including issues related to discrimination, housing, education, and employment. Accordingly, partnerships and planning groups have been formed that include social service agencies, AIDS service organizations, municipal governments, community-based organizations, and other state agencies.

While medical advances have led to tremendous successes in HIV prevention and care, Rhode Island’s current challenge is to combine these advancements with improvements in local environments and communities in which at-risk groups and people living with HIV live, grow, work, and learn. This comprehensive approach is intended to be a foundation on which Rhode Island hopes to be the first state in the nation to “get to zero.”

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## Acknowledgment

Special thanks to Kate Tierney, BS, Rhode Island Department of Health Intern, for conducting research in support of this article.

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# Preventing Foodborne and Enteric Illnesses Among At-Risk Populations in the United States and Rhode Island

JONATHAN BARKLEY, MPH; ERNEST JULIAN, PhD; BRENDALEE VIVEIROS, MPH; MICHAEL GOSCIMINSKI, MT, MPH; UTPALA BANDY, MD, MPH

## ABSTRACT

One out of every six people in the United States is estimated to become sick each year from pathogens that can cause foodborne illness. The groups at greatest risk for serious illness, hospitalization, or death include young children, older adults, people with chronic conditions, and pregnant women. Such health disparities must be considered along with those disparities that may exist among racial and ethnic groups and among groups of varying socioeconomic status. We analyzed risk profiles for enteric disease using data from Rhode Island and the nation as a whole, exploring disparities among groups defined by demographic and health characteristics. As expected, disparities in the burden of enteric illnesses are not limited to racial or ethnic differences in disease burden, or in differences otherwise attributable to socioeconomic status. Age is an especially important determinant of risk, as is residential status. Other groups found to be especially vulnerable to foodborne and enteric illnesses in Rhode Island include pregnant women and those with certain health conditions (e.g., cancer, liver disease or immunosuppression). By understanding what groups are at increased risk, providers can more effectively counsel their patients to mitigate risk and effectively treat these conditions.

**KEYWORDS:** foodborne diseases, disparities, Rhode Island

## INTRODUCTION

The Centers for Disease Control and Prevention (CDC) estimates that each year in the U.S. one in six people become sick from a foodborne pathogen, which equates to approximately 48 million illnesses, 128,000 hospitalizations, and 3,000 deaths annually.<sup>1</sup> Although everyone is susceptible to foodborne and other enteric illness, certain groups are more susceptible and are also likely to suffer more serious illnesses, hospitalizations, and death. These highest risk individuals include young children, older adults, people with weakened immune systems, and pregnant women. When considering health disparities with regard to foodborne and enteric illnesses, these at-risk groups are important to consider along with disparities that may exist due to differences in race, ethnicity, and socioeconomic status. This paper will

discuss these at-risk groups using national and Rhode Island data and provide recommendations aimed at preventing and diagnosing enteric illness among these and other groups.

## DISPARITIES DUE TO AGE AND WEAKENED IMMUNE SYSTEMS

Research suggests that the most important disparities in foodborne illness burden relate to differences in age and immune health. Young children are at risk for foodborne and enteric illnesses because of developing immune systems. Similarly, older individuals are at risk because of weakening immune systems, chronic conditions, and because bacteria remain in their gastrointestinal tracks for longer periods of time. (Many older individuals are on protein pump inhibitors that reduce stomach acid, allowing organisms to escape destruction from gastric acid, leading to bacterial overload in the lower gut.) Conversely, increased antibiotic pressure both in hospital and community environments leads to elimination of healthy enteric flora and overgrowth of deadly enteric pathogens such as *Clostridium Difficile*. Disparities in foodborne illness burden related to differences in age and immune health are revealed in both national and Rhode Island data.

The Foodborne Diseases Active Surveillance Network (FoodNet) monitors national trends in foodborne illness over time and attributes illnesses to specific foods and settings. The surveillance area covers 15% of the U.S. population (48 million people) and monitors trends in *Campylobacter*, *Cryptosporidium*, *Cyclospora*, *Listeria*, *Salmonella*, Shiga toxin-producing *Escherichia coli* (STEC), *Shigella*, *Vibrio*, and *Yersinia*.<sup>2</sup> Data from the most recently published FoodNet annual report states that the incidence of foodborne disease is highest among children under 5 years of age for all pathogens except for *Listeria*, *Vibrio*, and *Cyclospora*, where the highest incidence rates are seen among people older than 65 years of age.<sup>3</sup>

In Rhode Island, the average rate of listeriosis between 2010 and 2014 was 0.4 cases per 100,000 people, but the rate was higher among children less than 5 years of age (1.7/100,000) and highest among people who were 80 years of age or older (3.1/100,000). (See Figure 1).

Analysis of the 22 listeria cases reported in Rhode Island from 2010–2014 further illustrates these disparities. Of the 22 cases reported over this five-year time period, 5 (23%)

cases were newborns or pregnant females, 9 (41%) were cases with existing health conditions (cancer, liver disease or immunosuppression—conditions that increase the severity of listeria infection), and the remaining 8 (36%) cases were older adults ranging in age from 72 to 90 years.

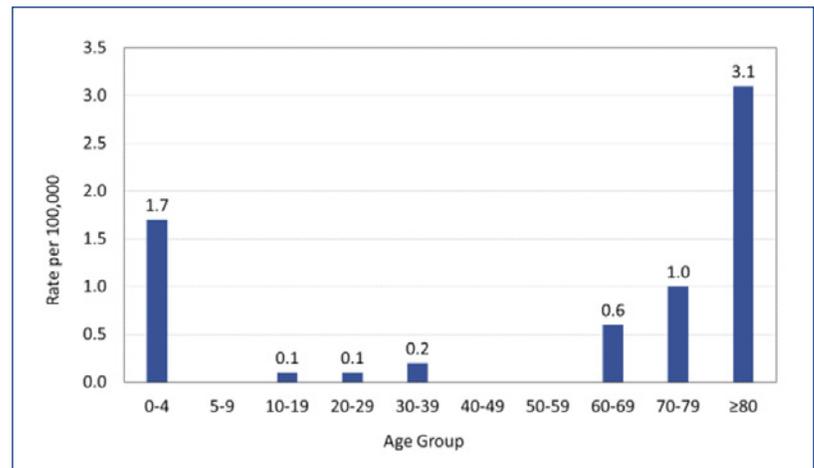
Age-specific rate disparities are also observable in 2014 Rhode Island Salmonella data. Although the overall Salmonellosis incidence rate was 13.3 cases per 100,000 people, the rate was higher among older adults and highest among children less than 5 years of age (34.8/100,000). (See Figure 2.) These disparities are consistent with disparities observable in national data. In addition to being at increased risk from foodborne infectious disease exposures because of developing immune systems, young children are *especially* vulnerable to salmonella infections from livestock or reptile exposure. The reasons for this phenomenon are multifactorial, including immature immune systems, household contamination events, overcrowded dwellings, and inadequate hygienic practices. In 2014, 27% of Rhode Island salmonellosis cases under 5 years of age were reported to have had an exposure to livestock prior to their illness onset.

The burden of norovirus on the very young, the elderly, and immunocompromised people is also higher than among other people in the general population. Norovirus is the leading cause of acute gastroenteritis and foodborne illness in the U.S., with over 14,000 estimated annual hospitalizations nationally, mostly among young children and elders.<sup>1</sup> In the U.S. from 2009 through 2012, noroviruses accounted for over 48% of foodborne outbreaks. In Rhode Island from 2010 through 2014, 39% of foodborne outbreaks were suspected or confirmed to have been caused by norovirus.

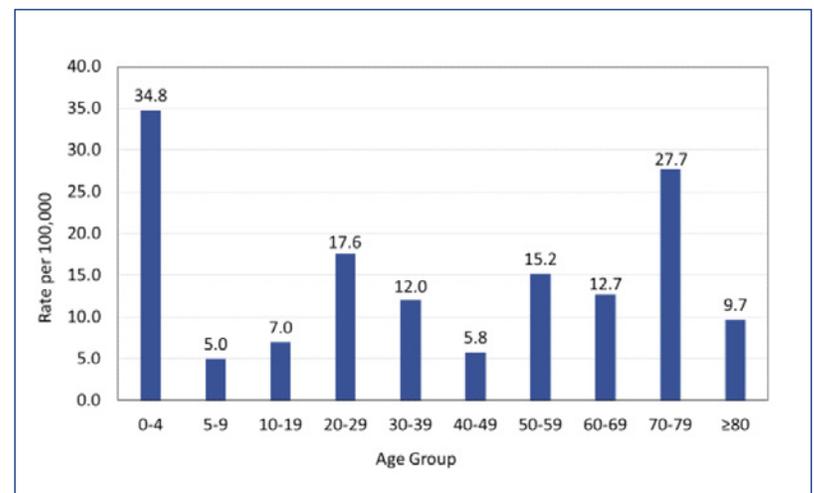
Norovirus can spread explosively from person to person in long-term care facilities, thus disproportionately affecting frail elders. In Rhode Island in 2014 for example, 45 of approximately 90 long-term care facilities reported a norovirus-like outbreak. Of these, 29 were confirmed to be caused by norovirus. The average attack rate of residents during these outbreaks was 25%.

Pregnant women and people with compromised immune systems (from conditions such as HIV, cancer, and liver disease) are also at increased risk of becoming seriously ill from foodborne pathogens. (For example, pregnant women are ten times more likely than the general population to become ill with listeriosis.<sup>5</sup>) Because of this, the Rhode Island Food Code includes special requirements for those establishments

**Figure 1.** Cumulative 5-Year Average Rate of Listeriosis Cases by Age Group, Rhode Island, 2010 – 2014. Rate is calculated per 100,000 population. The population denominator is based on the 2010 Rhode Island U.S. Census population.



**Figure 2.** Rate of Salmonellosis by Age Group, Rhode Island, 2014. Rate is calculated per 100,000 population. The population denominator is based on the 2010 Rhode Island U.S. Census population.



servicing highly susceptible populations, including hospitals, nursing homes, elder-care homes, schools, and day-care centers. Establishments serving these populations must exclude ill food employees with norovirus from working until the employees are symptom free for at least 48 hours.<sup>6</sup> Also, high risk food items that are served raw or partially cooked, such as raw shellfish and undercooked hamburgers, are not allowed to be served in these food establishments, and only fully cooked or pasteurized egg products may be used.

Individuals at greatest risk of foodborne illness can mitigate risk by avoiding certain foods and practicing food safety behaviors. High-risk groups should avoid unpasteurized dairy products, soft cheeses, sprouts, undercooked meats, raw shellfish, and deli meat that is not thoroughly reheated

prior to consumption. Proper handwashing, sanitation, and avoidance of bare hand contact with ready-to-eat foods is especially important to prevent norovirus transmission, because individuals can shed viral particles after the termination of symptoms, and the viral particles themselves can survive on typical indoor surfaces for up to 2 weeks.<sup>4</sup>

## DISPARITIES ASSOCIATED WITH DIFFERENCES IN RACE AND ETHNICITY

Race and ethnicity data have not been collected consistently in FoodNet and evidence suggests that Hispanics and low-income individuals are under-represented in the FoodNet population relative to their proportions in the U.S. as a whole.<sup>7</sup> Despite these limitations, FoodNet has constructed rates by race and ethnicity, revealing that *Campylobacter* and *Listeria* incidence rates are highest among Hispanics, that STEC rates are highest among non-Hispanics, and that *Salmonella* rates are similar for Hispanics and Non-Hispanics.<sup>2</sup>

A recent review of the public health literature suggests that minority and low-income people are at highest risk of foodborne illness.<sup>8</sup> Higher than average consumption of fresh, Mexican-style soft cheese may help explain the increased incidence of Listeriosis among Hispanics,<sup>5</sup> especially pregnant Hispanic women (whose risk of listeriosis is 24 times higher than non-pregnant, non-Hispanic women).<sup>5</sup> Several factors may explain this ethnic disparity, including unsafe food-handling practices, crowding in homes, number of young children in homes, and a lack of understanding of specific health risks. As well, access to fresh, healthy food is limited among minorities and persons of low income in the U.S. Studies have consistently demonstrated income, race, and ethnic disparities in access to fresh, healthy food at the retail level, leading to the concept of the “food deserts,” areas typified by a lack of supermarkets and an abundance of smaller ethnic markets, convenience stores, and fast food retailers. Researchers are beginning to look at specific food safety risks associated with “food deserts,” e.g., inadequate food-handling knowledge and improper food-handling practices in small independent retailers.<sup>8</sup>

In Rhode Island, activities are underway to improve our understanding of racial and ethnic disparities in the burden of foodborne illnesses. For example, an initiative begun in October 2015 aimed at improving the reporting of race and ethnicity information in foodborne case-reports received by the Rhode Island Department of Health (RIDOH) has led to more complete information. “Known” race and ethnicity in case reports of campylobacteriosis increased from 31% to 61% in the first eleven months of the initiative, and among case reports of STEC (Shiga-Toxin producing *E. coli*) from 50% to 83%. Such improvements will enable RIDOH to perform detailed analyses of racial and ethnic disparities, enabling the improved targeting of prevention measures. As well, the Rhode Island Center for Food Protection focuses attention on high-risk food establishments, including those smaller

independent food stores located in “food deserts,” to improve compliance with safe food-handling and storage practices.

## RECOMMENDATIONS

Understanding foodborne illness disparities can help providers diagnose, treat, and report infections from foodborne pathogens. Although elimination of these disparities will undoubtedly require societal change, patient-by-patient guidance and education is also of great value to individuals and their families. Individuals at especially high risk of severe foodborne infections should be counseled to avoid certain foods, e.g., undercooked animal products, raw shellfish, sprouts, deli meat that is not thoroughly re-heated, soft cheeses, and unpasteurized milk and juice products. Non-food related factors, such as contact with pets, reptiles, livestock, exotic animals, and unsanitary environments are also important to address, particularly where young children are involved. Immediate and thorough handwashing after contact is recommended. As well, *no* reptiles should be allowed in a home with an infant. Children should receive rotavirus and hepatitis A vaccines according to the prescribed schedule. At-risk persons can also protect themselves from disease *carriers* (known and unknown) by several means:

- Regular and thorough hand-washing
- Regular and thorough sanitizing of residential and work environments
- Use of “cyst filtration devices” for the extreme immunosuppressed
- Caution around domestic and wild animals
- Avoidance of untreated drinking water
- Proper food-handling and storage methods (Hot foods should be kept hot and cold foods cold.)

Many useful resources are available online to help educate those at increased risk.<sup>9,10</sup>

Testing for foodborne and enteric illnesses and the reporting of confirmed cases are *critical* elements in disease prevention, including the prevention of widespread food-borne illness outbreaks. It is important to recognize the symptoms of foodborne and enteric illnesses and to obtain a stool culture when bloody diarrhea or severe gastrointestinal symptoms are observed. Guidance on managing these conditions are available.<sup>11</sup> Data reported in the literature suggest that culture-independent diagnostic tests (CIDTs)—rapid tests that do not require the isolation of living organisms—are now commonly used to test for bacteria, aiding timely clinical management.<sup>2</sup> However, the isolation of organisms is still required for genetic testing. The latter permits public health officials to work with state partners and federal agencies to identify and to eliminate ongoing sources of food contamination. Therefore, sending specimens to the State Public Health Laboratory is critical following a positive CIDT. RIDOH has worked closely with hospital laboratories to

facilitate this process. Collecting and reporting information on race and ethnicity is also helpful in identifying the sources of foodborne illnesses and to reduce disparities in the burden of foodborne illnesses.

In conclusion, illnesses caused by enteric pathogens are preventable and can impact certain groups more severely than others. Continued research and outreach is needed at the national and state level to understanding *what* groups are at increased risk and *why*. Patient education, laboratory culture testing, and the collection and reporting of race and ethnicity to public health will facilitate the assessment of risk factors and the targeting of scarce public health resources.

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# Statewide Assessment of Cost-Related Healthcare Access Barriers in Rhode Island

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## ABSTRACT

Although co-payments and deductibles are means of keeping health expenditures low, they have also been cited as barriers that inhibit patients from accessing necessary healthcare. We aimed to evaluate Rhode Island residents' experiences with cost-related access challenges within the state's healthcare system. We conducted a cross-sectional survey of resident experiences with healthcare in Rhode Island. Our survey instrument was composed of the RAND Corporation "Short-Form Patient Satisfaction Questionnaire (PSQ-18)", questions developed by the Rhode Island Office of the Health Insurance Commissioner, and ranking of health priorities based on prior community assessments conducted by the Rhode Island Department of Health. Data were collected at venues across the state as part of the Rhode Island Department of Health 2015 Statewide Health Inventory. From July to August 2015, 404 surveys were completed. We found that 40% of respondents had a co-pay of \$20–\$50, while 35.7% of respondents had a deductible of greater than \$500. Further, one-third of respondents delayed receiving care due to financial barriers. This decision resulted in a worsening condition or hospital visit for nearly half of those respondents. Co-pays and deductibles pose challenges to Rhode Islanders accessing health care. Cost-related barriers to healthcare access should continue to be addressed, especially in the context of preventive care services, which are now being built into health insurance premiums through the Patient Protection and Affordable Care Act.

**KEYWORDS:** Rhode Island healthcare, financial barriers, co-payments, deductibles, preventative care

## INTRODUCTION

Health insurance cost sharing is often described as a barrier that prevents patients from accessing healthcare.<sup>1-2,3</sup> In fact, 45% of patients with a deductible of greater than \$500 reported a new or worsening condition due to cost-related access challenges; conversely, 32% of patients with a deductible of less than \$500 reported a new or worsening condition due to financial barriers.<sup>1</sup> Further evidence suggests that individuals with no cost sharing are 15% more likely to utilize emergency department services than individuals with co-pays and deductibles.<sup>4</sup> Although cost sharing is intended to keep

healthcare costs low, it also induces a variety of cost-related access challenges. Individuals burdened by such financial challenges are less likely to consult a physician, fill necessary prescriptions, or complete indicated follow-up procedures.<sup>1</sup>

On a national scale, it is known that co-payments and deductibles prevent both families and individuals from accessing the care that they require. This challenge is particularly pronounced in low- and middle-income families.<sup>2,5</sup> Low- and middle-income populations are both significantly less likely to receive preventative care than high-income populations.<sup>6,7</sup> However, the decision to forgo preventive care due to financial barriers is not solely linked to socioeconomic status. Income level aside, Medicare enrollees with supplemental insurance coverage are two to three times more likely to undergo breast cancer screenings than those without additional insurance benefits who pay additional costs to access care.<sup>8</sup> The tendency to delay, skip, or forgo preventive care due to cost is present across multiple socioeconomic levels, and can lead to worsening conditions.<sup>9,10</sup>

In order to increase access to preventive care it is important that public experience with healthcare cost and coverage is assessed. We surveyed patients and community members in Rhode Island (RI) in order to gather information that reflected actual resident experiences with the state healthcare system. This primary data collection was completed as part of the Rhode Island Department of Health (RIDOH) 2015 Statewide Health Inventory, with the intent of evaluating cost-related access issues.<sup>11</sup> The aim of this study was to evaluate the financial challenges associated with healthcare access for RI residents.

## METHODS

### Survey Design

We used a cross-sectional survey designed to examine three cost-related access issues from the perspective of RI residents. In order to do so, the survey was composed of three sections. The first section consisted of questions from the Validated RAND Corporation "Short-Form Patient Satisfaction Questionnaire (PSQ-18)".<sup>12</sup> These questions were incorporated in order to assess residents' experiences with RI healthcare. The second section consisted of questions designed by the Office of the Health Insurance Commissioner, and were used to evaluate financial barriers that limited residents' access to healthcare. Finally, the third

section presented health priorities that were found to be consistent across communities based on prior assessments conducted by the RIDOH,<sup>13-14,15,16</sup> participants were asked to rank these priorities based on perceived importance in their communities. The described priorities included drug and alcohol abuse, and access to healthcare. The survey could be accessed online or over the phone. Respondents noted that it took less than five minutes to complete.<sup>8</sup>

This survey was administered as part of the RIDOH 2015 Statewide Health Inventory in order to provide information about the financial barriers that currently prevent Rhode Island residents from accessing healthcare. The RIDOH 2015 Statewide Health Inventory was a comprehensive assessment of health service capacity and access to care for a variety of health services across the State.<sup>11</sup>

### Data Collection

Our team of eight interns distributed both English and Spanish copies of the survey directly to RI residents at a variety of locations throughout the state. Distribution venues included local farmers markets, Oakland Beach in Warwick, and Kennedy Plaza (the central bus terminal in Providence). Surveys were also distributed directly to patients and community members by many federally qualified health centers (FQHCs); Women, Infants, and Children (WIC) programs; and several community-based multiple service organizations.

In addition to direct distribution, surveys were also placed outside of the RIDOH's Office of Vital records for individuals wishing to participate while waiting to be assisted. Furthermore, both an English and Spanish version of the survey was posted to the RIDOH website in August 2015. The posting of the survey was followed shortly after by a press release that encouraged residents to complete the online version.

### Data Analysis

The John Snow Research and Training Institute, Inc. worked to clean and standardize the collected data. Descriptive statistics were generated in order to represent several attributes of interest. The standardized findings were aggregated into appropriate tables, and, in one case, a statistical map, in order to display the desired information. Analyses were conducted using SAS software.

## RESULTS

From July to August 2015, surveys were distributed both online and in person. During this time, 404 surveys were completed; 258 respondents completed a paper version of the survey, and 146 completed an online survey. Responses were collected from 84% of RI zip codes. Only two municipalities were excluded entirely from our convenience sample: North Smithfield and New Shoreham.

Of the 400 participants who reported on the cost of their co-pay, 40% stated that they had a co-payment of between \$20 and \$50 per doctor's office visit. Furthermore, 17.3%

of respondents had a co-pay of less than \$20, while an additional one-third (31.3%) stated that they had did not have any co-payment (**Table 1**).

The cost of deductibles was also examined. Of the 404 respondents who provided information regarding their deductibles, 33% claimed to have a deductible of at least \$500. Conversely, 30.4% of participants reported having no deductible whatsoever (**Table 2**).

In order to assess the effects of cost sharing on access to care, participants were also asked whether they or a member of their household had to delay or forgo receiving medical care due to cost. Slightly less than one-third (31.1%) of respondents said yes. Furthermore, of the 31.1% who answered yes, 46.7% reported that their condition either worsened or that they went to the emergency room as a result of their decision to delay or forgo receiving care (**Table 3**).

**Table 1.** Cost of patient co-pay per visit to a physician, 2015.

Doctor's Office Co-Pay	Percent of Respondents n=400
Less than \$20	17.3%
\$20-\$30	30.3%
\$30-\$50	9.8%
\$50-\$100	2.8%
More than \$100	0.3%
Don't know	8.5%
No co-pay	31.3%

Source: RIDOH 2015 Statewide Health Inventory.

**Table 2.** Average patient deductible, 2015.

Deductible	Percent of Respondents n=404
\$100	4.7%
\$250	4.7%
\$500	11.4%
\$1,000	4.0%
Under \$1,000 (cannot specify)	2.7%
Between \$1,000 and \$2,500	9.7%
Between \$2,500 and \$5,000	5.7%
Over \$5,000	2.2%
Don't know	24.5%
No deductible	30.4%

Source: RIDOH 2015 Statewide Health Inventory.

**Table 3.** Outcomes of respondents who delayed seeking medical care because of cost barriers, 2015.

Outcome	Percent n=126
I became sicker before seeking care	28.2%
Nothing – I got better on my own	27.4%
Don't know	25.8%
I went to the emergency room	18.5%

Source: RIDOH 2015 Statewide Health Inventory.

## DISCUSSION

Our survey results reflected healthcare experiences from 84% of RI zip codes. Our findings show that nearly half of RI residents are burdened by deductibles of greater than \$500 and co-payments of \$20-\$50. Furthermore, approximately one-third of respondents substituted or forwent receiving necessary care, suggesting a correlation between cost and the decision to delay care. This decision ultimately resulted in a worsening condition or hospital visit for 46.7% of patients. These results exemplify a heightened tendency to make cost-saving decisions due to insurance cost sharing, and are consistent with those of previous studies.

Trivedi *et al.* gathered investigated the effects of cost sharing on screening mammographies.<sup>17</sup> The study compared screening rates between participants who were subjected to gradual co-payment increases over the course of three years relative to those who maintained full-coverage plans. Investigators found that screening rates for individuals with rising co-payments were 7.2 percentage points lower than those enrolled in full-coverage plans. The effects of cost sharing were also more pronounced for women residing in lower-income areas. These results also demonstrate that individuals with high co-sharing responsibilities are less likely to seek necessary care, and suggest a correlation between income level and access challenges.

In assessing our results, we found that one-third of RI residents made decisions due to financial barriers, which caused nearly half of these respondents to report a worsening condition or an emergency room visit. In order to prevent similar outcomes, potential strategies to address such financial barriers should be considered. Exempting certain preventive care exams from cost sharing could be an effective means of reducing subsequent medical expenditures. This notion served as the foundation for the Essential Health Benefits Plan under the Affordable Care Act (ACA). Essential Health Benefits work to remove the effects of cost sharing on preventive care recommended by the United States Preventive Services Task Force. Examples of preventive services now included in insurance premiums are indicated mammography and colonoscopy exams.

Despite our consistent conclusions, there were several limitations to our study. First, we did not receive evaluations from every community in RI, nor did we collect an equal number of responses from each zip code. Indeed, even though we collected responses from 84% of RI's zip codes, our *convenience sample* cannot be considered representative of the entire Rhode Island population. Furthermore, we did not actually monitor patients in order to assess the outcomes of their delaying or forgoing necessary care. Regardless of these limitations, however, our conclusions paralleled those of previous studies.

Overall, our findings suggest that insurance cost-sharing measures present cost-related access challenges for many RI residents. In the setting of the ACA, which supports a reduction in the population of uninsured, the financial and

access-to-care barriers faced by the underinsured due to certain cost-sharing concerns should not be underestimated. Our results inform future policy decisions related to improving access barriers based on cost burden to patients.

## Acknowledgments

We would like to thank our Public Health Interns (summer interns at the Rhode Island Department of Health), including Brittany Mandeville, Madelyn McCadden, Jessica Miele, Lauren Poplaski, Christine Reavis, Emily Silivia, Pamela Sturgis, Sydaya Tompkins, and Avery Trim, for their assistance as survey facilitators and interviewers. We are grateful for the support of the Rhode Island Department of Health in creating this manuscript.

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# Diabetes and BMI: Health Equity through Early Intervention on Dysglycemia, and How Providers Can Help

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## ABSTRACT

Like most states in the U.S., Rhode Island's rate of type 2 Diabetes Mellitus (DM) is rising as its population has both aged and become heavier. Risk of both BMI $\geq$ 30 and DM has risen across almost all demographics, but disparities continue to exist in both conditions. We analyzed state health survey data to assess race/ethnicity-stratified DM and BMI and the age-adjusted rate of DM by weight status relative to the late 1990s. The prevalence of obesity increased across almost all demographic groups relative to 15 years ago, but the rise was greatest among non-Hispanic whites. The age-adjusted rate of DM had a similar increase across racial/ethnic categories where BMI $\geq$ 30, but black adults were still at higher risk of DM even at a BMI $<$ 30. In sum, non-Hispanic whites and Hispanics are "catching up" to blacks' historically higher prevalence of obesity and DM, but disparities remain in both conditions. We describe two ways providers can collaborate with the Department of Health to address these growing health problems.

**KEYWORDS:** Diabetes Mellitus, BMI, obesity, disparities, Rhode Island

## INTRODUCTION

Obesity and type 2 diabetes mellitus (T2DM) have become high-priority health concerns of both the Centers for Disease Control and Prevention (CDC) and World Health Organization (WHO). In the U.S., there is now regular talk of an "epidemic" of obesity, and the CDC projects a similar tripling of T2DM by 2050 if current trends continue.<sup>1</sup> Additionally, an estimated 37% of American adults have dysglycemia below the threshold indicating full-fledged T2DM, putting them at high risk of advancing to T2DM. In 2015, the Rhode Island Department of Health (RIDOH) made reducing health disparities one of its leading priorities. Like most states in the U.S., Rhode Island's rate of T2DM is rising as its population has both aged and increased its average BMI in the past generation, and RIDOH has struggled to navigate between interventions that are population-wide and those attempting to reduce racial/ethnic and economic disparities. We compare state disparities in T2DM and obesity status relative to 15 years ago, and suggest ways that healthcare providers can

collaborate with RIDOH to address both obesity and T2DM by intervening at earlier dysglycemia.

A recent "health at every size" paradigm argues that obesity does not necessarily increase risk of morbidity or mortality, and that calls to address the obesity epidemic are grounded more in moral panic than a real public health problem.<sup>2,3</sup> Despite valid concerns regarding the social stigmatization of fat and the vested interests of weight loss industries, this view rests on a "myth of healthy obesity."<sup>4</sup> A percentage of people with BMI $\geq$ 30 do manifest no organ dysfunction or other health problems,<sup>5</sup> but Kramer *et al.*'s recent systematic review confirms that obesity is indeed accompanied by increased risk of cardiovascular events and all-risk mortality at 10 years, regardless of metabolic health, and proposes a model in which excess weight is initially associated with subclinical metabolic/vascular dysfunction.<sup>6</sup>

The specific causal pathways between high BMI and T2DM can be complex and complicated by other medical issues that may underlie both conditions (e.g. use of antipsychotics or antidepressants). Coleman *et al.* speculate that the elevated risk of T2DM among lean clients in a low-income diabetes care clinic might reflect beta cell failure resulting from early poor nutrition,<sup>7</sup> and O'Brien *et al.* found dysglycemia developing at lower body weights and younger ages among people of color,<sup>8</sup> opening the possibility that chronic stress or disadvantage may play a role in T2DM similar to effects found on the allostatic load. Despite variability in the weight-T2DM relationship, there is now substantial evidence that even moderate weight loss slows or even prevents the development of T2DM.<sup>9-12</sup>

## METHODS

RI conducts the Behavioral Risk Factor Surveillance System (BRFSS) annually via random-digit dialing of both landlines and (since 2011) cellphones. In light of the state's relatively small black and Hispanic sample sizes, we pooled 2011-14 data to assess differences across groups with more confidence. The primary independent variable was self-reported race/ethnicity, categorized as non-Hispanic black, Hispanic, and non-Hispanic white. Due to small sample sizes, people who reported any other racial identity were excluded from analysis. The two dependent variables were BMI and T2DM. Weight status was calculated from self-reported height and weight as lean (BMI $\geq$ 18.5 and  $<$ 25); overweight (BMI $\geq$ 25

and <30); class 1 obesity (BMI=30 and <35); and class 2 or severe obesity (BMI≥35). T2DM was determined by whether the survey respondent reported ever being diagnosed by a healthcare provider; since risk increases steadily with age, we calculate both prevalence and age-adjusted rate using the National Center for Health Statistics' adjustment weights for the following age groups: 18–44; 45–64; 65–74; 75 and older.<sup>13</sup>

We conducted bivariate analyses to construct a demographic profile of the 4 weight categories and calculated T2DM prevalence by obesity status. We then pooled BRFSS data from 1997–2000 to create a 15-year comparison cohort. Because of a methodological change in 2011 to adjust for conversion from landline to cellphone use, strictly speaking, statistical tests should not be used to compare differences between the two cohorts; however, we tested for the cohort effect itself in multivariate logistic regressions to assess increased risk of class 1 and class 2 obesity and T2DM from 1997–2000 to 2011–14. All analyses were done with SAS 9.4 using survey weights provided by the CDC to accommodate BRFSS's complex sampling design.

## RESULTS

Black, Hispanic, and white adults had similar rates of overweight and class 2 obesity, though blacks had a higher prevalence of class 1 obesity (**Table 1**). The prevalence of diabetes was also similar across race/ethnicity, for both BMI<30 and BMI≥30 (**Table 2**). Age-adjusted diabetes rates appeared to have risen since the late 1990s among whites and Hispanics, while remaining unchanged among blacks (**Table 3**). When stratified by obesity status, the 15-year difference was slightly higher among non-obese blacks and Hispanics compared to whites, but measurably higher among obese

**Table 1.** Distribution of weight categories, Rhode Island adults 2011–2014.

Variable	Category	BMI 18.5–24.99 (lean)	BMI 25–29.99 (overweight)	BMI 30–34.99 (class 1 obesity)	BMI≥35 (class 2 obesity)
Race/ethnicity	black (non-Hispanic)	33.7	33.7	20.3	11.6
	Hispanic	33.5	37.8	17.5	10.0
	white (non-Hispanic)	35.7	36.8	16.8	9.3
	p-value	<i>p</i> =.324	<i>p</i> =.524	<b><i>p</i>=.032</b>	<i>p</i> =.227
Age	18-44	41.4	32.5	15.1	9.1
	45-64	29.3	39.8	19.1	10.7
	65-74	27.0	41.8	19.5	10.7
	75+	38.6	40.3	14.2	4.9
	p-value	<b><i>p</i>&lt;.0001</b>	<b><i>p</i>&lt;.0001</b>	<b><i>p</i>&lt;.0001</b>	<b><i>p</i>&lt;.0001</b>
Sex	female	42.8	30.5	14.8	9.9
	male	27.9	43.3	19.0	8.9
	p-value	<b><i>p</i>&lt;.0001</b>	<b><i>p</i>&lt;.0001</b>	<b><i>p</i>&lt;.0001</b>	<i>p</i> =.056
Highest level of education	no high school degree	34.0	34.8	17.9	11.8
	high school graduate/GED	32.2	37.2	18.4	10.5
	any college	37.4	37.2	15.9	8.2
	p-value	<b><i>p</i>&lt;.0001</b>	<i>p</i> =.219	<b><i>p</i>=.006</b>	<b><i>p</i>&lt;.0001</b>
Ever diagnosed with diabetes	no	37.5	37.2	15.8	8.0
	yes	14.7	33.7	27.6	23.5

Data source: RI Behavioral Risk Factor Surveillance System. Boldface indicates statistical significance at *p*<.05

**Table 2.** Type 2 diabetes prevalence by weight category, Rhode Island adults 2011–2014.

Variable	Category	Total population	BMI >18.5 & <30	BMI≥30
State average		9.3 (8.9-9.7)	6.2 (5.7-6.6)	17.9 (16.7-19.1)
Race/ethnicity	black (non-Hispanic)	10.6 (8.1-13.1)	7.2 (4.9-9.6)	17.6 (11.9-23.4)
	Hispanic	9.0 (7.4-10.6)	6.3 (4.7-7.8)	16.1 (12.2-20.0)
	white (non-Hispanic)	9.2 (8.7-9.7)	6.0 (5.5-6.4)	18.2 (16.9-19.5)
Age	18-44	2.8 (2.3-3.4)	1.3 (0.9-1.6)	7.6 (5.9-9.4)
	45-64	11.5 (10.7-12.3)	7.2 (6.4-8.0)	21.4 (19.5-23.2)
	65-74	21.1 (19.5-22.6)	15.2 (13.5-16.9)	34.6 (31.3-37.8)
	75+	18.1 (16.4-19.8)	15.1 (13.3-16.9)	30.5 (25.9-35.1)
Sex	female	8.7 (8.1-9.3)	5.6 (5.1-6.2)	17.7 (16.1-19.3)
	male	9.9 (9.2-10.6)	6.7 (6.0-7.4)	18.1 (16.4-19.8)
Highest level of education	no high school degree	13.6 (11.9-15.3)	9.9 (8.2-11.7)	22.1 (18.4-25.8)
	high school graduate/GED	10.3 (9.4-11.2)	6.5 (5.7-7.3)	19.5 (17.2-21.7)
	any college	7.6 (7.1-8.1)	5.1 (4.6-5.6)	15.5 (14.1-16.9)

Data source: RI Behavioral Risk Factor Surveillance System

**Table 3.** Age-adjusted T2DM, Rhode Island adults 1997–2000 and 2011–2014.

Race/Ethnicity	Total population			BMI>=18.5 & <30			BMI >=30		
	1997-2000	2011-14	RD*	1997-2000	2011-14	RD*	1997-2000	2011-14	RD*
Black	11.5 (7.4-15.5)	11.9 (9.3-14.4)	0.4	6.9 (3.1-10.8)	9.1 (6.3-11.9)	2.2	17.3 (9.1-25.4)	16.6 (11.1-22.0)	-0.7
Hispanic	8.5 (5.6-11.5)	13.7 (11.7-15.6)	5.1	5.8 (2.7-8.8)	10.2 (8.0-12.5)	4.4	18.5 (10.7-26.3)	20.0 (15.7-24.3)	1.5
White	4.9 (4.5-5.3)	7.7 (7.3-8.2)	2.8	3.8 (3.4-4.3)	4.8 (4.4-5.2)	1	9.8 (8.3-11.3)	15.5 (14.2-16.8)	5.7

\*Risk difference between cohorts Data source: RI Behavioral Risk Factor Surveillance System

whites (risk difference 5.7) compared to obese blacks and Hispanics (RD -0.7 and 1.5 respectively; Table 3). Adjusted odds ratios for obesity, severe obesity, and T2DM were all higher for white adults relative to 15 years earlier (AORs ranging from 1.54-2.80; Table 4); they trended similarly for black adults but did not reach statistical significance, while the AOR for Hispanics was statistically significant only for obesity (AOR 2.05 [95% CI 1.17-3.58]).

## DISCUSSION

Black adults in RI have historically been at especially high risk for unhealthy weight and T2DM, but since the late 1990s white adults have been closing that gap. Their odds of class 2 obesity nearly tripled, and obesity is where black, white, and Hispanic adults are reaching parity in age-adjusted T2DM. We note that black and Hispanic adults are still at higher risk for T2DM at BMI below 30, compared to whites, in addition to being diagnosed at an earlier age (data available on request). These changing patterns reinforce the need for attention to multiple social and demographic factors in confronting these twin emerging epidemics.<sup>14,15</sup>

Substantial evidence now exists that lifestyle change resulting in moderate weight loss in early dysglycemia can reduce T2DM incidence. More specifically, the CDC's Diabetes Prevention Programs (DPPs) are even more effective than metformin in preventing T2DM—e.g. reducing incidence by 58% versus 31% in the first 3 years alone—among people with prediabetes or otherwise at high risk for T2DM.<sup>5,9,11,12</sup> With support from the CDC, RIDOH is building up free DPP offerings across the state, especially in designated Health Equity Zones (the YMCA also hosts DPPs). There are two ways in which providers have a critical role in increasing participation:

### Screen patients for prediabetes.

Most providers using EHRs have experienced “flag fatigue” and may balk at one more trigger to check for a low-priority condition like early dysglycemia. However, patients are most likely to participate in a DPP when they are initially diagnosed with prediabetes.<sup>16</sup>

**Table 4.** Adjusted odds of obesity and diabetes among Rhode Island adults in 2011–2014 relative to 1997–2000, by race/ethnicity.

	White (non-Hispanic)	Black (non-Hispanic)	Hispanic
	AOR (95% CI)*		
BMI 30-34.99	<b>1.55 (1.35-1.78)</b>	1.34 (0.75-2.41)	<b>2.05 (1.17-3.58)</b>
BMI>=35	<b>2.80 (2.29-3.42)</b>	1.28 (0.54-3.02)	0.93 (0.45-1.92)
<b>Type 2 diabetes</b>			
Total population	<b>2.04 (1.70-2.46)</b>	1.66 (0.71-3.87)	1.41 (0.66-3.00)
BMI<30	<b>1.54 (1.22-1.94)</b>	1.53 (0.36-6.62)	1.28 (0.44-3.70)
BMI>=30	<b>2.20 (1.55-3.11)</b>	1.66 (0.58-4.75)	1.00 (0.37-2.72)

\*Adjusted for age, sex, education, and income. Boldface indicates statistical significance.

Data source: RI Behavioral Risk Factor Surveillance System

### Refer patients to DPP programs and actively encourage them to complete the program.

RIDOH has set up a Community Health Network (CHN), through which providers can request patients be enrolled in a DPP. (Contact DOH.community@health.ri.gov for more information.)

To counter the escalation of diabetes most effectively, providers and the public health sector will also need to recognize that the convergence of rates among black, Hispanic, and white adults does not necessarily mean equity and a one-size-fits-all approach. Rather, the increasingly similar numbers can still mask very different social and cultural circumstances and health needs. For instance, there is evidence that the 2015 U.S. Preventive Services Task Force (USPSTF) guidelines for screening for abnormal blood glucose leave out a large number of cases among black and Hispanic adults at risk at younger ages and lower BMI (8); since USPSTF guideline grades are the basis for whether screens are exempt from cost-sharing under the ACA, state stakeholders may need to assess whether strict adherence to the guidelines will fail to ensure adequate screening for patients of color and lower-income patients, and if so, what solutions might be worked out with legislators or third-party payors. The escalation of obesity and diabetes among whites and across all levels of education might suggest that traditional social advantages of race and socioeconomic status no longer offer the same extent of protective effect they used to<sup>17,18</sup> but providers still need to be attentive to how meaningfully they implement CLAS (culturally and linguistically sensitive) standards

when addressing unhealthy weight and dysglycemia for patients to respond well.

Perhaps most importantly, healthcare providers can leverage their considerable professional authority in support of state and local policies that facilitate healthy choices. We have reached a social and political situation in which it requires both cognitive effort and socioeconomic resources to maintain basic health behaviors.<sup>18,19</sup> Leaving the dual problems of unhealthy weight and T2DM to the weight loss industry and promises of pharmaceutical fixes is not a viable solution. Healthcare providers, patients, their families, and the public health sector all need to commit a sustained effort to reducing these two emerging epidemics. Behavioral changes related to correcting energy imbalances are not easy, and may require not only multiple partners but multiple efforts—just as smoking cessation and addiction recovery often require repeated attempts. Even so, healthcare providers have much to gain by investing the minimal time in encouraging such efforts.

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# 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 health 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).<sup>1</sup> 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<sup>2</sup> 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.<sup>3</sup>

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.<sup>4</sup> 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

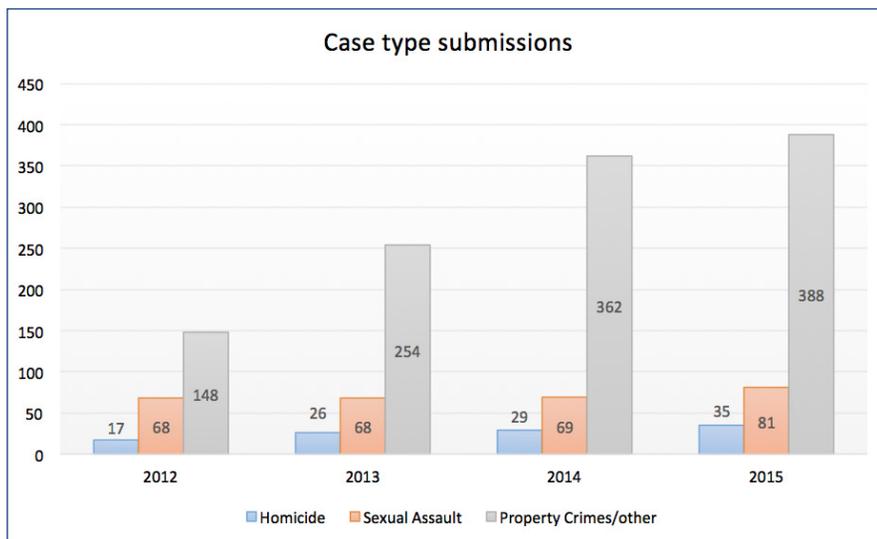
samples), missing persons, and relatives of missing persons on a weekly basis. As of July 2016, the National DNA Index (NDIS) contained over 12,471,006 offender profiles, 2,429,723 arrestee profiles, and 720,873 forensic (casework) profiles. Ultimately, the success of the CODIS program is measured by 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.<sup>5</sup>

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.

## 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.<sup>6</sup>

**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.



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