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Foreword

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Reducing health disparities is a major goal of public health. Despite the persistence of disparities, progress is being made. Since 2011, *CDC Health Disparities and Inequalities Reports (1,2)* and the inaugural *Strategies for Reducing Health Disparities* report (3) have highlighted effective public health programs that have demonstrably reduced disparities. The reports in this supplement add to this record of progress.

There are six key components to effective public health program implementation: innovation, a technical package of evidence-based interventions, performance management, partnerships, effective communication, and political commitment (4). Among these, performance management, the real-time monitoring and evaluation of programs to ensure continuous program improvement, is particularly important to reduce disparities.

Public health programs can be particularly difficult to manage because of the inability to track program performance in real time. Moreover, results might not be apparent for months or even years. As a result, all programs must include sustainable monitoring systems that provide simple, accurate information on progress in program implementation and long-term impact. Even the best-designed programs might fail without timely, honest evaluation.

The reports in this Supplement detail various CDC or CDC-funded programs that incorporate effective performance management. For example:

- Over a decade, the Advisory Committee on Immunization Practices made incremental changes to hepatitis A (HepA) vaccination recommendations intended to increase coverage for children and persons at high risk for HepA infection. CDC analysis of data sets established that the recommended vaccinations eliminated most disparities in HepA disease by age, racial and ethnic group, and geographic area. The analysis also documented an increased proportion of HepA among an emerging population of susceptible adults, underscoring the importance of improving programs and avoiding complacency (5).
- After conducting a needs assessment over two years, Boston Children's Hospital and CDC researchers developed a program at Harvard Medical School to address disparities in pediatric asthma mortality. Targeting primarily black and Hispanic low-income neighborhoods served by Boston Children's Hospital, the program offered families advanced asthma care, including care coordination, case management,

and home visits. Evaluation compared program enrollees with children with asthma living in demographically similar areas. The program significantly improved asthma outcomes over a three-year period and has been adapted and replicated in other cities and states (6).

- Racial and ethnic minority groups, persons without health insurance, and households with low educational attainment and income have lower rates of colorectal cancer (CRC) screening. Since 2009, CDC's Colorectal Cancer Control Program has worked with states and tribal organizations to create and implement programs to increase CRC screening. Evaluation of two programs, one by the Alaska Native Tribal Health Consortium and another by Washington State's Breast, Cervical and Colon Health program, indicated that they increased CRC screening in underserved populations each year to levels similar to statewide rates in which patient navigators coordinate CRC screening services and perform community outreach. Previous studies validated the efficacy of patient-navigator services in increasing medical screening rates (7,8).

These and other reports in this supplement demonstrate that public health disparities can be overcome by innovative, well-designed, and consistently evaluated programs that build viable and sustainable long-term partnerships and inspire political commitment through effective implementation and communication.

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Background and Rationale

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In 2011, CDC published the first *CDC Health Disparities and Inequalities Report* (CHDIR) (1). This report examined health disparities in the United States associated with various characteristics, including race/ethnicity, sex, income, education, disability status, and geography. Health disparities were defined as “differences in health outcomes and their determinants between segments of the population, as defined by social, demographic, environmental, and geographic attributes” (1). Among other recommendations, the 2011 CHDIR emphasized the need to address health disparities with a dual intervention strategy focused on populations at greatest need and on improving the health of the U.S. population by making interventions available to everyone. The 2013 CHDIR updated the 2011 CHDIR and included additional reports on social and environmental determinants of health; the supplement emphasized the importance of multisectoral collaboration, highlighting the need for a comprehensive, community-driven approach to reducing health disparities in the United States (2). A follow-up report described five interventions that were shown to be effective or demonstrated promise for reducing health disparities (3). These publications have focused attention on the need to address health disparities in the United States (4), as well as on programs and interventions that address them. This supplement describes additional interventions that address particular disparities observed by race and ethnicity, socioeconomic status, geographic location, disability, and/or sexual orientation across a range of conditions, including asthma, infection with HIV and hepatitis A, use of colorectal cancer screening, youth violence, food security, and health-related quality of life.

One of the four overarching goals of *Healthy People 2020*, the initiative that establishes the nation’s health objectives, is achieving health equity, eliminating disparities, and improving the health of all U.S. population groups (5). Achieving the aim of eliminating health disparities depends on the availability of data for understanding the distribution of health outcomes and social and other determinants of health across population groups, and for determining whether progress in eliminating disparity is being made; these data are necessary to inform intervention efforts. Another goal of *Healthy People 2020* is to create social and physical environments that promote good

health for all persons (5). Both this goal and that of achieving health equity, eliminating disparities, and improving the health of all population groups relate to the social determinants of health (i.e., the conditions in the environments in which persons are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks) (6). Achieving the goals of *Healthy People 2020* requires addressing the social determinants of health and reducing health disparities and health inequities (i.e., health disparities that are systematic, avoidable, and unfair) (7,8).

Several challenges to advancing health equity exist. One such challenge is that health disparities and inequities typically are not specified as outcomes of interest in intervention research studies, which makes it difficult to understand whether equity has been advanced. Another challenge is that when disparities decrease or the health or risks of affected populations improve, determining which factors and strategies contributed to the improvement can be difficult.

This supplement includes CDC-sponsored interventions selected by CDC’s Office of Minority Health and Health Equity (OMHHE). Seven of the eight reports describe interventions that have demonstrated effectiveness or showed promise for decreasing health disparities and had sufficient data collected to enable evaluation.

The first report describes important community-driven and participatory approaches and reflects efforts of tribal communities to connect efforts to reclaim their lands, foods, language, and culture to improving the health of their people (9). Although sufficient evaluation data for demonstrating effectiveness or promise cannot be presented at this time, the report was included because it describes culturally relevant approaches to reducing health disparities. The second report describes Boston Children’s Hospital’s Community Asthma Initiative, which demonstrated that community health workers can be effective agents of change in communities (10). The third report describes the use of evidence-based interventions to improve levels of screening for colorectal cancer in two states, in Alaska (among Alaska Natives) and in Washington (among racial and ethnic minority and low-income populations). In this report, the use of established evidence-based interventions helped in the attribution of observed outcomes or effects

(thus addressing one of the challenges mentioned above) (11). The fourth report documents the reduction of disparities in hepatitis A virus (HAV) infection following incremental changes in hepatitis A vaccination recommendations to increase coverage for children and persons at high risk for HAV infection; description of health disparities as program outcomes is an important strength of this report (12). The fifth and sixth reports outline how the Personalized Cognitive Counseling (PCC) HIV prevention intervention and Project ECHO and the HoMBReS and HoMBReS por un Cambio interventions have been demonstrated to reduce HIV- and STD-related risk behaviors among Hispanic or Latino men and men who have sex with men, respectively (13,14). Similar to the Boston Children's Hospital's Community Asthma Initiative, which involved community health workers, the HoMBReS and HoMBReS por un Cambio report points to the important role of lay health advisors in addressing health disparities. Involving lay health advisors and community health workers can help ensure the cultural and linguistic appropriateness of interventions, which is critical for their success (15). The seventh report demonstrates how the social determinants of health can be addressed effectively by community-level strategies; the report describes three community-level interventions that were linked to reductions in youth violence, presumably by influencing social determinants (16). The eighth report describes an intervention that addresses disparities in health-related quality of life (17) that were shown in the 2013 CHDIR to affect persons who experience disabilities (18).

The reports in this *MMWR* supplement address important challenges to the health of the U.S. population. It is only through implementing evidence-based interventions and supporting ongoing efforts that *Healthy People 2020* goals can be achieved.

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Health Promotion and Diabetes Prevention in American Indian and Alaska Native Communities — Traditional Foods Project, 2008–2014

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Summary

Type 2 diabetes was probably uncommon in American Indian and Alaska Native (AI/AN) populations before the 1940s. During 2010–2012, AI/AN adults were approximately 2.1 times as likely to have diabetes diagnosed as non-Hispanic white adults. Although type 2 diabetes in youth is still uncommon, AI/AN youth (aged 15–19 years) experienced a 68% increase in diagnosed diabetes from 1994 to 2004. Health disparities are related to biological, environmental, sociological, and historical factors. This report highlights observations from the Traditional Foods Project (2008–2014) that illustrate tribally driven solutions, built on traditional ecological knowledge, to reclaim food systems for health promotion and prevention of chronic illnesses, including diabetes.

Introduction

Before the 1940s, diabetes was probably uncommon among American Indians/Alaska Natives (AI/AN) (1). In 1940, only 21 cases of diabetes were identified among the Akimel O’odham people (Pima) living in the Sonoran Desert on the Gila River (2). In 2006, 38% of Akimel O’odham adults aged ≥ 20 years had type 2 diabetes (3). In 2001, one in 359 Navajo youth aged 15–19 years had diabetes and one in 2,542 developed diabetes annually (4).

During 2010–2012, AI/AN adults aged ≥ 20 years were 2.1 times as likely to have diabetes diagnosed compared with non-Hispanic white adults (15.9% versus 7.6% respectively) (5). The age-adjusted rate of diagnosed diabetes among AI/AN adults varied by region from 6.0% among Alaska Natives to 24.1% among American Indians in southern Arizona (5). From 1994 to 2004, diagnosed diabetes rates increased 68% among AI/AN youth aged 15–19 (6) and 100% from 1994 to 2007 among AI/AN young adults aged 18–34 (7). Young persons who develop type 2 diabetes are at risk for diabetes-related complications, including end-stage renal disease (ESRD), while they are young adults (8). During 2013–2014, approximately 17.5% of youth aged 2–19 years were obese, a risk factor for type 2 diabetes, which has remained about the same since 2003–2004 (9). In 2009, 20.7% of AI/AN children aged 2–4 years were obese (10).

CDC’s Office of Minority Health and Health Equity selected the Traditional Foods Project’s thematic analysis and discussion to provide an example of a program that builds awareness of health disparities and tribally driven solutions to address health promotion and diabetes prevention by reclaiming their

traditional food systems and related physical activity and social support. Criteria for selecting this project are described in the Background and Rationale for this supplement (11).

Diabetes and Social Determinants of Health

Biologic explanations for disproportionate burdens of chronic illness, though strong and predictive, tend to focus on the behaviors of individuals rather than the risk-laden social conditions (e.g., income distributions and violation of human rights) that contributed to their development in the first place (12,13). For diseases such as diabetes, attention to the social history is as important as learning the natural history (14). Physiologic stress responses have been associated with historical trauma (i.e., cumulative emotional and psychological wounding across generations, including the lifespan, which emanates from massive group trauma) (15) and adverse childhood experiences (ACE) (e.g., abuse and neglect, and serious household dysfunction, and premature death of a family member) (16). The ACE Study, a collaboration between CDC and Kaiser Permanente’s Health Appraisal Clinic in San Diego, is one of the largest investigations ever conducted to assess associations between childhood maltreatment and later-life health and well-being (16), including obesity (17–19) and chronic disease (20). Research has identified links between physiologic stress responses in childhood and neurologic changes to the brain that can affect the complex web of causation for chronic diseases and other threats (21–23).

Social determinants of health (SDOH) are defined as the conditions in which persons are born, grow, live, work, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes (24). SDOH include social, economic, and physical environments as “place,” conditions that include economic stability, education, access to healthy foods, health care, patterns of social engagement, and sense of security and of well-being (24).

In 2010, an estimated 23% of Native American families earned incomes below the poverty line (25), a SDOH linked to “place” (24). Food insecurity, defined as uncertain or limited access to enough foods for an active healthy life because of a lack of money or resources, affected 28% of Native households with children in 2008, compared with 16% of U.S. households with children (26). Researchers have linked food insecurity to obesity in households with children (27), diabetes in adults (28), and poor glucose control for adults who have diabetes (29,30). Food insecurity is found on many reservations where food deserts (i.e., rural, low-income residents must travel more than 10 miles to access supermarkets or grocery stores) are prevalent (31–33). On a reservation in the Great Plains, 40% of families with children were food insecure. Much of the food available in homes was purchased at convenience stores on or near the reservation (33).

A first step in creating systemic, long-term changes to redress imbalances and promote health in AI/AN communities is to build awareness of the complexities regarding the historic and contemporary context of policy, poverty, historical trauma, and food systems related to health disparities, including diabetes disparities (34). Innovative models will likely be informed by traditional ecological knowledge, a natural science grounded in lifetimes of observation, experimentation, and adaptation (35).

The Land — Place — as a Social Determinant of Health and of Tribally Governed Solutions

Disruption of indigenous persons’ relationships with their homelands, including land, language, culture, and religious beliefs, has been suggested to be “at the root of health disparities” (36). Certain public health leaders have noted that this connection to health disparities, including the diabetes epidemic in Native populations, has received little attention (37,38). Indigenous persons had traditionally gathered and cultivated plants and hunted and fished on their lands (39). Even with the restricted access to their fertile lands through policy changes, including the reservation era, many tribes maintained a high-fiber diet based on traditional foods that fueled a physically active life (39,40). However, industrial

developments beginning in the mid-1900s on some tribal lands have further limited tribes’ ability to harvest their traditional foods and curtailed the associated physical activity (39).

For centuries, the Pima-Maricopa and Akimel O’odham people had channeled the waters of the Gila and Salt Rivers in the Sonoran Desert in Arizona through irrigation systems that secured their foods (e.g., drought-hardy tepary beans and prickly pear cactus). By the 1950s, the rivers had been diverted for ranches and construction of the Coolidge Dam, and the land became unsuitable for farming (41). By 2006, 38% of adults aged ≥ 20 years had type 2 diabetes, a rate 5.5 times that of tribal people of the same heritage in Mexico (6.9%), who continued to farm and consume food cultivated for generations (3). Currently, O’odham people living in Arizona who consume a traditional diet are less likely to develop type 2 diabetes than their peers who eat a modern-day diet (42).

In the 1940s and 1950s, the bottomlands of the Missouri River on the Fort Berthold Reservation, home of the Three Affiliated Tribes (Mandan, Hidatsa, and Arikara) and seven other Native communities, were flooded to accommodate the waters of the Garrison Dam (43–46). Approximately one fourth of the population of the Standing Rock Tribe had to evacuate their homes before the flood of approximately 160,000 acres (44). Many local foods, (e.g., wild turnips, berries, beans, wildlife, and medicinal plants) were lost as the bottomlands were flooded (43–45). By 2000, the prevalence of diagnosed diabetes in the area was approximately three times the rate for non-Hispanic whites (47).

Values, including stewardship of natural resources of land and water, are reflected in tribes’ unique stories about their food systems (45,46). The importance of flowing water is a common teaching; “Water is life,” is often said in Native languages (48). In recent decades, many tribal nations are reclaiming the water and foods specific to their landscape, history, and culture (34,46,48). Tribal nations are part of a global food sovereignty movement that maintains the rights of all persons to define their own policies and strategies for sustainable food and agriculture systems. La Via Campesina, the International Indian Treaty Rights Council, and allies catalyzed the movement in the 1990s, presenting a declaration to the United Nations, which also stated that food sovereignty is a necessary condition to assure food security (49–51).

History of the Traditional Foods Project

In response to the epidemic of diabetes among Native persons, in 1997, Congress passed the Balanced Budget Amendment (Law 105–33) establishing the Special Diabetes Program for

Indians (SDPI) (52), administered by IHS and guided by their Tribal Leaders Diabetes Committee (TLDC). During 1999–2000, approximately 400 tribal members representing 171 tribal nations helped inform planning. Their suggestions included creating stories for children about preventing diabetes, since there were few stories because diabetes had been largely unknown until recent decades, and incorporating traditional knowledge and culture alongside Western medicine (48).

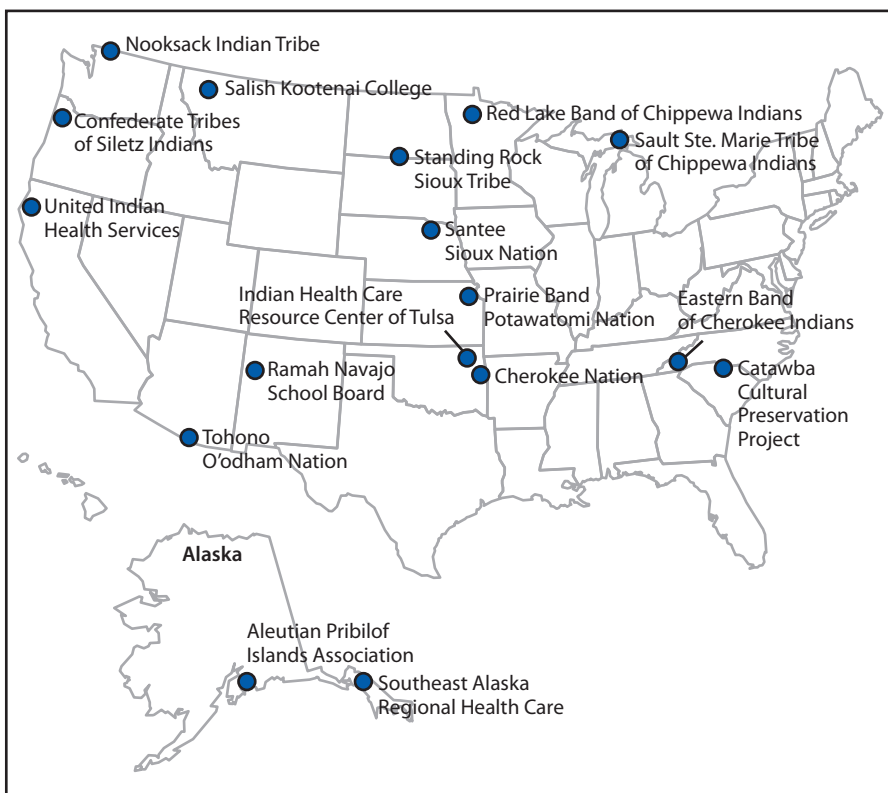
Reports document encouraging health trends since SDPI was established in 1998, including sustained improvements in glucose and blood pressure control and reduced incidence of ESRD (53–55). From 2001 to 2013, ESRD prevalence among AI/ANs declined 29%, the only instance of a significant decline in prevalence for a major racial group since ESRD care was implemented in 1973 (55).

CDC's National Diabetes Prevention Center, established in 1998 in part to complement the work of SDPI, was reorganized and named the Native Diabetes Wellness Program (NDWP) in 2004. Principles of practice were integral to program operations (48), including concepts of cultural humility (56) and tribally driven, community-based participatory approaches (57–59). In 2006, NDWP, in collaboration with IHS and TLDC, introduced the *Eagle Books* series for young children. The stories highlight the wisdom of traditional ways of health (e.g., harvesting healthy foods, physical activity, gratitude, generosity, stewardship, and courage) through the voices of animals (e.g., a wise eagle, garden-loving rabbit, and clever coyote) engaged in dialogue with eager-to-learn children (48,60). The early grades (K-4) of the Diabetes Education in Tribal Schools (DETS) K-12 curriculum, *Health is Life in Balance*, led by the National Institutes of Health, CDC, IHS, and eight Tribal colleges and universities, features the *Eagle Books* stories. The DETS curriculum embeds the “5 E’s” of educational instruction (i.e., engagement, exploration, explanation, elaboration, and evaluation) (61,62).

In 2008, CDC announced a 5-year funding opportunity entitled *Using Traditional Foods and Sustainable Ecological Approaches to Promote Health and Help Prevent Diabetes in American Indian and Alaska Native Communities* (i.e., Traditional Foods Project) informed by tribal leaders and earlier programming about the resonance of increasing traditional foods access with health promotion efforts (63). The project proposed

to 1) support sustainable and evaluable ecologic approaches to reclaim traditional foods and physical activity; 2) encourage local practices that increase access to local foods and physical activity; 3) revive and create stories of healthy traditional ways to be remembered, retold, and talked about in homes, schools, and communities; and 4) engage community members to track success, participate in health promotion activities, explore diabetes in context with community history, and share stories of hope (e.g., radio, print, social media, and digital stories). Supported by funding from IHS following approval by TLDC and operations support from CDC, NDWP launched the Traditional Foods Project with 11 cooperative agreements with diverse tribal communities in September 2008. Additional funding was allocated by CDC in 2009, enabling the addition of more partners (Figure). Traditional Foods Project partners each received \$100,000 per year to implement their local programs. In 2012 and 2013, Traditional Foods Project partners and NDWP staff were invited to present to the CDC Tribal Advisory Committee, which recommended continuing the Traditional Foods Project for a year beyond the 5-year cycle. Partners applied for a sixth year of funding for 2014 by demonstrating their evaluation results and plans to sustain their native food systems.

FIGURE. Location of Traditional Foods Project partners



Methods

NDWP collaborated with Traditional Foods Project partners to evaluate the process (“how do we do this work effectively?”), methods (“how do we measure interventions to reclaim food systems in relation to health?”), and environmental outcomes (increased and sustained accessibility of traditional local healthy foods, physical activity and social support in relation to health) of the Traditional Foods Project. Quantitative data included measures of access to traditional foods, physical activity, and social support over time.

Ethnographic and qualitative data from tribal partner presentations, partner collaborations, monthly conference calls, and annual meetings described each programs’ maturation, strategy development, accomplishments, barriers encountered, and adaptations made. Data reported by partners at 6-month intervals through the Traditional Foods Project’s conclusion in September 2014 were gathered using Office of Management and Budget-approved shared data elements, an aggregate data evaluation tool; results are being analyzed by CDC.

Discussion

Early observations gleaned from this multifaceted evaluation and preliminary CDC analysis of the tool are promising. These observations include:

- **Significance of land:** Recognition of the importance of the land holds deep meaning for tribal members. Working with the land, or Mother Earth, is considered an honorable activity (64). This grounding observation was manifested as partners worked to strengthen tribal self-governance to secure land that helped to revive and sustain food systems and preserve subsistence practices and their homelands. Many programs provided workshops on cooking, hunting, gathering, fishing, and preserving foods and environmental stewardship.
- **Interest in Native American food pathways and foodsheds:** Tribal communities are leading a food sovereignty movement in North America to revive the foods specific to the landscape, history, and culture of their people (45). During the 6 years of the Traditional Foods Project (2008–2014), the momentum grew locally and nationally as partners aligned their efforts with the 2008 Farm Bill and created opportunities to operationalize the Agricultural Act of 2014 (65) related to the service of traditional foods in public facilities and the U.S. Department of Agriculture (USDA) Food Distribution Program on Indian Reservations (FDPIR), nutrition education, and physical activity (66). The momentum of the food sovereignty movement continued to grow as

partners shared experiences and stories with other tribal programs. For example, *Qaqamiigux: Traditional Foods and Recipes from the Aleutian and Pribilof Islands* was published in 2014 by the Aleutian Pribilof Islands Association, a Traditional Foods Project partner (67).

- **Respect for traditional knowledge:** Wisdom to adapt to changing conditions, including rebuilding food systems that worked for thousands of years, is inherent in traditional ecologic knowledge. Persons develop traditional knowledge through direct personal experience with the land and its interrelationships. The knowledge is communicated orally and validated by generations who successfully manage “the commons” of shared land, language, foods, and culture (35).
- **Consistency with traditional values:** Messages and approaches grounded in traditional ways of knowing about health are consistent with cultural values. Values are reinforced through storytelling, gratitude for the gifts of the earth, and generosity in sharing harvested foods throughout communities. Stories and practices of gathering, growing, and harvesting with families are often remembered and shared, contributing to the description of persons’ homelands as “resilient places of remembrance” (68).
- **The role of elders as teachers of traditional knowledge fosters intergenerational relationships:** Elders served as advisors to help guide program development. They taught traditional subsistence practices to youth, often naming foods and activities in their tribal language. The engagement of elders and youth strengthened social connections.
- **Traditional foods facilitate dialogue about health.** Partners agreed that traditional foods activities are a way to discuss health in tribal communities. Community members were drawn to messaging and activities that involved growing, harvesting, and preparing foods; sharing stories and traditional ecological knowledge; playing traditional games and dancing; and participating in talking circles. Educational materials that connect harvesting and consuming traditional foods to promoting health were created or adapted, including calendars of seasonal foods, posters, and lesson plans. The medicine wheel nutrition intervention was tailored by several programs to illustrate the story of their food systems (46,69).
- **Emphasis on education:** Sharing traditional foods recipes, cooking and preparing foods, participating in hands-on food demonstrations, and taste tests created learning opportunities in schools and clubs. Children experienced traditional foods as school cafeteria staples and commodity foods available through FDPIR. Some programs educated tribal members and interested allies (e.g., state and local

government officials) about food sovereignty, engaging interested youth in creating digital stories about their work. To gather background to inform interventions, as well as to engage communities, one program developed a family meal survey that informed their food preparation educational sessions and was shared with partners. Several programs used the Food Sovereignty Assessment Tool developed by the First Nations Development Institute (70).

- **Community-driven planning:** Communities determined their needs and approaches with the help of advisory boards, community needs assessments and focus groups, interviews, and surveys among community members.
- **Sustained efforts beyond the project's end:** Programs sustained elements of their work after the cooperative agreement ended in September, 2014. Several programs secured support through their tribal councils to continue positions established by their program; several were awarded grants and contracts from university partnerships, state and county health departments, federal agencies (e.g., USDA and IHS), and nonprofit organizations.

Conclusion

Community collaboration to increase access to traditional foods, physical activity, and social support might have the potential to advance health initiatives across agencies and the country. For example, in 2011, Traditional Foods Project's partners offered insight to the Bureau of Indian Education as they developed their School Health and Wellness Policy supporting the provision for "healthy traditional and cultural foods" (71). Tribal schools also are providing hands-on learning activities about growing healthy foods. Sustainability of these activities is strengthened by local and national efforts, including the Farm to School initiative (72).

Native communities across the country are applying their traditional ecological knowledge, specific to the history and culture of their tribe, to protect their homelands of land, language, culture, memory, and traditional foods practices. Sharing and documenting food sovereignty efforts continues to be a priority. A collection of stories told by tribes about their traditional foods systems is published on the NDWP website (47). Underpinning the stories are long-sighted lessons for sustainability, steeped in cultural significance and emotional attachment (68) and inspired by agency (i.e., capacity of acting or of exerting power), self-determination, and hope, for the health of the people.

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Community Asthma Initiative to Improve Health Outcomes and Reduce Disparities Among Children with Asthma

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Summary

Black and Hispanic children are hospitalized with complications of asthma at much higher rates than white children. The Boston Children's Hospital Community Asthma Initiative (CAI) provides asthma case management and home visits for children from low-income neighborhoods in Boston, Massachusetts, to address racial/ethnic health disparities in pediatric asthma outcomes. CAI objectives were to evaluate 1) case management data by parent/guardian report for health outcomes and 2) hospital administrative data for comparison between intervention and comparison groups. Data from parent/guardian reports indicate that CAI decreased the number of children with any (one or more) asthma-related hospitalizations (decrease of 79% at 12 months) and any asthma-related emergency department visits (decrease of 56% at 12 months) among children served, most of whom were non-Hispanic black or Hispanic. Hospital administrative data also indicate that the number of asthma-related hospitalizations per child significantly decreased among CAI participants compared with a comparison group. The CAI model has been replicated in other cities and states with adaptations to local cultural and systems variations. Health outcome and cost data have been used to contribute to a business case to educate legislators and insurers about outcomes and costs for this enhanced approach to care. Strong partnerships with public health, community, and housing agencies have allowed CAI to leverage its outcomes to expand systemic changes locally and statewide to reduce asthma morbidity.

Introduction

Asthma, one of the most common chronic illnesses in the United States, has reached historically high national prevalence rates (i.e., 9.5% for children aged ≤ 18 years) (1,2). Furthermore, racial/ethnic disparities in asthma prevalence are substantial (1,2). Evidence from national randomized clinical trials (3–6), previous models of culturally sensitive care (6–9), and National Asthma Education and Prevention Program 2007 guidelines (10) indicates that comprehensive community-based approaches are highly effective in reducing environmental allergens, missed school days, and emergency department (ED) visits, as well as increasing symptom-free days. *The Guide to*

Community Preventive Services also recommends home-based education and interventions to reduce home environmental triggers of asthma, as well as asthma education and social supports to improve outcomes for children with asthma (11,12). Quality improvement evaluation approaches have been developed that can monitor multifactorial interventions to improve outcomes such as ED visits and hospitalizations for asthma (13) that are consistent with the national guidelines (10). All levels of the socioecological model, including interventions involving individual persons, communities, and systems (e.g., health care payment reform to allow for sustainable funding for programs such as CAI), are essential for improving health outcomes (14,15).

Asthma can be managed effectively when children and families receive asthma education, understand medications, live in healthy housing, and have a system of coordinated care in place (16,17). Multiple social determinants of health contribute to asthma disparities: low household income; environmental inequities (e.g., outdoor air pollution and substandard housing) and living in poor communities (18,19); exposure to pests, mold, air pollution (including secondhand smoke); and high levels of stress due to community violence (20). Major barriers to health care access in poor communities include lack of adequate health insurance coverage, overwhelmed clinics, shortages of culturally and linguistically competent providers, and low health literacy (21–24).

Asthma was the leading cause of hospitalization at Boston Children's Hospital (referred to as Boston Children's) in Boston, Massachusetts (Boston Children's, unpublished data, 2003), which suggested an important area for pediatric care improvement. The substantial prevalence of pediatric asthma in Boston, Massachusetts, also was reflected in a 2003–2004 surveillance study of asthma prevalence in Massachusetts schools (grades kindergarten through 8), which indicated that the overall asthma prevalence in Boston schools was 16%, with five Boston schools reporting rates of >24% (25). In 2004, rates of asthma-related hospitalizations among children aged <5 years in Boston were almost five times higher for non-Hispanic black children (referred to as black in this report) (14.2 per 1,000 population) and Hispanic children (14.1 per 1,000) compared with non-Hispanic white children (referred to as white in this report) (2.9 per 1,000) (26). Seventy percent of the children hospitalized for asthma at Boston Children's were from five Boston neighborhoods (Boston Children's, unpublished data, 2003) with higher rates of poverty (census block groups with $\geq 20\%$ of the population living below the federal poverty level) and primarily black and Hispanic populations (census blocks groups in which blacks, Hispanics, or both comprise $\geq 50\%$ of the population).

The Community Asthma Initiative (CAI), which is based at Boston Children's, is an enhanced model of care in which nurses and community health workers (CHWs) provide community-based asthma case management and home visits. CAI was developed to decrease asthma morbidity for children aged 2–18 years with poorly controlled asthma. Before the initiation of the CAI program, Boston Children's Office of Community Health had conducted a 2-year community needs assessment using a community participatory approach, which identified asthma as an important area for intervention. CAI initially focused on children living in four ZIP codes of the Roxbury and Jamaica Plain neighborhoods of Boston that had high rates of poverty and asthma and were near Boston Children's and the hospital's community health center (Figure 1) (27,28).

The program was launched in 2005 with philanthropic and community benefits funds. In 2007, CAI received a 5-year grant from CDC's Racial and Ethnic Approaches to Community Health (REACH) program to address asthma health disparities and underlying social determinants of health while continuing to provide comprehensive asthma home visits. This report describes outcomes and evaluations of the CAI program during 2005–2012.

CDC's Office of Minority Health and Health Equity selected the intervention analysis and discussion that follows to provide an example of a program that might be effective in reducing asthma-related disparities in the United States. Criteria for selecting this program are described in the Background and Rationale for this supplement (29).

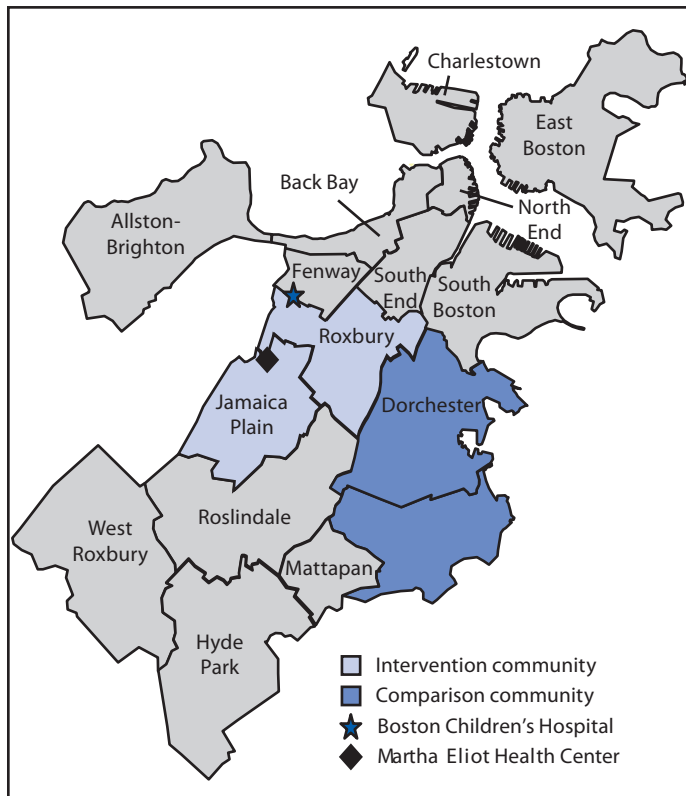
Methods

Intervention Methods

CAI hired bicultural, Spanish-speaking CHWs to provide enhanced asthma care to families through case management and home visiting services. Case management services included working with landlords, property managers, and the public housing authority on housing code violations such as pests and mold; referrals to City of Boston Inspectional Services, legal services, food pantries, and smoking cessation resources; and assessment of eligibility and assistance obtaining benefits and services, such as food stamps, Medicaid, shelter or day care placement, and tutoring. Home visits involved 1) individualized asthma education, care coordination, and connection to primary care, asthma specialists, and community resources; 2) home environmental assessment and remediation with provision of allergen-proof bedding encasements and high-efficiency particulate air (HEPA) filter vacuum cleaners; 3) education regarding use of green cleaning methods, such as use of low volatile organic compound (VOC) products; 4) integrated pest management (IPM) materials and instruction and referrals to Boston Inspectional Services Department as needed to address state sanitary code violations (30); 5) visits by a private IPM company when necessary; and 6) encouragement of smoking cessation among parents and guardians and of smoke-free homes.

The program partnered with local organizations providing care for children, including state and city public health agencies, community health centers, Boston Public Schools, Head Start, after-school programs, the Boys & Girls Clubs of America, and the Greater Boston Young Men's Christian Association (YMCA) to address social determinants of health that affect asthma and to promote system change beyond what can be performed in the individual home. This included

FIGURE 1. Boston, Massachusetts, neighborhoods in the Boston Children's Hospital Community Asthma Initiative, including the pilot intervention communities (Roxbury and Jamaica Plain) and comparison communities (North Dorchester and South Dorchester)



collaboration among local and regional asthma healthy housing and healthy schools coalitions to address indoor air quality in schools and homes (31) and among regional and national agencies to develop a business case and educate legislators and insurers about outcomes and costs for this enhanced approach to care. CAI has active community and family advisory boards, which contributed recommendations that have been incorporated into the program.

Data Collection and Analysis

Longitudinal Evaluation of CAI Participants

Nurses reviewed administrative logs of ED visits and hospitalizations and identified children with asthma-related diagnoses. The enrollment event was defined as an ED visit or hospitalization for an asthma exacerbation as reflected in the primary or secondary diagnosis. Enrollment criteria included the following:

1. Aged 2–18 years
2. From Roxbury or Jamaica Plain during the initial pilot and subsequently Dorchester and then other Boston ZIP codes with high levels of poverty (i.e.,

≥20% of the population below the federal poverty level) (32,33) and high annual rates of asthma hospitalizations during 1999–2003 for children aged <5 years (14.8 per 1,000 population in Roxbury, 9.7 per 1,000 population in Jamaica Plain, 11.4 per 1,000 population in South Dorchester, and 13.7 per 1,000 population in North Dorchester) (26)

3. One or more hospitalizations, ED visits, or courses of oral corticosteroids (referred to as high-risk asthma in this report) in the past 12 months
4. Referral because of poorly controlled asthma as defined by the National Asthma Education and Prevention Program 2007 guidelines (10), which take into account frequency of day and nighttime coughing, wheezing, and shortness of breath and interference with normal activities such as exercise, frequency of use of short-acting bronchodilators, and number of exacerbations requiring oral systemic corticosteroids

Eligible participants were seen face-to-face during hospitalizations or contacted by telephone, and all were offered the full range of CAI services. Intervention participants were enrolled in the program during October 1, 2005–March 31, 2012, which includes the initial pilot in Roxbury and Jamaica Plain and subsequent expansion of the program to other Boston ZIP codes. This is a larger case management sample than analyzed previously (27,28). Nurses, CHWs, or both documented participant adherence to medication and treatment plans, as well as home environmental findings, using an assessment tool adapted from the National Center for Healthy Housing Pediatric Environmental Home Assessment form (34).

Data were collected by parent/guardian report via face-to-face interviews in the hospital or by telephone as part of clinical care (reflecting back 6 months) at three time points: enrollment (i.e., enrollment date, which is referred to as baseline for the case management data in this report), 6 months after enrollment, and 12 months after enrollment. These data included daytime and nighttime asthma symptoms (defined as coughing, wheezing, or shortness of breath in the past 2 weeks), missed school days (defined as school absences due to asthma in the past 6 months), missed parent/guardian workdays (defined as work absences due to the child's asthma in the past 6 months), days of limitation of physical activity (defined as the need to slow down or stop playing due to asthma in the past 2 weeks), and number of ED visits and hospitalizations (defined as those with asthma exacerbation with or without status asthmaticus as the primary or secondary diagnosis). An attrition analysis was performed comparing initial demographic variables at baseline, 6 months, and 12 months.

Number of events (ED visits or hospitalizations) or days (of missed school, of missed parent/guardian workdays, or limitation of physical activity) were treated as dichotomous (zero versus one or more) or continuous variables. The percent decrease was calculated as the baseline value (number of events or days) minus the follow-up value divided by the baseline value. McNemar's test was used for dichotomous variables, and paired t-tests and general linear model repeated measures analysis were used for continuous variables. Results were considered significant at $p < 0.05$. A geographic information system (GIS) analysis of census block distribution of intervention participants examined the relationship between asthma and neighborhood demographics, including federally defined poverty areas, in which $\geq 20\%$ of the population lives below the federal poverty level (32,33), and neighborhoods that are predominantly black, Hispanic, or both. Boston Children's Institutional Review Board approved the evaluation and access to case management data and hospital administrative databases with a waiver of consent for the enhanced clinical care program.

Comparison of CAI Children with Those in Similar Neighborhoods

The first 33 months of CAI (October 1, 2005–June 30, 2008) were a pilot period, with services limited to four ZIP codes representing Jamaica Plain and Roxbury (after which point enrollment was extended to other ZIP codes in Boston). This initial pilot design allowed early CAI intervention participants to be compared with children in four other ZIP codes in the demographically similar Boston neighborhoods of North Dorchester and South Dorchester, where the intervention was not yet taking place (27,28). Both the intervention group and the comparison group included patients at Boston Children's who had previous asthma-related ED visits or hospitalizations, and the hospital administrative database was used to collect information on ED visits and hospitalizations for both these groups based on the enrollment date for CAI participants and an index date within a similar date range for the comparison group. A correlation analysis was performed to compare parent/guardian reports with hospital administrative data in the intervention group.

Paired t-tests were used to compare total asthma encounters 1 year before and 1 year after the enrollment date within the CAI group, and 1 year before and 1 year after an index date within the comparison group (within-group comparisons) to assess changes in ED visits and hospitalization encounters. Because the comparison group did not have an enrollment date, an index date was chosen for them as the first time the child had an ED visit or hospitalization for asthma during October 1, 2005–September 30, 2006 or October 1, 2007–June 30, 2008. The 1-year gap between these periods was chosen so that there

would be no overlap between 1-year back analyses and new participant selection. Unpaired t-tests were used to compare the decrease in ED visits or hospitalizations from 1 year before to 1 year after the enrollment/index visit date between the CAI participants and the comparison group. To address concerns about normality of the data, nonparametric counterpart tests also were performed as appropriate. In addition, to examine the regression to the mean effect, an analysis of covariance (ANCOVA) analysis was performed to control for this effect.

Results

Longitudinal Evaluation of CAI Participants

During October 1, 2005–March 31, 2012, a total of 908 children were enrolled in the CAI program, which is a larger sample than the sample included in previous publications (27,28) (Table 1). Of these, 56% were male, 45% were black, 47% were Hispanic, and 25% spoke only Spanish. The average age was 7.3 years (standard deviation [SD]: 4.4; range: 1–21 years); 72% were Medicaid recipients, and 65% had a household income of $< \$25,000$ (as reported by the parent/guardian). At enrollment, 56% of participants were seen face-to-face during their hospitalization. For the 2005–2012 longitudinal evaluation, the attrition analysis showed no differences in demographic variables for the baseline, 6-month, and 12-month follow-up groups (Table 2).

After enrollment, 76% of participants had at least one home visit, including 689 nurse visits, 305 CHW visits, and 190 combined nurse and CHW visits (Table 3). Home environmental assessments revealed the following risk factors in households on the first visit: 51% had clutter and dust; 41%, volatile organic compounds; 38%, carpeting; 36%, rodents; 26%, pets; 19%, environmental tobacco smoke; 17%, mold; and 12%, cockroaches. IPM services were required for 5% of families because they had extensive infestations.

At 12 months, significant decreases were found in the dichotomous outcomes of participants with any (one or more) asthma-related hospitalizations (79% decrease), ED visits (56% decrease), missed school days (42% decrease), missed parent/guardian workdays (46% decrease), and days of limited physical activity (29% decrease) (Table 4). The continuous variables for the decrease in number of asthma-related events or days for these same health outcomes demonstrate significant improvement at follow-up (Table 5). GIS mapping showed that 66% of families enrolled in CAI lived in a poverty area, and 74% of families lived in areas that were primarily black, Hispanic, or both (Figure 2).

TABLE 1. Number and percentage* of children enrolled in the Boston Children's Community Asthma Initiative, by selected demographic characteristics, asthma severity, and type of enrollment — Boston, Massachusetts, 2005–2012

Characteristic	Baseline (N = 908)
Mean age, yrs	7.3 (SD: 4.4, range: 1–21)
Sex (N = 908), no. (%)	
Male	507 (56)
Female	401 (44)
Insurance (N = 908), no. (%)	
Medicaid/MassHealth	654 (72)
Private	233 (26)
Other	21 (2)
Household income (N = 840), no. (%)	
<\$25,000	544 (65)
\$25,000–\$50,000	196 (23)
>\$50,000	100 (12)
Race/Ethnicity (N = 907), no. (%)	
Hispanic	430 (47)
Black, non-Hispanic	412 (45)
Other	65 (7)
Language (N = 885), no. (%)	
English (monolingual or bilingual)	641 (72)
Spanish (monolingual)	224 (25)
Other	20 (2)
Asthma severity category[†] (N = 871), no. (%)	
Intermittent	99 (11)
Mild persistent	390 (45)
Moderate persistent	308 (35)
Severe persistent	74 (8)
Enrollment (N = 906), no. (%)	
Face-to-face during hospitalization	512 (56)
By telephone	394 (44)

Abbreviation: SD = standard deviation.

* Percentages do not include missing data and might not add to 100% because of rounding.

[†] As defined in the National Heart, Lung, and Blood Institute asthma treatment guidelines (Source: National Heart, Lung, and Blood Institute, National Asthma Education and Prevention Program. Expert Panel Report 3: Guidelines for the diagnosis and management of asthma. Bethesda, MD: National Institutes of Health, National Heart, Lung, and Blood Institute; 2007. <http://www.nhlbi.nih.gov/health-pro/guidelines/current/asthma-guidelines>).

Comparison of CAI Children with Those in Similar Neighborhoods

No significant differences between the intervention and the comparison groups were found in demographic variables (Table 6). In the comparison of CAI intervention participants enrolled during the pilot period with children from similar neighborhoods, the mean number of patient hospitalizations for asthma among CAI participants (N = 268) during the pilot period demonstrated a greater decrease between 1 year before and 1 year after the enrollment date compared with the children in the comparison group (N = 818) (Figure 3). The decrease in mean number of asthma-related hospitalizations per child among CAI participants between 1 year before the intervention and 1 year after the intervention was 0.32 hospitalizations per child ($p < 0.001$), and the decrease in the mean number of

hospitalizations for asthma per child in the comparison group was 0.16 ($p < 0.001$). A significantly greater decrease occurred in mean number of hospitalizations per child for the intervention group compared with the comparison group from 1 year before to 1 year of follow-up (difference = 0.16 hospitalizations per child, $p < 0.001$).

In contrast, the decrease in mean number of asthma-related ED visits per child among CAI participants (0.45 fewer ED visits per child, $p < 0.001$) was similar to the decrease in the comparison group (0.49 fewer ED visits per child, $p < 0.001$), with no significant difference in decrease in ED visits between the two groups (difference = 0.04 ED visits per child, $p = 0.49$) (Figure 3). For the intervention group, the correlation was high between parent/guardian reports in the case management data and Boston Children's administrative data for hospitalizations ($r = 0.90$) and ED visits ($r = 0.85$).

Community Partnerships

Boston Children's has worked with the Asthma Regional Council of New England, which is a program of Health Resources in Action that receives funding from the U.S. Department of Health and Human Services and the U.S. Environmental Protection Agency (EPA), and faculty from the University of Massachusetts Lowell to develop a business model for home visit programs for patients with high-risk asthma. The 2010 version includes CAI outcomes and cost analyses (35). In addition, CAI is a member of the Boston Asthma Home Visit Collaborative, convened by the Boston Public Health Commission, which receives funding from EPA and others to share best practices among public health, hospital, health center, payer, and community-based organizations of a nurse-supervised CHW model of home visits using a standardized, evidence-based protocol. CAI provided outcome and cost data to the Boston Children's Office of Government Relations and community partners to educate decision-makers and make a case for the potential benefits of a bundled payment pilot project for patients with high-risk asthma within the Massachusetts Medicaid program (31,36). Boston Children's was recently designated as one of three sites in Massachusetts approved to participate in this pilot; implementation will begin pending an agreement with The Commonwealth of Massachusetts Executive Office of Health and Human Services.

Limitations

The findings in this report are subject to at least three limitations. First, this evaluation was not a randomized controlled trial, and the contributions of individual components of the program to outcomes were not evaluated.

TABLE 2. Attrition analysis for children enrolled in the Boston Children's Hospital Community Asthma Initiative at baseline and at 6 and 12 months, by selected demographic and insurance characteristics* — Boston, Massachusetts, 2005–2012

Characteristic	Baseline (N = 908 [†])	6 months (N = 466 [†])	12 months (N = 405 [†])	p value
Mean age, yrs	7.3 (SD: 4.4, range: 1–21)	7.5 (SD: 4.3, range: 1–21)	7.5 (SD: 4.3, range: 1–21)	0.54 [§]
Sex, no. (%)				
Male	507 (56)	271 (58)	231 (57)	0.81 [¶]
Female	401 (44)	195 (42)	174 (43)	
Insurance, no. (%)				
Medicaid/MassHealth	654 (72)	349 (76)	308 (77)	0.45 [¶]
Private	233 (26)	112 (24)	92 (23)	
Race/Ethnicity, no. (%)				
Hispanic	430 (47)	229 (49)	205 (51)	0.79 [¶]
Black, non-Hispanic	412 (45)	206 (44)	174 (43)	
Other	65 (7)	31 (7)	26 (6)	

Abbreviation: SD = standard deviation.

* Using data collected from parent/guardian.

[†] Percentages do not include missing data and might not add to 100% because of rounding.

[§] Based on analysis of variance model.

[¶] Based on chi-square test.

TABLE 3. Services received by children enrolled in the Boston Children's Hospital Community Asthma Initiative — Boston, Massachusetts, 2005–2012

Services received	No.
Total children who received at least one home visit	692 of 908 (76%)
Total home visits	1,184
Nurse	689
CHW	305
Combined nurse and CHW	190
IPM extermination visits	61[†]
Children whose households received IPM extermination services	43 of 908 (5%)

Abbreviations: CHW = community health worker; IPM = integrated pest management.

* Percentages do not include missing data.

[†] Families might have received more than one extermination visit.

However, national evidence indicates that a comprehensive approach is most effective to address asthma triggers and medication adherence (3–9). Second, 35% of respondents were lost to follow-up by parent report, and potential biases might have been introduced. However, hospital administrative data were used to provide follow-up and outcome information for all participants, as long as they returned to Boston Children's for subsequent visits. Finally, data obtained from parent/guardian report might be affected by recall and social response biases. Although hospital administrative data provide accurate information about hospitalizations and ED visits at one institution, these data do not include information on patients who go elsewhere for emergency care. Data collected through parent/guardian reports and from the hospital administrative data were similar in terms of hospitalization and ED visits, indicating that most subsequent events are captured by the hospital administrative data. Access to insurance data will be helpful for evaluating health outcomes and costs due to care

among various institutions, as well as all levels of care including primary care visits and pharmacy use.

Discussion

The CAI model includes home visits with tailored asthma education, case management, and home environment assessments with remediation by nurses, CHWs, or both. Bicultural and Spanish-speaking staff members provided linguistically and culturally sensitive care. The nurses and CHWs worked closely with families of children with asthma to increase follow-up with primary care and specialty providers, obtain and understand an up-to-date asthma action plan, and increase use of urgent care facilities earlier in the course of an asthma exacerbation, rather than waiting to have an even more serious exacerbation treated at an ED. For the majority of families, home environmental remediation was a needed service; parts of Boston have older housing and poor conditions, with substantial mouse and cockroach infestations and mold. HEPA filter vacuum cleaners and bedding encasements were provided to all families due to the high levels of inhalant indoor allergens, combined with the strong prevalence of allergies among enrolled children. IPM supplies and interventions were provided as needed.

The CAI model includes all components of the chronic care model, including addressing patient safety, cultural competency, care coordination, community policies, and case management, for improving the care of patients and families living with a chronic illness (37,38). GIS mapping demonstrated that most families lived in Boston census blocks with high poverty levels and in census blocks with populations that were ≥50% black, Hispanic, or both.

TABLE 4. Number and percentage of children with selected asthma-related health outcomes* among those enrolled in the Boston Children's Hospital Community Asthma Initiative at baseline, 6 months, and 12 months and percent decreases from baseline to 12 months — Boston, Massachusetts, 2005–2012

Outcome [†]	Baseline [§] % (No.)	6 mos [¶] % (No.)	12 mos ^{**} % (No.)	Decrease at 12 mos from baseline % ^{††} (95% CI)
Any hospital admissions	60 (241 of 404)	15 (62 of 404)	12 (41 of 333)	79 (73–86)
Any emergency department visits	53 (213 of 402)	26 (103 of 402)	23 (78 of 333)	56 (46–65)
Any missed school days	93 (311 of 335)	55 (185 of 335)	54 (154 of 286)	42 (36–48)
Any missed workdays (parent/guardian)	82 (176 of 216)	55 (119 of 216)	44 (76 of 174)	46 (37–56)
Any days of limitation in physical activity	55 (223 of 403)	35 (141 of 403)	39 (131 of 334)	29 (16–42)

Abbreviation: CI = confidence interval.

* Data were collected by parent/guardian report via face-to-face interviews in the hospital or by telephone as part of clinical care (reflecting back 6 months) at three time points: enrollment (i.e., enrollment date, which is referred to as baseline in this report), 6 months after enrollment, and 12 months after enrollment.

[†] Number of emergency department visits and hospitalizations: those with asthma exacerbation with or without status asthmaticus as the primary or secondary diagnosis; missed school days: school absences due to asthma in the past 6 months; missed parent/guardian workdays: work absences due to the child's asthma in the past 6 months; days of limitation of physical activity: the need to slow down or stop playing due to asthma in the past 2 weeks.

[§] N = 908.

[¶] N = 404.

^{**} N = 333.

^{††} The percent decrease is the baseline percent minus the follow-up percent divided by the baseline percent. All decreases are significant ($p < 0.001$); p values are based on the Wilcoxon test.

TABLE 5. Mean differences in number of asthma-related health outcomes for children enrolled in the Boston Children's Hospital Community Asthma Initiative at 6 months and 12 months compared with baseline — Boston, Massachusetts, 2005–2012

Outcome*	Follow-up month [†]	Mean difference [§] (95% CI)	Standard deviation
Hospital admissions	6 mos	0.51 (0.44–0.58)	0.73
	12 mos	0.51 (0.44–0.58)	0.74
Emergency department visits	6 mos	0.48 (0.36–0.60)	1.25
	12 mos	0.55 (0.41–0.69)	1.37
Missed school days	6 mos	2.59 (1.89–3.29)	7.47
	12 mos	2.90 (2.16–3.64)	7.21
Missed workdays (parent/guardian)	6 mos	1.36 (0.98–1.74)	4.10
	12 mos	1.25 (0.80–1.70)	4.42
Days of limited physical activity	6 mos	2.28 (1.73–2.83)	5.91
	12 mos	1.80 (1.19–2.41)	5.97

Abbreviation: CI = confidence interval.

* Number of emergency department visits and hospitalizations: those with asthma exacerbation with or without status asthmaticus as the primary or secondary diagnosis; missed school days: school absences due to asthma in the past 6 months; missed parent/guardian workdays: work absences due to the child's asthma in the past 6 months; days of limitation of physical activity: the need to slow down or stop playing due to asthma in the past 2 weeks.

[†] N = 908 at baseline, n = 404 at 6 months, and n = 333 at 12 months.

[§] Number of emergency department visits, hospital admissions, missed school days, parent missed workdays, days of limited physical activity at 6 and 12 months subtracted from the value for baseline (6 months before enrollment) divided by the baseline. All differences are significant ($p < 0.001$); p values are based on t-tests.

Some changes over time might be a result of regression to the mean; for example, an initial event such as a hospital admission might be an outlier, and the participant might never be admitted again. However, the ANCOVA model with a comparison population accounts for baseline differences (39) as well as community effects due to changes in primary care and community education. CAI intervention participants show a significantly higher decrease in hospitalizations than

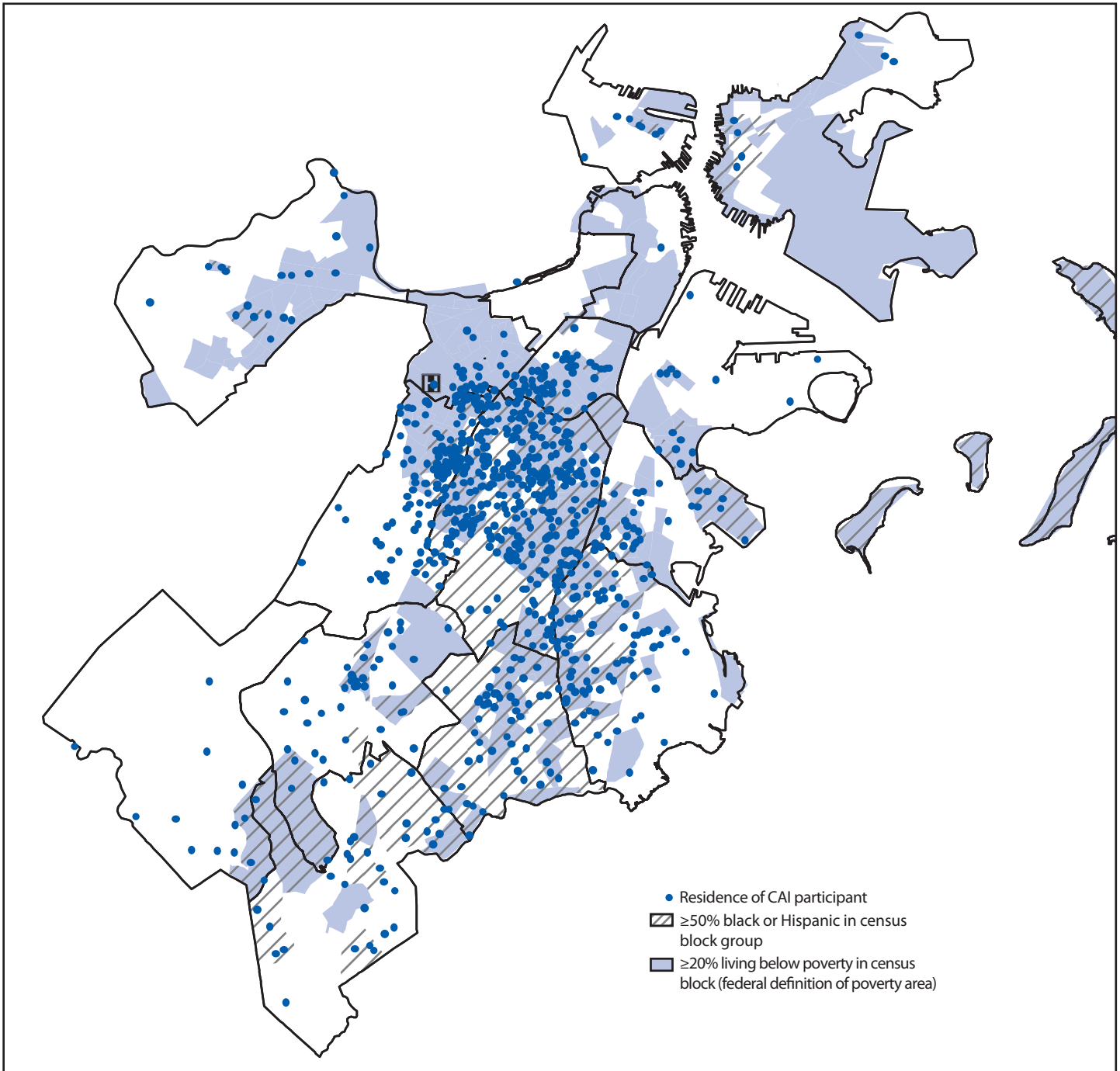
the comparison group, which accounts for most of the cost savings (because the majority of cost and cost savings are a result of hospitalizations). The children in the intervention group had more hospitalizations than those in the comparison group in the year before their enrollment/index visit (Figure 3). Therefore, the number of ED visits might have been more difficult to influence in the intervention group because children with past hospitalizations might have been those with the most severe asthma symptoms. Accessing insurance claims data is the next step toward expanding the analyses in this report to include a full cost analysis by accounting for all potential events and costs, including costs at other facilities and pharmacies.

Because of the demonstrated success of the pilot program, CAI expanded on July 1, 2008, to serve the comparison ZIP codes and other low-income neighborhoods in Boston. CAI was one of multiple sites for the New England Asthma Regional Council's Centers for Medicare and Medicaid Services Innovation grant to assess the cost effectiveness of CHW home visits with nurse supervision. A major goal of this grant was to work with payers to develop a sustainable funding model, allowing for ongoing services at current sites as well as the potential expansion of services to more patients regionally. In addition, CAI partnered with the American Academy of Pediatrics to replicate CAI in Birmingham, Alabama, and to develop a replication manual (40). UMass Memorial Medical Center in Worcester, Massachusetts, has replicated the program as well.

Conclusion

CAI has significantly reduced asthma morbidity among black and Hispanic children in Boston. Data from parent/guardian

FIGURE 2. Distribution of families served by the Boston Children's Hospital Community Asthma Initiative — Boston, Massachusetts, October 1, 2005–March 30, 2012*



Abbreviation: CAI = Community Asthma Initiative.

* N = 908 participants served during the pilot and expanded program. A total of 66% of the CAI participants lived in a poverty area ($\geq 20\%$ of the population lives below the federal poverty level), and 74% lived in areas that are predominantly black or Hispanic.

TABLE 6. Demographic and insurance characteristics of children in the Boston Children's Hospital Community Asthma Initiative (intervention group)* and children in similar neighborhoods (comparison group) during the pilot period — Boston, Massachusetts, October 1, 2005–June 30, 2008

Characteristic	Intervention group (N = 268)	Comparison group (N = 818)	p value
Mean age, yrs	6.9	6.1	0.34 [§]
Sex, no. (%)[†]			
Male	150 (56)	468 (57)	0.72 [¶]
Female	118 (44)	350 (43)	
Insurance, no. (%)[†]			
Medicaid/MassHealth	195 (73)	556 (68)	0.14 [¶]
Private	73 (27)	262 (32)	
Race/Ethnicity, no. (%)[†]			
Hispanic	122 (46)	326 (41)	
Black, non-Hispanic	110 (42)	382 (48)	0.22 [¶]
Other	31 (12)	91 (11)	

* Boston Children's Hospital administrative data.

[†] Percentages do not include missing data and might not add to 100% because of rounding.

[§] Based on t-test.

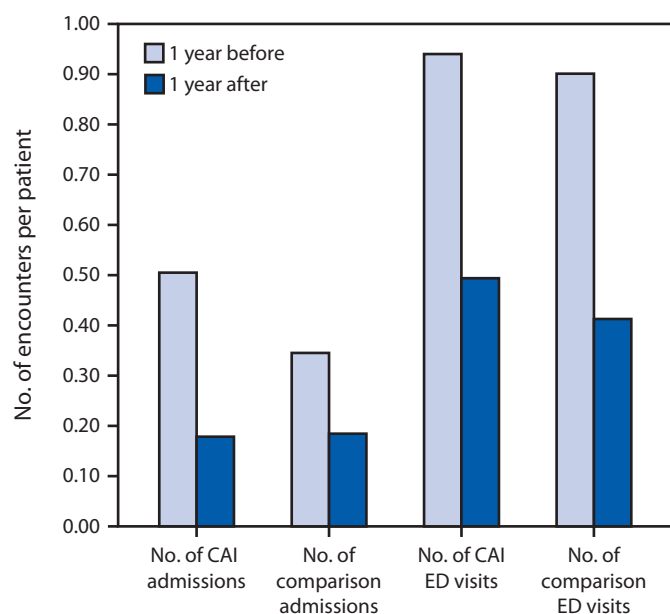
[¶] Based on chi-square test.

reports indicate a decrease in number of children with any (one or more) asthma-related hospitalizations and emergency department visits, and hospital administrative data indicate a decrease in mean number of asthma-related hospitalizations. The CAI model has been replicated in other cities and states, with adaptations to local cultural and system variations. Ongoing efforts for CAI and partners have included greater use of CHWs for home visits to decrease program costs and provide additional cultural and linguistic competency. Strong partnerships with public health, community, and housing agencies have allowed CAI to incorporate health outcomes and cost analyses into the business case to promote systemic changes locally and statewide to reduce asthma morbidity.

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FIGURE 3. Comparison of number of asthma-related hospitalizations and emergency department visits per child among children in the Boston Children's Hospital Community Asthma Initiative 1 year before and 1 year after the index visit* — Boston, Massachusetts



Abbreviations: CAI = Community Asthma Initiative; ED = emergency department.

* Obtained from CAI hospital administrative data (N = 268) and children in similar neighborhoods (comparison group) (N = 818) who had an asthma-related ED visit or hospitalization 1 year before and 1 year after the index visit during the pilot period (index visits October 1, 2005–June 30, 2008). A significantly greater decrease occurred in mean number of hospitalizations per child for the intervention group compared with the comparison group from 1 year before to 1 year of follow-up ($p < 0.001$). No significant difference was found in the decrease in mean number of asthma-related ED visits per child between CAI participants and the comparison group ($p = 0.49$).

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Use of Evidence-Based Interventions to Address Disparities in Colorectal Cancer Screening

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Summary

Colorectal cancer (CRC) is the second leading cause of cancer death among cancers that affect both men and women. Despite strong evidence of their effectiveness, CRC screening tests are underused. Racial/ethnic minority groups, persons without insurance, those with lower educational attainment, and those with lower household income levels have lower rates of CRC screening. Since 2009, CDC's Colorectal Cancer Control Program (CRCCP) has supported state health departments and tribal organizations in implementing evidence-based interventions (EBIs) to increase use of CRC screening tests among their populations. This report highlights the successful implementation of EBIs to address disparities by two CRCCP grantees: the Alaska Native Tribal Health Consortium (ANTHC) and Washington State's Breast, Cervical, and Colon Health Program (BCCHP). ANTHC partnered with regional tribal health organizations in the Alaska Tribal Health System to implement provider and client reminders and use patient navigators to increase CRC screening rates among Alaska Native populations. BCCHP identified patient care coordinators in each clinic who coordinated staff training on CRC screening and integrated client and provider reminder systems. In both the Alaska and Washington programs, instituting provider reminder systems, client reminder systems, or both was facilitated by use of electronic health record systems. Using multicomponent interventions in a single clinical site or facility can support more organized screening programs and potentially result in greater increases in screening rates than relying on a single strategy. Organized screening systems have an explicit policy for screening, a defined target population, a team responsible for implementation of the screening program, and a quality assurance structure. Although CRC screening rates in the United States have increased steadily over the past decade, this increase has not been seen equally across all populations. Increasing the use of EBIs, such as those described in this report, in health care clinics and systems that serve populations with lower CRC screening rates could substantially increase CRC screening rates.

Introduction

Colorectal cancer (CRC) is the second leading cause of cancer death in the U.S. among cancers that affect both men and women (1). In 2012, the most recent year for which data are available, CRC was diagnosed in approximately 135,000 persons, and approximately 51,000 died from the disease (1). Evidence indicates that screening for CRC reduces its incidence and mortality (2). The U.S. Preventive Services Task Force recommends screening average risk adults aged 50–75 years for CRC with one of three options 1) a guaiac fecal occult blood test (FOBT) or fecal immunochemical test (FIT) annually, 2) a colonoscopy every 10 years, or 3) a flexible sigmoidoscopy every 5 years with a FOBT or FIT every 3 years (2).

Despite strong evidence of their effectiveness, CRC screening tests are underused. In 2012, 65% of U.S. adults aged 50–75 years reported being up-to-date with CRC screening

(3). A larger proportion of Hispanics, American Indian/Alaska Native men, and persons living in nonmetropolitan areas (in comparison to non-Hispanics, white men, and those living in metropolitan areas) reported never being screened. A direct relationship between having been screened and educational attainment and annual household income level was also evident. A substantially smaller proportion of those that reported being uninsured or lacking a usual source of care were up-to-date with CRC screening.

Since 2009, CDC's Colorectal Cancer Control Program (CRCCP) has funded states and tribal organizations to implement evidence-based population-level interventions to increase CRC screening rates in adults aged 50–75 years and to provide limited direct CRC screening services to adults aged 50–64 years who are uninsured or underinsured and below 250% of the federal poverty level. The goal of the CRCCP is to increase CRC screening prevalence to 80% in funded

states and tribal areas. Program funds are used primarily to implement evidence-based interventions (EBIs) or strategies recommended in *The Guide to Community Preventive Services (Community Guide)* to increase use of CRC screening tests (4).

These strategies include the following:

1. client reminders (telephone messages and written reminders advising clients they are due or overdue for screening);
2. high quality small media (videos or printed material such as letters, brochures, and newsletters informing and motivating persons to be screened for cancer);
3. reduction of structural barriers (noneconomic burdens or obstacles making access to screening services difficult);
4. provider reminder and recall systems (systems reminding health care providers that a patient is due or overdue for screening); and
5. provider assessment and feedback (interventions that evaluate provider performance in delivering and offering screening to clients and present providers with information about their performance).

CRCCP grantees partner with various entities to implement one or more of these EBIs in clinic, health system, or insurer populations. CRCCP implementation of EBIs has increased over time, with client-oriented EBIs used most frequently (5). Patient navigation, an approach to assist persons to overcome barriers to screening, also has been used by most CRCCP grantees (6). Although patient navigation has not been reviewed by the *Community Guide* as an independent strategy, several studies supporting its efficacy for increasing CRC screening have been published (7).

This report highlights the implementation of EBIs by two CRCCP grantees: the Alaska Native Tribal Health Consortium (ANTHC) and Washington State's Breast, Cervical, and Colon Health Program (BCCHP). Alaska Native persons have the highest incidence of CRC among all racial/ethnic groups in the United States, and their CRC mortality rate is twice that among whites (1). The proportion of American Indian/Alaska Native persons who are up-to-date with CRC screening is substantially lower than other racial/ethnic groups (3). Both the incidence of and mortality from CRC in Washington are below the national average; however disparities persist, with blacks having higher CRC incidence and mortality than whites or Hispanics (1). In 2012, 66.8% of adults aged 50–75 years were up-to-date with CRC screening in Washington; a lower proportion of Hispanics, American Indian/Alaska Native persons, and persons with lower levels of education or annual household income reported being up-to-date with CRC screening (8).

CDC's Office of Minority Health and Health Equity selected the intervention analysis and discussion that follows to provide an example of a program that might be effective in reducing colorectal cancer-related disparities in the United States. Criteria for selecting this program are described in the Background and Rationale for this supplement (9).

Methods

Intervention Methods

Alaska Native Tribal Health Consortium

ANTHC is a statewide, tribal, nonprofit, health services organization owned and managed by Alaska Native populations. ANTHC provides health services to members of the 229 federally recognized tribes in Alaska and supports the regional tribal health organizations (THOs) comprising the Alaska Tribal Health System. The Alaska Tribal Health System operates as a large system consisting of village-based clinics, regional hospitals, and a large secondary/tertiary care facility. Leveraging multiple resources, the Alaska Tribal Health System provides comprehensive care for approximately 143,000 American Indian/Alaska Native persons.

Since 2009, the ANTHC CRCCP has focused on improving CRC screening rates by partnering with the Alaska Native Medical Center in Anchorage and with five rural/remote regional THOs serving approximately 40,224 Alaska Native persons. To increase CRC screening, ANTHC facilitated implementation of provider reminders at three THOs and patient reminders at all five THOs and the Alaska Native Medical Center.

ANTHC surveyed regional partner THOs to determine whether their electronic health record (EHR) systems had the capacity to generate provider reminders and found three partner regions with this capability. Because some EHRs did not contain information about CRC screening tests performed before implementation of the intervention or were missing information on tests performed elsewhere, dedicated CRC screening patient navigators reviewed medical charts and updated the EHR system with accurate CRC screening information. Patient navigators also were used at all five partnering THOs to implement client reminders as an outreach strategy to Alaska Native community members to encourage them to get screened. Additional methods used by patient navigators to increase CRC screening included one-on-one patient education, small media distribution, and reduction of structural barriers (e.g., assisting with transportation).

Washington

BCCHP has contracts with six regional contractors to administer program services across the state. Public Health Seattle & King County (PHSKC) is the regional contractor for Clallam, Jefferson, King, and Kitsap counties. In 2011, BCCHP funded PHSKC to implement EBIs to increase CRC screening in the counties served. PHSKC partnered with HealthPoint (<http://www.healthpointchc.org>), a network of nonprofit community health centers in the Seattle metro area serving historically underserved populations such as the uninsured and racial/ethnic minority populations, to provide funding for staff time and upgrades to the clinics' EHR to support EBI implementation. The primary goal of the partnership was to increase the proportion of the HealthPoint clinic population aged 50–75 years who were up-to-date with CRC screening.

Patient care coordinators (PCCs) (who functioned as patient navigators) were identified in each clinic to coordinate staff training on CRC screening and to integrate client and provider reminder systems. Using clinic-based EHRs, PCCs identified active panels of patients who were eligible for CRC screening for each provider. PCCs attempted to reach eligible patients by telephone to remind them that they were due or overdue for screening and to schedule an appointment in the clinic. If the patients could not be reached after two attempts, a reminder letter was sent to the patients notifying them that they were due for screening.

To implement provider reminders, medical assistants used the EHR to produce a daily report of patients coming to the clinic who were due for screening; they also ensured that each patient received a FIT kit with a preaddressed, stamped envelope for returning samples to the processing laboratory. HealthPoint waived the lab processing costs for all patients as part of the intervention. To increase FIT kit return rates, PCCs used the EHR to identify patients who had not returned their FIT kits within 2 weeks. Medical assistants then made two attempts to reach these patients by telephone, after which a reminder letter was sent. PCCs also tracked patients with positive FITs (i.e., positive for occult blood in stool) who were referred for colonoscopy to ensure complete follow-up.

Data Collection and Analysis

Alaska Native Tribal Health Consortium

The 1995 Government Performance and Results Act (GPRA) is a law requiring all federal agencies to report performance data annually to the Office of Management and Budget (10). To meet this requirement, the Indian Health Service (IHS) provides data on 22 clinical performance

measures with specified benchmarks, including one on CRC screening rates that was added in 2006. This measure represents an important source of national CRC screening prevalence data among American Indian/Alaska Native populations. The CRC screening definition used for the GPRA measure is based on diagnostic and procedure codes obtained from medical records. The numerator includes patients who have had any CRC screening, defined as any of the following: 1) an FOBT or FIT during the annual report period, 2) a flexible sigmoidoscopy or double contrast barium enema in the past 5 years, or 3) a colonoscopy in the past 10 years. Use of double contrast barium enema as a screening test was included in the screening measure until 2013, when it was removed to align the measure with changes in the U.S. Preventive Services Task Force recommendations. Until 2013, the denominator included all living IHS patients aged 51–80 years without a documented history of CRC or total colectomy with two or more visits to an IHS health facility within the previous 3 years and residing in the service area during the reporting period. Participation in GPRA reporting by Alaska regional THOs is voluntary and varies by THO.

The 2005–2012 annual, Alaskan, statewide GPRA rates representing data from 9–13 regional THOs and the available annual region-specific GPRA rates from regional THOs participating in the intervention were used to evaluate differences in screening rates before and during program participation (2009–2012). Region A did not report GPRA data for 2009. Statewide rates from the 2012 Alaska Behavioral Risk Factor Surveillance System also were used to assess CRC screening rates in the American Indian/Alaska Native population and the general population in Alaska. Data from the 2010 Behavioral Risk Factor Surveillance System cannot be used for comparison because of changes in the survey methods (11).

Washington

Demographic data for 2011, the year the intervention was initiated, were obtained from the Health Resources and Services Administration Uniform Data System, and include patients who had at least one clinical visit within the calendar year for the variables presented (12). Data from the clinics' EHR were used to generate descriptive statistics of clinic-level CRC screening rates. CRC screening rates were calculated as the proportion of adults aged 50–75 years without a documented history of total colectomy who had at least one visit to the clinic in the previous 18 months and had documentation of appropriate screening for CRC. Appropriate CRC screening was defined as documented colonoscopy within 10 years, flexible sigmoidoscopy within 5 years, or FOBT or FIT within a year of the reporting period end date.

Results

Alaska Native Tribal Health Consortium

In 2009, before initiation of the program, the proportion of all adults aged 51–80 years included in the statewide GPRA rate who were up-to-date with CRC screening was 50.9% (Figure 1). By 2012, this proportion had increased to 58.4%, with an average annual increase of 3.8% per year. Regional proportions for reporting THOs varied with Region A having the lowest proportion of eligible adults screened in 2010 (24.4%) and Region D having the highest proportion in 2009 (64.2%). All reporting regions showed increases. Region A had the largest increase in the proportion of adults who were up-to-date with CRC screening, increasing from 24.4% in 2010 to 67.6% in 2012, whereas Region D had the smallest absolute increase (64.2% to 66.8%).

Data from the Alaska 2012 Behavioral Risk Factor Surveillance System demonstrated that the proportion of

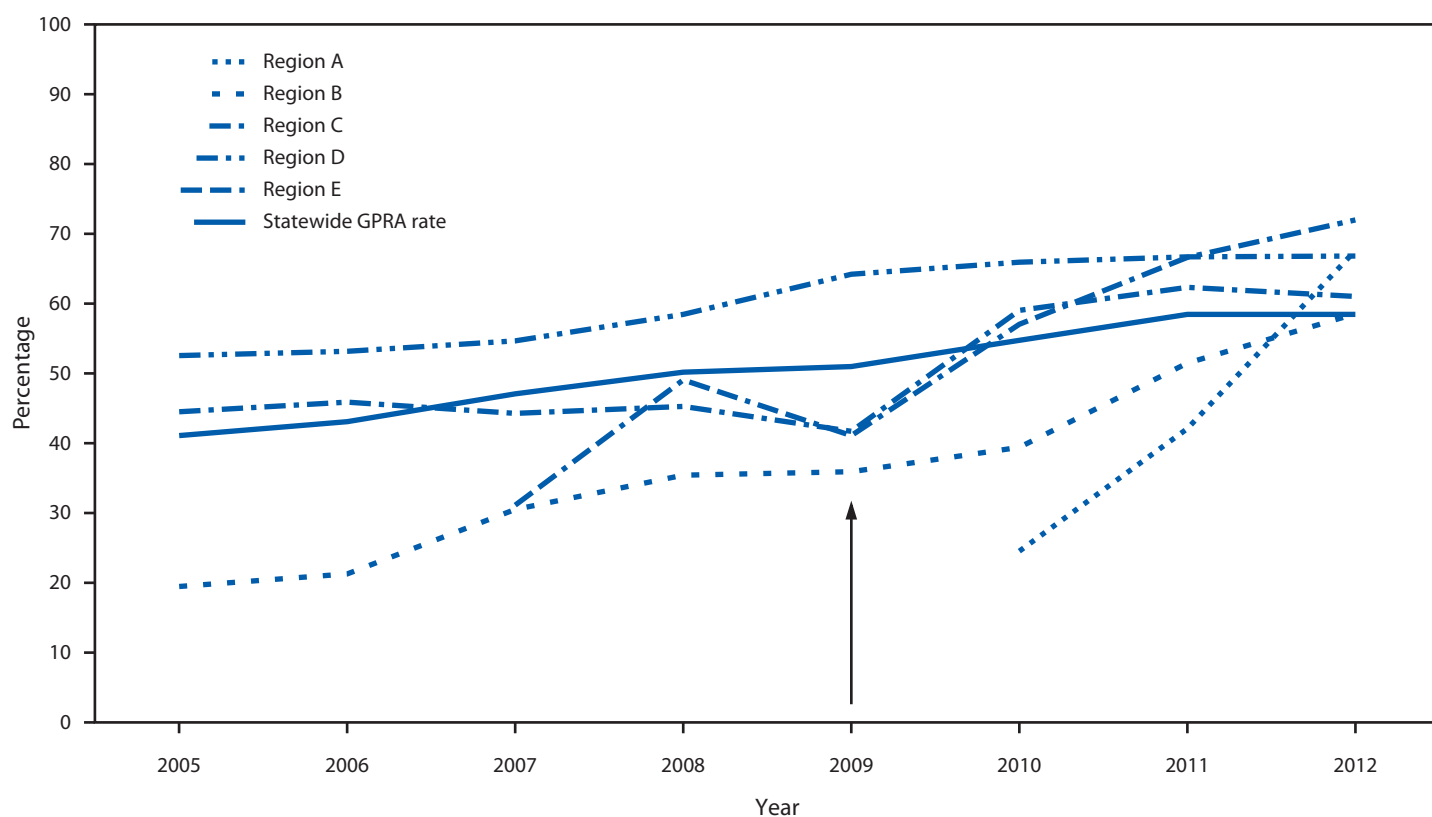
Alaska Native adults aged 50–80 years who were up-to-date with CRC screening was 59.8%. The proportion of all Alaskan adults aged 50–80 years who were up-to-date with CRC screening was 58%.

Washington

In 2011, HealthPoint clinics served 65,582 patients, 59.7% of whom were aged 18–64 years (Table). A substantial proportion of patients represented racial/ethnic minority populations; most had annual household incomes $\leq 200\%$ of the federal poverty level (97.4%). Most of the clinic population was either uninsured (41.8%) or insured by Medicaid or the Children's Health Insurance Program (44.8%).

Among the seven participating clinics in 2011, the baseline proportion of adults aged 50–75 years who were up-to-date with CRC screening was 24% (Figure 2). By 2014, this proportion had increased to 48%. The proportion of adults that were up-to-date with screening in 2011 varied by clinic

FIGURE 1. Percentage of American Indian/Alaska Native adults aged 51–80 years who were up-to-date* with colorectal cancer screening, by region† and year§ — Alaska, 2005–2012



Source: Indian Health Services. Alaska area aggregate GPRA clinical performance report, Version 10.0. Anchorage, Alaska: Alaska Area Native Health Service; 2012.

Abbreviation: GPRA = Government Performance and Results Act.

* Persons having fecal occult blood test or fecal immunochemical test within the past year, flexible sigmoidoscopy or double contrast barium enema within the past 5 years, or colonoscopy within the past 10 years.

† Regions indicate different tribal health organizations.

§ Arrow indicates year of implementation of evidence-based interventions.

TABLE. Demographic characteristics and insurance status of the population* served by HealthPoint clinics — Washington, 2011

Characteristics	%†
Age (yrs)	
<18	36.3
18–64	59.7
≥65	4.0
Race/Ethnicity	
White	63.2
Hispanic [§]	32.2
Black	16.1
Asian	12.9
American Indian/Alaska Native	1.1
Native Hawaiian/Other Pacific Islander	4.3
More than one race	2.5
Income[¶]	
≤200% FPL	97.4
≤100% FPL	52.1
Insurance status	
Uninsured	41.8
Medicaid/CHIP	44.8
Medicare	3.8
Other third party	9.6

Abbreviations: CHIP = Children's Health Insurance Program; FPL = federal poverty level.

* N = 65,582.

† Percentages might not total 100% due to rounding.

§ Hispanics might be of any race.

¶ Data from patients with known income.

and ranged from 17% in clinic E to 32% in clinic G. All clinics showed increases. Clinic D had the largest absolute increase in the proportion of adults who were up-to-date with CRC screening, increasing from 24% in 2011 to 53% in 2014, and clinic E had the smallest absolute increase (17% to 32%).

Discussion

This report describes evidence-based activities implemented by health care organizations to increase CRC screening in historically underserved populations. In Alaska, use of client and provider reminders and patient navigators contributed to increases in the proportion of Alaska Native adults aged 50–80 years who were up-to-date with CRC screening from 50.9% in 2009 to 58.4% in 2012. In Washington, the use of dedicated staff to implement clinic systems to support CRC screening and the use of client reminders helped to increase the proportion of adults aged 50–75 years who were up-to-date with CRC screening from 24% in 2011 to 48% in 2014 in the participating clinics. By comparison, national data from the National Health Interview Survey indicate that 59.2% of adults of any race/ethnicity aged 50–75 years were up-to-date with CRC screening in 2010, and 58.2% were up-to-date in 2013 (13).

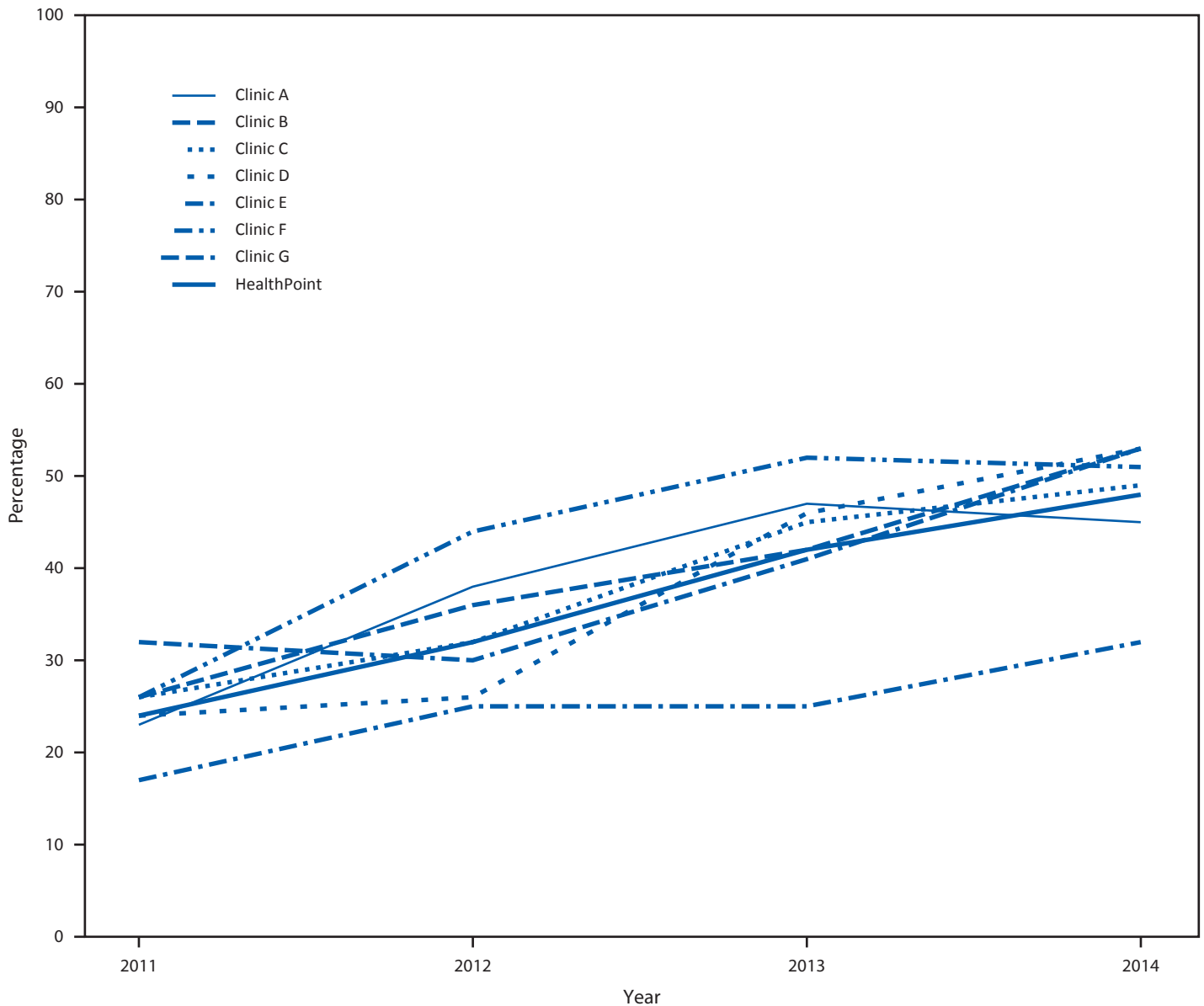
CDC encourages CRCCP grantees to implement one or more EBIs recommended by the *Community Guide* in health systems and other settings to increase CRC screening in the population. A systematic review of these interventions found their use resulted in median increases of 11%–15% in completed CRC screenings (14). On average, CRCCP grantees have implemented three EBIs, with client-oriented interventions (i.e., client reminders and small media), which grantees report as easier to implement, being the most commonly used (15). CRCCP grantees were found to be more likely to implement EBIs than state health departments without CDC funding, suggesting that with sufficient programmatic support, these interventions can be widely adopted in various settings and, if implemented, can increase CRC screening (16).

In both the Alaska and Washington programs, instituting provider reminder systems, client reminder systems, or both was facilitated by the use of EHR systems. Although efficient, embedding reminder systems in the EHR might require up-front costs and staff with the necessary skills. EHRs might contain inaccurate, missing, or outdated CRC screening information, or the information might be stored in data fields that cannot be queried systematically, resulting in the generation of inaccurate or misleading provider reminders. However, once properly established, these systems should be sustainable over time.

EHR data also can be mined to implement provider assessment and feedback reports, another EBI appropriate for use in clinical settings. Assessment reports such as those displaying quality clinical measures, including CRC screening, could be produced to assess provider performance over time. These types of reports increase CRC screening rates and allow clinics and health systems to better monitor the health of their overall patient population (14). IHS clinics, clinics funded by Health Resources and Services Administration, and health maintenance organizations (HMOs) all have reporting requirements that include CRC screening rates. EBIs such as those used by Alaska and Washington, whether in individual clinics, health care systems, or insured populations, can help to meet established benchmarks.

Patient navigation is increasingly used as an intervention to address disparities in use of cancer screening tests and to increase screening rates for several cancers, including CRC (17,18). Although shown effective in improving CRC screening adherence (6), patient navigation can be costly given the intensive, individualized approach. Few cost studies have been published; however, some have demonstrated cost savings for endoscopy centers because navigators can increase screening volume and reduce patient no-shows and cancellations (18–20).

FIGURE 2. Percentage of adults aged 50–75 years served by HealthPoint clinics who were up-to-date* with colorectal cancer screening, by clinic — Washington, 2011–2014†



* Persons having fecal occult blood test or fecal immunochemical test within the past year, flexible sigmoidoscopy within the past 5 years, or colonoscopy within the past 10 years.

† Electronic health records provided by HealthPoint, which had the capacity to generate provider reminders, were used to collect data.

Alaska and Washington implemented more than one EBI in their implementation sites. Rather than relying on a single strategy, using multicomponent interventions in a single clinical site or facility can support more organized screening programs and result in greater increases in screening rates. Most CRC screening in the United States is opportunistic (i.e., persons are often offered screening tests during a clinical visit conducted for other reasons). This method relies on the provider to remember to offer screening when patients appear

in the office. Organized screening systems have an explicit policy for screening, a defined target population, a team responsible for implementation of the screening program, and a quality assurance structure (21). Implementing multiple interventions such as client and provider reminders and patient navigation often requires institutionalization of many of the aspects of an organized screening system. Consistent with findings described in this paper, these coordinated efforts can

contribute to an increase in CRC screening rates above that seen with usual opportunistic care.

Use of multiple interventions might require more time and effort at the outset to establish routines and collect and monitor data on screening rates and follow-up; however, once these routines are established and institutionalized, less staff time and resources might be needed to maintain these efforts. Maintenance of CRC screening as a priority in the clinical setting is necessary, although it might be difficult to sustain given competing priorities (e.g., multiple chronic diseases and lack of time or desire to address nonurgent health issues) for the target patients and their providers. At ANTHC, initiating use of provider reminders in the EHR was initially hampered by competing clinical priorities, which was resolved by requiring use of provider reminders as a condition of funding. In the absence of specific grant funding to support implementation of multicomponent interventions, alternative incentives are needed to prioritize support of these efforts, such as required reporting of CRC screening rates to insurers as a quality measure. By adhering to the principles of population management and data usage, health care professionals can apply these processes to prevent other health conditions or to manage chronic disease. Organized screening systems might increase the likelihood of the uptake and maintenance of the interventions in the absence of specific funding.

Limitations

The findings in this report are subject to at least two limitations. First, CRC screening rates were not compared with a nonintervention group. The primary purpose of these interventions was to increase CRC screening in the targeted populations as measured by CRC screening rates before and after the intervention, rather than through comparison to a nonintervention group. Because the interventions implemented already have a strong evidence base demonstrating their efficacy, interventions were not evaluated with the intention of proving the effectiveness of the intervention itself. Assurance that the observed changes in CRC screening rates were due solely to the intervention alone cannot be provided. Second, systematic intermediate outcome data (e.g., the number of patients who scheduled or completed a CRC screening test after receiving a reminder, the percentage of FIT kits distributed that were returned, or the proportion of patients who received patient navigation services and completed screening) were not collected.

Conclusion

Although CRC screening rates in the United States have increased steadily over the past decade this increase has not occurred equally across all populations. Increasing the use of the types of EBIs described in this report in health care clinics and systems that serve populations with lower CRC screening rates could substantially increase CRC screening rates. State health departments, tribal organizations, and other public health entities can play a key role in these efforts by partnering with health care providers to support the use of EBIs in clinical settings.

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Progress Toward Eliminating Hepatitis A Disease in the United States

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Summary

Hepatitis A virus (HAV) disease disproportionately affects adolescents and young adults, American Indian/Alaska Native and Hispanic racial/ethnic groups, and disadvantaged populations. During 1996–2006, the Advisory Committee on Immunization Practices (ACIP) made incremental changes in hepatitis A (HepA) vaccination recommendations to increase coverage for children and persons at high risk for HAV infection. This report examines the temporal association of ACIP-recommended HepA vaccination and disparities (on the absolute scale) in cases of HAV disease and on seroprevalence of HAV-related protection (measured as antibody to HAV [anti-HAV]). ACIP-recommended childhood HepA vaccination in the United States has eliminated most absolute disparities in HAV disease by age, race/ethnicity, and geographic area with relatively modest ≥ 1 -dose and ≥ 2 -dose vaccine coverage. However, the increasing proportion of cases of HAV disease among adults with identified and unidentified sources of exposure underscores the importance of considering new strategies for preventing HAV infection among U.S. adults. For continued progress to be made toward elimination of HAV disease in the United States, additional strategies are needed to prevent HAV infection among an emerging population of susceptible adults. Notably, HAV infection remains endemic in much of the world, contributing to U.S. cases through international travel and the global food economy.

Introduction

Hepatitis A virus (HAV) infection can result in serious illness (HAV disease) with a risk for morbidity and mortality, particularly among susceptible older adults. Symptoms characteristically include anorexia, vomiting, malaise, fever, abdominal pain, and jaundice, similar to other types of viral hepatitis. Severe disease (e.g., fulminant hepatitis) is life-threatening; complications are uncommon but can be long-lasting (e.g., nephrotic syndrome, glomerulonephritis, vasculitis, pancreatitis, Guillain-Barré syndrome, thrombocytopenia, or aplastic anemia) (1). HAV infection is asymptomatic (without jaundice) in approximately 70% of children aged <6 years, whereas approximately 70% of adolescents and adults are symptomatic (2). In previous studies, adults with HAV disease averaged 27 days (range: 0–180 days) of work loss (3). Hospitalization rates were 11%–22% overall, and approximately 40% among adults; case-fatality rates were

0.3% overall, and $\geq 1.8\%$ among persons aged >50 years and persons with chronic liver disease (3–5).

HAV is highly infectious and remains infectious for prolonged periods (i.e., months) in the environment. Transmission is fecal-oral from ingestion of HAV in contaminated food or water or contact with an infected person (3). HAV shedding in stool is heaviest before onset of symptoms, facilitating transmission. Persons who engage in certain risky behaviors (e.g., injection drug use [IDU]) and men who have sex with men (MSM) are more likely to become infected. Conditions favoring transmission include lack of access to clean water and food, poor sanitation, and crowded living conditions. Disadvantaged persons, including persons with low socioeconomic status and indigenous populations, can be affected disproportionately by these conditions (3). In the United States, spread from asymptotically infected children has contributed to community outbreaks, particularly among children attending child care centers (2,3,6,7).

The epidemiology of acute HAV disease varies worldwide and is in transition in many areas (8–12). In regions where HAV infection has been considered endemic (e.g., Africa, Asia, Central and South America, and Eastern Europe), up to 90% of children are infected by age 10 years (13). Because asymptomatic HAV infection in endemic settings is almost universal during childhood, and is associated with life-long immunity in these settings, illness and deaths from HAV infection are uncommon at any age. As sanitation, access to clean water, and living conditions improve, a decrease occurs in the proportion of persons protected by infection in childhood, HAV disease becomes more frequent among adolescents and adults, and cycles of outbreaks occur as the proportion of the population that is susceptible increases. Because improvements in conditions that foster transmission occur unevenly across communities, disparities in disease incidence can be accentuated by the quality of living conditions, geography, and race/ethnicity of affected populations (3,9,13).

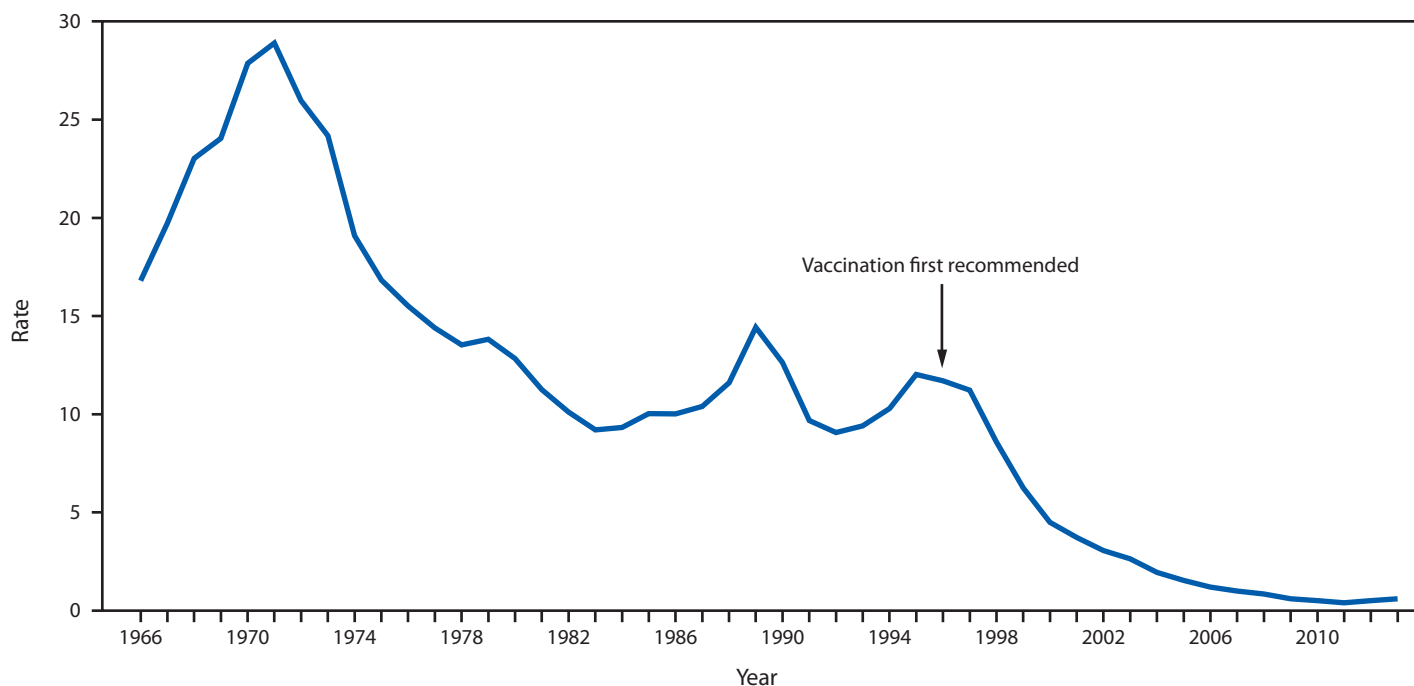
In the United States, transition from intermediate to low endemic HAV infection occurred during the second half of the 20th century. During this period, temporal increases in HAV infection and communitywide outbreaks led to cyclic increases in HAV disease approximately every 10–15 years (Figure 1) (5,11,14). Between cyclic increases, the number of reported cases remained $\geq 21,000$ annually (5). When underdiagnosis

and underreporting are accounted for, the actual number of cases was estimated to be two to ten times higher (5,15). In 1994, what appeared to be a new cycle of increasing HAV infection began, with 26,796 reported cases (rate: 10.3 cases per 100,000 population) (5).

During 1983–1997, the highest case rates were among children aged ≥ 5 years and young adults, and the lowest case rates were among adults aged ≥ 40 years. This pattern was still present in 2000 (Figure 2) (3,5,6,14). The 1988–1994 National Health and Nutrition Examination Survey (NHANES) estimated that approximately one third (37.4%; 95% confidence interval [CI]: 35.1%–39.8%) of U.S. adults aged ≥ 20 years had antibody to HAV (anti-HAV), presumably from past infection. Among the three major racial and ethnic populations evaluated by NHANES, the highest seroprevalence of anti-HAV was among Mexican-American (81.9%; 95% CI: 79.3%–84.4%) and non-Hispanic black adults (50.0%; 95% CI: 47.8%–52.2%); the lowest prevalence was among non-Hispanic white adults (29.0%; 95% CI: 26.9%–31.1%) (17).

Cases were unevenly distributed geographically across the United States. During 1987–1997, the highest case rates were in Alaska and the western states (18) (Figure 3). HAV disease also affected racial/ethnic minority populations disproportionately. Rates were well above the national average of 10.3 cases per 100,000 population among American

FIGURE 1. Incidence* of reported acute hepatitis A cases — National Notifiable Diseases Surveillance System, United States, 1966–2013



* Rate per 100,000 population. Rate (number of cases) in 1971 (peak), 1996 (first Advisory Committee on Immunization Practices [ACIP] recommendation for hepatitis A vaccination) and 2011 (low) were 28.9 (59,606 cases), 11.7 (31,032 cases), and 0.4 (1,398 cases), respectively.

Indians/Alaska Natives (AI/ANs) and Hispanics; rates were lower among non-Hispanic whites, non-Hispanic blacks, and Asians/Pacific Islanders (Figure 4) (3,5,18).

To control HAV infection, CDC's Advisory Committee on Immunization Practices (ACIP) developed recommendations for hepatitis A (HepA) vaccination incrementally in 1996, 1999, and 2006. Initially, persons living in areas experiencing community outbreaks and high rates of infection were targeted for vaccination, and eventually universal childhood HepA vaccination was recommended (3,6,18). This report describes the HepA vaccination program in the United States, its impact on elimination of disparities (on the absolute scale) in the incidence of HAV disease, and new challenges posed by disparities in HAV seroprotection.

CDC's Office of Minority Health and Health Equity selected the intervention analysis and discussion that follows to provide an example of a program that has been effective in reducing hepatitis A-related disparities in the United States. Criteria for selecting this program are described in the Background and Rationale for this supplement (19).

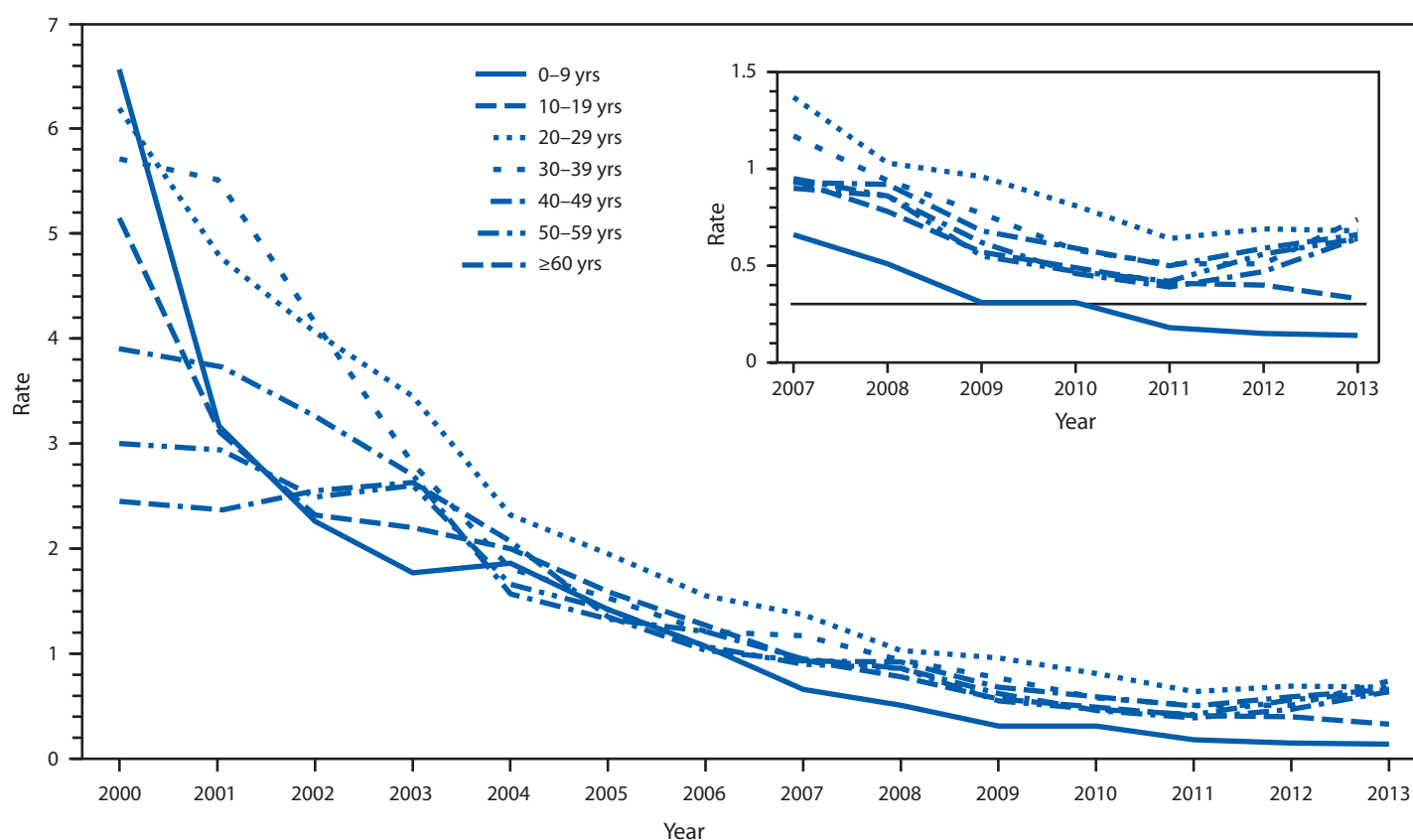
Methods

Interventions

Inactivated HepA vaccines were approved in the United States in 1995 and 1996 for use in 2-dose schedules at age ≥ 2 years (20). A trial in New York among 1,037 children aged 2–16 years found 100% (95% CI: 87.3%–100.0%) efficacy 6–18 months after a single dose of Vaqta (Merck and Company, West Point, Pennsylvania) (21). Another trial in Thailand among 38,157 children aged 1–16 years found 94% (95% CI: 79%–99%) efficacy after 2 doses of Havrix (GlaxoSmithKline Biologics, King of Prussia, Pennsylvania) administered 1 month apart (22). Anti-HAV levels associated with protection and reduction in viral shedding were achieved in 97%–100% of children and adolescents by 1 month after a single dose; 100% of children had protective levels of antibody after a second dose (6). In 2005, the Food and Drug Administration (FDA) approved both inactivated HepA vaccines for use at age ≥ 12 months (20).

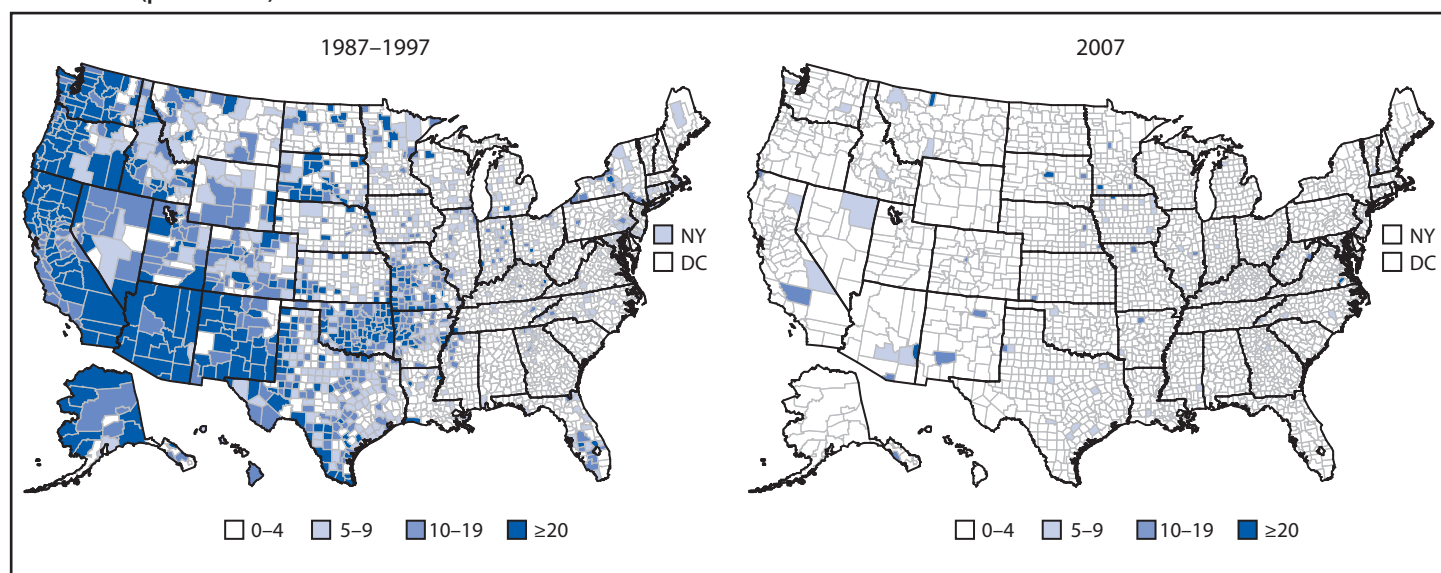
Since the introduction of the HepA vaccine, ACIP has recommended HepA vaccination as a control measure in

FIGURE 2. Incidence* of reported acute hepatitis A cases, by age group — National Notifiable Diseases Surveillance System, United States, 2000–2013



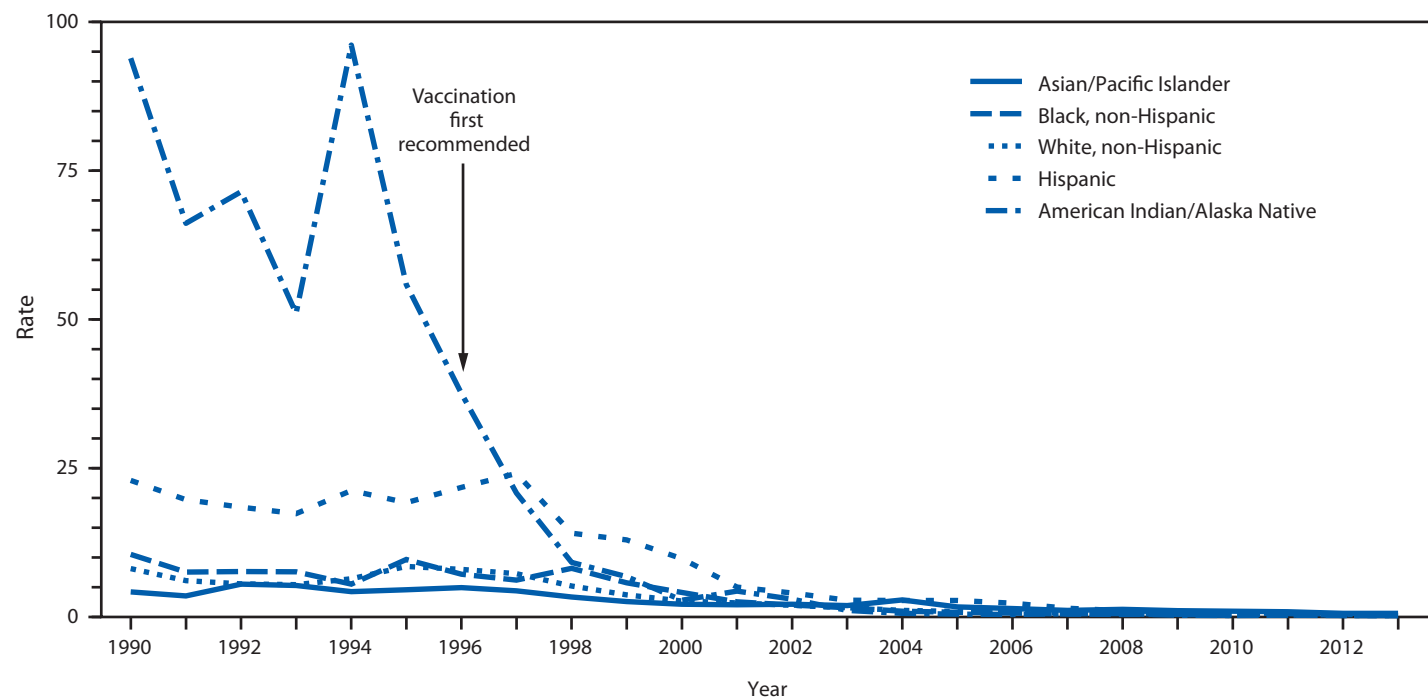
* Rate per 100,000 population.

FIGURE 3. Incidence* of reported acute hepatitis A cases, by county — National Notifiable Diseases Surveillance System, United States, 1987–1997† (pre-vaccine) and 2007



* Rate per 100,000 population.
 † Annual average incidence.

FIGURE 4. Incidence* of reported acute hepatitis A cases, by race/ethnicity — National Notifiable Diseases Surveillance System, United States, 1990–2013



* Rate per 100,000 population.

outbreaks, for populations at increased risk, for persons who have chronic liver disease, as routine vaccination for children aged 12–23 months and for anyone wishing to obtain immunity (Box) (3,6,18). During 1996–2006, ACIP made

incremental changes in HepA vaccination recommendations to increase coverage for children and persons at highest risk for HAV infection.

BOX. Childhood hepatitis A vaccination recommendations — Advisory Committee on Immunization Practices, 1996–2006**1996**

1. Routine hepatitis A (HepA) vaccination for children aged ≥ 2 years and accelerated vaccination of older children (including children to age 10–15 years) to control ongoing outbreaks in communities that have high rates of hepatitis A and periodic hepatitis A outbreaks.
2. Vaccinate populations at increased risk for hepatitis A infection (e.g., persons traveling to or working in countries that have high or intermediate endemicity of infection, men who have sex with men, illegal-drug users, persons who have occupational risk for infection, and persons who have clotting-factor disorders) or persons who have chronic liver disease.
3. Vaccinate any person wishing to obtain immunity.

1999

1. Routine HepA vaccination for children aged ≥ 2 years who live in states, counties, or communities where the average annual rate during 1987–1997 was ≥ 20 cases per 100,000 population (i.e., approximately twice the national average of 10.8 cases per 100,000 population) (included 11 states: Alaska, Arizona, California, Idaho, Nevada, New Mexico, Oklahoma, Oregon, South Dakota, Utah, and Washington).
2. Consider routine HepA vaccination for children aged ≥ 2 years living in states, counties, or

communities where the average annual rate of hepatitis A during 1987–1997 was ≥ 10 cases per 100,000 population but < 20 cases per 100,000 population (six states: Arkansas, Colorado, Missouri, Montana, Texas, and Wyoming).

3. Vaccinate older children (e.g., up to age 10–15 years) in communities with high rates of hepatitis A to prevent epidemics.
4. Vaccinate persons at increased risk for hepatitis A and persons who have chronic liver disease (see 1996, above).
5. Vaccinate any person wishing to obtain immunity.

2006

1. Routine HepA vaccination for all children in the United States at age 12–23 months.
2. Continue HepA vaccination for children ages 2–18 months in states, counties and communities with existing vaccination programs.
3. Consider catch-up vaccination for children ages 2–18 years in areas without existing programs, especially when incidence is increasing or with ongoing outbreaks among children and adolescents.
4. Vaccinate persons at increased risk for HAV and persons who have chronic liver disease (see 1996 above).
5. Vaccinate any person wishing to obtain immunity.

Sources: Adapted from CDC. Prevention of hepatitis A through active or passive immunization: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep 1996;45(No.RR-15); CDC. Prevention of hepatitis A through active or passive immunization: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep 1999;48(No.RR-12); CDC. Prevention of hepatitis through active or passive immunization: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep 2006;55(No.RR-7).

Risk for infection for unvaccinated persons is related to the prevalence of HAV in the community (9,11,12). The 1996 ACIP recommendations were directed at controlling outbreaks and preventing HAV infection in high-risk persons (3). In 1999, ACIP stratified its recommendations (i.e., “recommend” vaccination or “consider” vaccination) on the basis of the incidence of HAV disease in geographic locations (6). ACIP recommended routine HepA vaccination for children aged ≥ 2 years who were living in states, counties, and communities with rates of HAV disease at least twice the national average. During 1987–1997, the national average HAV rate was 10.8 cases per 100,000 population. In 1999, a total of 11 states (Alaska, Arizona, California, Idaho, Nevada, New Mexico, Oklahoma, Oregon, South Dakota, Utah, and Washington) had an average

annual rate of ≥ 20 cases per 100,000 population (i.e., twice the national average). ACIP recommended that HepA vaccination be considered for children aged ≥ 2 years who were living in states, counties, and communities with rates of HAV disease ≥ 10 cases per 100,000 population but < 20 cases per 100,000 population. In 1999, six states met these criteria: Arkansas, Colorado, Missouri, Montana, Texas, and Wyoming. The remaining 33 states (i.e., nonvaccinating states) and the District of Columbia (DC) did not meet the ACIP incidence thresholds for HepA vaccination. ACIP recommended that older children (e.g., up to age 10–15 years) residing in communities with high rates of HAV disease be vaccinated to prevent epidemics. States that met incidence criteria for “recommend” vaccination (11 states) or “consider” vaccination (six states) were encouraged to consider

strategies for increasing childhood HepA vaccination rates (e.g., vaccination before entering child care or school or when making health care visits for other purposes) (6).

In 2006, ACIP recommended HepA vaccination at age 12–23 months for all children in the United States (18). ACIP encouraged continuation of existing HepA vaccination programs for children aged 2–18 years and consideration of catch-up vaccination, especially in the context of increasing incidence or ongoing outbreaks among children or adolescents (18).

Data Collection and Analysis

This report summarizes results from published literature and novel CDC analyses. These results are derived from multiple data sources including the National Immunization Survey (NIS), NIS-Teen, the National Health Interview Survey (NHIS), and the National Notifiable Disease Surveillance System (NNDSS). Certain results for HepA vaccination coverage are presented by the state's status (i.e., incidence of HAV disease and the 1999 ACIP stratified HepA vaccination recommendations): recommended (11 states), considered (six states), or nonvaccinating (33 states and DC).

NIS provides vaccine coverage estimates at the national, state, and selected local area levels (23). NIS began collecting data on HepA vaccine coverage among children aged 24–35 months in 2003 (24). After ACIP recommended routine HepA vaccination for children aged 12–23 months in 2006, data for children aged 19–35 months were collected and reported as national ≥ 2 -dose coverage for 2008 and 2010, and as national ≥ 1 dose coverage for 2009 (25–27). Starting in 2011, national HepA coverage was reported annually as ≥ 1 and ≥ 2 doses, and national coverage for ≥ 1 dose and ≥ 2 doses was included in the reports for up to four years retrospectively (28–30). NIS reports for 2008, 2010–2013 also included ≥ 2 -dose HepA coverage by economic status (at or above the poverty level or below the poverty level), and by mutually exclusive race/ethnicity categories (non-Hispanic white only, non-Hispanic black only, Hispanic [in combination with any race], non-Hispanic Asian only, and non-Hispanic multiracial). In 2009, NIS data for HepA vaccine coverage were reported for ≥ 1 dose by mutually exclusive race/ethnicity categories including non-Hispanic AI/AN, and non-Hispanic Native Hawaiian or Other Pacific Islander (NHOPI) (27).

To summarize progress toward eliminating HAV disease in the United States, CDC analyzed or reanalyzed NIS HepA coverage data for children 19–35 months by year (2008–2013) and number of doses (≥ 1 and ≥ 2). This report includes national coverage estimates, and coverage estimates according to 1999 ACIP “recommended” (11 states), “considered” (six states), or nonvaccinating (33 states and DC) status, by economic status,

and by mutually exclusive race/ethnicity categories. Data for non-Hispanic AI/AN only and NHOPI only categories also were included.

Subjects interviewed for NIS were identified via random-digit dialing, which included both landlines and, starting in 2011, cellular telephone numbers. Demographic information and health insurance status were collected by telephone interview of a parent or guardian from households with an age-eligible child. After consent, a mail survey of vaccination providers was used to obtain the child's vaccination history. The data were weighted to be representative of the population of U.S. children aged 19–35 months. Adjustments were made to compensate for nonresponse and for households without telephones and those with multiple phone lines or mixed telephone use (i.e., landlines and cellular).

For older children and adults, HepA vaccination coverage rates were taken from published surveys. Estimates for adolescents aged 13–17 years were from the NIS-Teen and estimates for adults aged 18–49 years were from the NHIS (31,32).

The number and rates of HAV disease cases overall, by race/ethnicity, age, and state were obtained from published surveillance data from NNDSS. NNDSS receives weekly reports from state health departments summarizing results of case investigations conducted by local and state health department personnel (5,15,33,34).

CDC estimated the prevalence of anti-HAV from NHANES data. NHANES conducts surveys in 2-year cycles of a representative sample of the noninstitutionalized U.S. civilian population. Survey data from 1999–2000 and 2009–2010 were used to estimate anti-HAV prevalence among U.S.-born persons aged ≥ 6 years. The prevalence of anti-HAV was compared between the two survey cycles by age, and prevalence was compared in 2009–2010 for U.S.-born non-Hispanic whites, non-Hispanic blacks, and Hispanics. Sample sizes were insufficient to examine other racial and ethnic groups among U.S.-born persons (35). Analysis was performed in SAS-callable SUDAAN (Version 11.0) using sampling weights to produce population estimates. A *p* value of <0.05 was considered significant.

Measurement of total anti-HAV was performed at CDC using the HAVAB-EIA solid phase EIA Assay (Abbott Diagnostics, Chicago, Illinois) for 1999–2000 and the Vitros HAV-T Anti-HAV Total assay (VITROS Immunodiagnostic System, Ortho-Clinical Diagnostics, Inc., Rochester, New York) for 2009–2010.* A positive result was defined for

*This qualitative assay was assessed for cut-off in mIU/mL using a World Health Organization Second International Standard dilution series against three master lots of the anti-HAV total reagents. The concentration at the cut-off assay mean was 30 mIU/mL (range: 29–31 mIU/mL) (Maria-Magdalena Patru, Ortho Clinical Diagnostics, personal communication, 2014).

purposes of this analysis as having anti-HAV likely to correlate with protection. The serologic correlate of protection against HAV disease is not well defined but has been estimated as anti-HAV of approximately 20 IU/mL (11). Assays for anti-HAV do not distinguish between antibody induced by HAV infection and antibody induced by HepA vaccination.

Results

Hepatitis A Vaccination Coverage

In CDCs analyses, significant differences were found for 2008–2013 estimates of ≥ 1 -dose HepA vaccine coverage among children aged 19–35 months by states according to 1999 ACIP recommended, considered, or nonvaccinating status. Coverage was highest in the 11 states where HepA vaccination was recommended, slightly slower in the six states where HepA vaccination was to be considered, and lowest in states where HepA vaccination was not recommended until 2006. By 2013, ≥ 1 -dose HepA vaccine coverage was 82%–86% in the three groups of states, and remaining disparities were decreasing. The pattern of ≥ 2 -dose HepA vaccine coverage, although at a lower level, was similar to ≥ 1 -dose HepA vaccine coverage reaching 53%–57% in 2013. Differences among 1999 vaccinating (recommended and considered) and nonvaccinating states were no longer significant in 2010, 2012, and 2013 (Table 1).

CDC analyses showed children living below the poverty level had greater HepA ≥ 1 -dose vaccine coverage than children at or above the poverty level during 2008–2010. During 2008–2013, HepA ≥ 2 -dose coverage was similar for children above or at the poverty level and below the poverty level, except in 2012, when children above and at the poverty level had greater coverage than children below the poverty level (Table 2).

Differences in HepA coverage were substantial among racial/ethnic groups for both ≥ 1 dose and ≥ 2 doses. Hispanic and Asian children had the greatest point estimates for ≥ 1 -dose and ≥ 2 -dose coverage in 2008. Point estimates of HepA vaccine coverage remained consistently lower among non-Hispanic white and non-Hispanic black children than among children in other racial/ethnic groups. Nevertheless, in 2013, ≥ 1 -dose coverage had increased to 80% and 82% among non-Hispanic white and non-Hispanic black children, respectively (Table 3).

Published 2009 NIS-Teen data for national ≥ 1 -dose and ≥ 2 -dose HepA coverage among adolescents aged 13–17 years were 42.0% (95% CI: 40.8%–43.2%) and 29.5% (95% CI: 28.3%–30.7%), respectively (31). Differences were evident among states stratified by 1999 ACIP recommended, considered, or nonvaccinating status. Coverage with ≥ 1 dose

and ≥ 2 doses was 74.3% (95% CI: 71.1%–77.1%) and 60.4% (95% CI: 56.8%–63.9%) in areas recommended for vaccination, 54.0% (95% CI: 50.5%–57.4%) and 38.7% (95% CI: 35.5%–42.2%) in areas considered for vaccination, and 27.8% (95% CI: 26.6%–29.0%), and 16.3% (95% CI: 15.4%–17.3%) in nonvaccinating states, respectively (31). Coverage by race/ethnicity showed a pattern similar to that seen among children aged 19–35 months in the CDC analysis for this report (Table 3).

Published NHIS estimates of national ≥ 2 -dose HepA vaccine coverage are from self-report of vaccination. Estimates for 2007 among adults aged 18–49 years and 2012 among adults aged 19–49 years were similar, 12.1% (95% CI: 9.9%–14.8%) and 12.2% (95% CI: 11.5%–13.0%), respectively (36,37). In 2012, coverage was higher among adults who had traveled outside the United States since 1995 to a country of high or intermediate hepatitis A endemicity (18.9%; 95% CI: 17.6%–20.3%) (37). In contrast to estimates from NIS for children aged 19–35 months, and NIS-Teen for adolescents aged 13–17 years, NHIS HepA coverage among Hispanic adults was lower in 2007 and 2012 (7.1%; 95% CI: 4.3%–11.6% and 10.5%; 95% CI: 9.2%–11.9%, respectively) than among other racial/ethnic groups, and significantly lower than among non-Hispanic whites, whose coverage rates were similar to national coverage rates (36,37).

Acute Hepatitis A in the Vaccine Era

Reports from NNDSS documented a steady decline in the annual rate of HAV disease from 11.7 cases per 100,000 population in 1996 to 2.6 cases per 100,000 population in 2003 (5). Rates of HAV disease in 17 states with HepA vaccination previously recommended (11 states) or considered (six states) were lower than rates in the 33 previously nonvaccinating states and DC (2.5 and 5.7 cases per 100,000 population, respectively) (16). Disparities in the distribution of cases by geographic area decreased notably nationwide, and by 2007 had almost disappeared (5) (Figure 3). Rates of HAV disease declined 96.6% from 1996 to 2011 (from 11.7 to 0.4 cases per 100,000 population), and the number of reported cases decreased from 31,032 to 1,398, respectively (Figure 1). Previously observed cyclic increases in HAV disease disappeared. Starting in 2007, children aged ≥ 9 years had the lowest rate of HAV disease of any age group; the rate of HAV disease was < 1 case per 100,000 population in all age groups starting in 2009 (Figure 2) (15).

Declines in rates of HAV disease were most striking by racial/ethnic group. From the average rate for 1990–1997 to 2003, the rate of HAV disease among Native Americans

TABLE 1. Estimated national ≥ 1 -dose and ≥ 2 -dose coverage of hepatitis A vaccine among children aged 19–35 months by reporting year and by 1999 ACIP hepatitis A vaccine recommendations* — National Immunization Survey, United States, 2008–2013

No. of doses	Year	National % (95% CI)	11 states [†]	6 states [§]	33 states and DC [¶]
			HepA vaccination recommended for children aged ≥ 2 years % (95% CI)	HepA vaccination considered for children aged ≥ 2 years % (95% CI)	No routine HepA vaccination for children aged ≥ 2 years % (95% CI)
≥ 1	2013	83.1 (81.9–84.3)	86.1 (82.5–89.7)	84.4 (81.8–87.0)	81.6 (80.2–83.0)**
	2012	81.5 (80.4–82.6)	85.5 (82.4–88.6)	83.3 (81.0–85.6)	79.3 (78.0–80.6) ^{††}
	2011	81.2 (80.2–82.2)	86.7 (84.5–88.9)	83.5 (81.1–85.9)	78.2 (76.9–79.5) ^{††}
	2010	78.3 (77.2–79.4)	82.5 (79.4–85.6)	82.0 (80.0–84.0)	75.6 (74.3–76.9) ^{††}
	2009	75.0 (73.9–76.1)	83.4 (80.9–85.9)	78.1 (75.4–80.8)	70.8 (69.4–72.2) ^{††}
	2008	70.5 (69.4–71.6)	83.0 (80.8–85.2)	77.0 (73.9–80.1)	63.8 (62.4–65.2) ^{††}
≥ 2	2013	54.7 (53.1–56.3)	56.8 (52.1–61.5)	57.4 (53.6–61.2)	53.1 (51.4–54.8)
	2012	53.0 (51.5–54.5)	54.3 (49.9–58.7)	55.5 (52.5–58.5)	51.9 (50.4–53.4)
	2011	52.2 (50.8–53.6)	56.5 (52.8–60.2)	54.7 (51.4–58.0)	49.7 (48.2–51.2) ^{††}
	2010	49.7 (48.3–51.1)	51.9 (48.1–55.7)	50.1 (46.9–53.3)	48.8 (47.3–50.3)
	2009	46.6 (45.2–48.0)	51.0 (47.4–54.6)	47.6 (43.7–51.5)	44.6 (43.1–46.1) ^{††}
	2008	40.4 (39.2–41.6)	45.6 (42.5–48.7)	44.2 (40.3–48.1)	37.2 (35.8–38.6) ^{††}

Sources: Include estimates of national coverage for 2008–2013. CDC. National, state and local area vaccination coverage among children aged 19–35 months—United States, 2008. MMWR Morb Mortal Wkly Rep 2009;58:921–6; Byrd KK, Santibanez TA, Chaves SS. Predictors of hepatitis A vaccination among young children in the United States. Vaccine 2011;29:3254–9; CDC. National, state, and local area vaccination coverage among children aged 19–35 months—United States, 2010. MMWR Morb Mortal Wkly Rep 2011;60:1157–63; CDC. National, state, and local area vaccination coverage among children aged 19–35 months—United States, 2011. MMWR Morb Mortal Wkly Rep 2012;61:689–96; CDC. National, state, and local area vaccination coverage among children aged 19–35 months—United States, 2012. MMWR Morb Mortal Wkly Rep 2013;62:733–40; CDC. National, state, and local area vaccination coverage among children aged 19–35 months—United States, 2013. MMWR Morb Mortal Wkly Rep 2014;63:741–8.

Abbreviations: ACIP = Advisory Committee on Immunization Practices; CI = confidence interval; DC = District of Columbia; HepA = hepatitis A vaccine.

* In 1999, ACIP recommendations for children aged ≥ 2 years were stratified (i.e., “recommend” vaccination, “consider” vaccination or no recommendation for routine vaccination) on the basis of the incidence of HAV infection in geographic locations.

[†] Eleven states with 1987–1997 average rate of ≥ 20 cases of acute HAV infection per 100,000 population and recommended HepA vaccination for children aged ≥ 2 years in 1999: Alaska, Arizona, California, Idaho, Nevada, New Mexico, Oklahoma, Oregon, South Dakota, Utah, and Washington.

[§] Six states with 1987–1997 average rate of ≥ 10 cases of acute HAV infection per 100,000 population and considered HepA vaccination for children aged ≥ 2 years in 1999: Arkansas, Colorado, Missouri, Montana, Texas, and Wyoming.

[¶] Thirty-three states and the District of Columbia with 1987–1997 average rate < 10 cases of acute HAV per 100,000 population and no recommendation for routine HepA vaccination for children in 1999: Alabama, Connecticut, Delaware, Florida, Georgia, Hawaii, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, West Virginia, Wisconsin and the District of Columbia.

** Statistically significant differences ($p < 0.05$) in estimated coverage by ACIP recommendation: 11 states, 6 states, and 33 states and DC.

^{††} Statistically significant differences ($p < 0.01$) in estimated coverage by ACIP recommendation: 11 states, 6 states, and 33 states and DC.

and Hispanics decreased by 98.8% (95% CI: 98.4%–99.2%) and 86.4% (95% CI: 85.3%–87.1%) to 0.8 and 2.8 cases per 100,000 population, respectively (16,38). Rates of HAV disease among non-Hispanic whites, non-Hispanic blacks, and Asians/Pacific Islanders decreased by 78.3% (95% CI: 77.1%–78.9%), 80.5% (95% CI: 79.0%–82.6%), and 63.0% (95% CI: 57.1%–68.9%), to 1.5, 1.5, and 1.7 cases per 100,000 population, respectively (16). By 2011, national rates of HAV disease among all racial/ethnic groups had declined to < 1.0 case per 100,000 population, virtually eliminating absolute disparities among racial/ethnic groups (Figure 4) (15).

Despite these historic declines, in 2011, approximately 1,400 cases of HAV disease were reported, and in 2012, reports of 1,562 cases represented the first increase in cases since 1995, when HepA vaccine became available in the United States ($p < 0.01$) (5,39). Among cases in 2012, rates continued to decline for children aged ≤ 19 years but increased for adults aged

40–49 years ($p = 0.07$), for adults aged ≥ 50 years ($p < 0.05$), and among non-Hispanic whites ($p < 0.01$). An estimated 45.8% of persons with HAV cases were hospitalized, and 0.6% died, which represented increases from previous years. Interviews to determine possible sources of exposure were available for 63.5% of cases; a source was identified in only 20.3% of cases, representing 13% of all cases. The majority of possible exposures were attributed to international travel outside the United States and Canada (12.9%) and to contact with an HAV-infected person (approximately 8.1%). Outbreaks associated with contaminated food or water accounted for 1.8% of cases (39). In 2013, reported cases increased again to 1,781 (34). Contributing to the increase in 2013 was a foodborne outbreak tied to contaminated pomegranate arils imported from Turkey, which sickened 165 patients in 10 states. Most (93%) persons with cases in the 2013 outbreak were aged ≥ 18 years; 42% were hospitalized, three developed fulminant hepatitis, and one required a liver transplant (40).

TABLE 2. Estimated national ≥ 1 -dose and ≥ 2 -dose coverage of hepatitis A vaccine among children aged 19–35 months, by reporting year, and income above and at or below the poverty level* — National Immunization Survey, United States, 2008–2013

No. of doses	Year	Above and at poverty level	Below poverty level
		% (95% CI)	% (95% CI)
≥ 1	2013	82.7 (81.2–84.2)	84.0 (81.7–86.3)
	2012	82.3 (81.0–83.6)	80.8 (78.7–82.9)
	2011	80.3 (79.1–81.5)	82.4 (80.6–84.2)
	2010	77.0 (75.6–78.4)	80.7 (78.7–82.7) [†]
	2009	73.2 (71.9–74.5)	78.3 (76.1–80.5) [†]
	2008	68.9 (67.6–70.2)	73.6 (71.2–76.0) [†]
≥ 2	2013	56.1 (54.2–58.0)	53.5 (50.6–56.4)
	2012	55.4 (53.6–57.2)	49.4 (46.7–52.1) [†]
	2011	53.4 (51.8–55.0)	50.7 (48.2–53.2)
	2010	49.1 (47.5–50.7)	51.0 (48.3–53.7)
	2009	46.2 (44.7–47.7)	47.3 (44.3–50.3)
	2008	40.8 (39.4–42.2)	39.7 (37.1–42.3)

Sources: Include 2008 and 2010–2013 data for ≥ 2 dose estimates and 2009 data for ≥ 1 dose estimate of below the poverty level. CDC. National, state, and local area vaccination coverage among children aged 19–35 months—United States, 2008. MMWR Morb Mortal Wkly Rep 2009;58:921–6; CDC. National, state, and local area vaccination coverage among children aged 19–35 months—United States, 2010. MMWR Morb Mortal Wkly Rep 2011;60:1157–63; CDC. National, state, and local area vaccination coverage among children aged 19–35 months—United States, 2011. MMWR Morb Mortal Wkly Rep 2012;61:689–96; CDC. National, state, and local area vaccination coverage among children aged 19–35 months—United States, 2012. MMWR Morb Mortal Wkly Rep 2013;62:733–40; CDC. National, state, and local area vaccination coverage among children aged 19–35 months—United States, 2013. MMWR Morb Mortal Wkly Rep 2014;63:741–8; Byrd KK, Santibanez TA, Chaves SS. Predictors of hepatitis A vaccination among young children in the United States. Vaccine 2011;29:3254–9.

Abbreviation: CI = confidence interval.

* Children were classified as below poverty if their total family income was less than the poverty threshold specified for the applicable family size and number of children aged <18 years. Children with total family income at or above the poverty threshold specified for the applicable family size and number of children aged <18 years were classified as at or above poverty. Poverty thresholds reflect yearly changes in the Consumer Price Index. Additional information is available at <http://www.census.gov/hhes/www/poverty.html>.

[†] Statistically significant difference ($p < 0.01$) in estimated vaccination coverage by above and at poverty level and below poverty level.

Seroprevalence of Antibody to Hepatitis A Virus

Analysis of anti-HAV prevalence from 1999–2000 to 2009–2010, showed an increase of 28.1% and 15.5% among children aged 6–11 and 12–19 years, respectively ($p < 0.01$). Among adults aged 20–29 years and 30–39 years, point estimates of anti-HAV prevalence remained largely unchanged between the two surveys. Prevalence was lower by 21.2%, 16.9%, and 27.4% among adults aged 40–49, 50–59, and ≥ 60 years, respectively ($p < 0.01$). Among all persons aged ≥ 6 years, the estimated prevalence of anti-HAV decreased from 31.2% during 1999–2000 to 26.5% during 2009–2010, respectively ($p = 0.06$) (Table 4).

During 2009–2010, the prevalence of anti-HAV among U.S.-born residents differed significantly by race/ethnicity.

Overall, prevalence was lowest among non-Hispanic whites, intermediate among non-Hispanic blacks, and greatest among Hispanics, a pattern reflected across all age groups. Among non-Hispanic whites, prevalence was <20% in each 10-year age group of adults aged 20–59 years (Table 5).

Discussion

During 1996–2006, ACIP made incremental recommendations for HepA vaccination focused on children and groups with the highest rates of infection (18). National declines occurred in reported cases of HAV disease despite uneven coverage of HepA vaccine. Declines were accompanied by near elimination of absolute disparities by age, race/ethnicity, and geographic area. In 2011, rates of HAV disease were the lowest ever recorded since HAV disease reporting began in 1966 (15). Moreover, declines were greater than expected on the basis of HepA vaccination coverage. An analysis of the impact of HepA vaccination during 1995–2001 found national coverage among children aged 2–18 years averaged 10%, whereas an estimated 51% of expected cases of HAV disease in this age group had been prevented in 2001. Modest vaccination coverage appeared to be associated with a degree of indirect protection for unvaccinated persons in the community, or herd protection (41–43). Possible factors responsible for herd protection from HepA vaccination include the high efficacy of a single dose of vaccine, vaccine-induced immunity of young children who otherwise might sustain communitywide transmission of HAV, and focused vaccination among populations with the highest rates of HAV infection, including disadvantaged populations (2,41,42).

Demonstration projects and other special campaigns to reach children in high-risk areas and disadvantaged populations contributed to initial rapid increases in HepA vaccination (38,44–46). The Vaccines for Children (VFC) program was implemented in 1994 to provide vaccines at no cost to children who might otherwise not be vaccinated because of inability to pay for vaccine (47), and HepA vaccine was added to the VFC program in 1995. During 2008–2010, national ≥ 1 -dose HepA vaccine coverage was greater among children aged 19–35 months living below than, above, or at the poverty level. The availability of VFC program vaccines probably contributed to reductions in economic disparities in access to HepA vaccination and resulted in increased HepA vaccine coverage among economically disadvantaged populations, as has been reported for other recommended childhood vaccines (47,48).

HAV disease is much less common in the United States than in the past primarily because of the success of childhood HepA vaccination. However, nationwide, approximately 1,000

TABLE 3. Estimated national ≥ 1 -dose and ≥ 2 -dose coverage of hepatitis A vaccine among children aged 19–35 months, by reporting year and race/ethnicity* — National Immunization Survey, United States, 2008–2013

No. of doses	Year	White, non-Hispanic % (95% CI)	Black, non-Hispanic % (95% CI)	Hispanic % (95% CI)	AI/AN % (95% CI)	Asian % (95% CI)	NHOPI % (95% CI)	Multi-racial, non-Hispanic % (95% CI)
≥ 1	2013	80.3 (78.8–81.8)	82.4 (79.1–85.7)	86.0 (82.8–89.2)	89.8 (83.1–96.5)	90.9 (85.8–96.0)	91.1 (83.3–98.9)	86.7 (83.2–90.2) [†]
	2012	79.4 (78.0–80.8)	83.1 (80.2–86.0)	84.2 (81.7–86.7)	73.2 (52.7–93.7)	87.2 (83.3–91.1)	76.8 (58.2–95.4)	80.2 (75.3–85.1) [†]
	2011	77.0 (75.7–78.3)	83.1 (80.5–85.7)	86.7 (84.8–88.6)	81.7 (73.5–89.9)	87.1 (81.5–92.7)	84.9 (73.2–96.6)	79.5 (74.3–84.7) [†]
	2010	72.8 (71.2–74.4)	79.8 (76.9–82.7)	86.3 (84.2–88.4)	81.9 (74.4–89.4)	81.7 (76.3–87.1)	77.5 (63.8–91.2)	81.1 (76.5–85.7) [†]
	2009	71.3 (69.9–72.7)	71.9 (68.6–75.2)	81.9 (79.5–84.3)	87.0 (77.2–96.8)	82.9 (77.1–88.7)	90.4 (84.2–96.6)	72.6 (67.1–78.1) [†]
	2008	64.9 (63.4–66.4)	70.5 (67.3–73.7)	78.5 (76.2–80.8)	74.9 (66.6–83.2)	80.7 (75.7–85.7)	76.7 (61.8–91.6)	74.1 (69.1–79.1) [†]
≥ 2	2013	53.4 (51.5–55.3)	49.1 (44.8–53.4)	56.6 (52.6–60.6)	58.6 (47.1–70.1)	67.3 (60.5–74.1)	50.2 (26.1–74.3)	57.8 (51.8–63.8) [†]
	2012	52.6 (50.8–54.4)	52.0 (48.1–55.9)	54.4 (51.0–57.8)	49.8 (34.2–65.4)	57.5 (49.8–65.2)	48.7 (26.9–70.5)	49.4 (43.7–55.1)
	2011	50.0 (48.4–51.6)	50.9 (47.2–54.6)	56.3 (53.1–59.5)	50.3 (39.4–61.2)	56.9 (49.8–64.0)	53.2 (37.0–69.4)	50.2 (43.6–56.8) [§]
	2010	45.8 (44.2–47.4)	48.6 (44.9–52.3)	57.0 (53.9–60.1)	50.9 (40.9–60.9)	50.8 (43.3–58.3)	59.0 (42.4–75.6)	49.8 (43.2–56.4) [†]
	2009	46.2 (44.6–47.8)	41.3 (37.6–45.0)	49.3 (46.0–52.6)	33.2 (23.4–43.0)	50.9 (41.8–60.0)	61.4 (42.9–79.9)	47.8 (41.9–53.7) [†]
	2008	37.6 (36.1–39.1)	39.7 (36.0–43.4)	44.7 (41.8–47.6)	43.0 (33.0–53.0)	47.4 (40.0–54.8)	33.5 (14.1–52.9)	42.3 (36.3–48.3) [†]

Sources: Include 2009 data for ≥ 1 dose estimates and 2008 and 2010–2013 data for ≥ 2 dose estimates. Byrd KK, Santibanez TA, Chaves SS. Predictors of hepatitis A vaccination among young children in the United States. *Vaccine* 2011;29:3254–9; CDC. National, state, and local area vaccination coverage among children aged 19–35 months—United States, 2008. *MMWR* 2009;58:921–6; CDC. National, state, and local area vaccination coverage among children aged 19–35 months—United States, 2010. *MMWR Morb Mortal Wkly Rep* 2011;60:1157–63; CDC. National, state, and local area vaccination coverage among children aged 19–35 months—United States, 2011. *MMWR Morb Mortal Wkly Rep* 2012;61:689–96; CDC. National, state, and local area vaccination coverage among children aged 19–35 months—United States, 2012. *MMWR Morb Mortal Wkly Rep* 2013;62:733–40; CDC. National, state, and local area vaccination coverage among children aged 19–35 months—United States, 2013. *MMWR Morb Mortal Wkly Rep* 2014;63:741–8.

Abbreviations: AI/AN = American Indian/Alaska Native; CI = confidence interval; NHOPI = Native Hawaiian and other Pacific Islander.

* Children's race/ethnicity was reported by parent or guardian. Children identified in this report as white, black, Asian, AI/AN, NHOPI, or multiracial were reported by the parent or guardian as non-Hispanic. Children identified as multiracial had more than one race category selected. Children identified as Hispanic might be of any race.

[†] Statistically significant difference ($p < 0.01$) in estimated vaccination coverage by race/ethnicity.

[§] Statistically significant difference ($p < 0.05$) in estimated vaccination coverage by race/ethnicity.

new cases are reported annually, and increases in cases in 2012 among adults aged ≥ 40 years and increases again in 2013 suggest the epidemiology of HAV infection in the United States might be changing. Although current NNDSS surveillance is missing risk-factor information for 36% of cases, investigations of acute cases in select sites during 2005–2007 found that travel was the greatest identified risk factor (46%) (49). Travel-related HAV disease theoretically could be prevented by ACIP-recommended pre-exposure prophylaxis consisting of active or passive immunization or a combination of both active and passive immunization (50). More challenging is the prevention of unknown exposures and prevention of exposures to contaminated food despite continuing efforts by FDA (51). Imports of fresh and frozen fruits and vegetables to the United States from HAV-endemic countries have increased steadily (52). Imported food from HAV-endemic countries has been identified as the source for recent increases in cases of HAV disease in European and other developed countries (53–56). Some investigators suggest that a substantial proportion of cases without recognized exposure are related to contaminated food (55,56). Herd protection provides a barrier against spread of HAV in populations but will not protect susceptible persons when exposed (43,57).

The increase in the prevalence of anti-HAV among U.S.-born children between 1999–2000 and 2009–2010 is indicative of increased protection against HAV infection through greater

vaccination coverage, as has been suggested previously (58). However, during 2009–2010, an estimated 50% or more of non-Hispanic white and non-Hispanic black children aged < 19 years still lacked anti-HAV protection. These data would not have reflected increases in ≥ 1 -dose childhood HepA vaccination coverage that were present during 2011–2013 NIS data, which would have resulted in increased seroprevalence of anti-HAV among children of all racial/ethnic groups. These data also would not reflect needed improvements in ≥ 2 -dose HepA vaccination among all U.S. children, which is more likely than a single dose of HepA vaccine to ensure protection into adulthood (59,60).

In contrast to increasing anti-HAV prevalence among children, anti-HAV prevalence among U.S.-born adults decreased between the 1999–2000 and 2009–2010 NHANES (Table 4). Even among Hispanic adults, who historically had among the highest seroprevalence of anti-HAV, the 2009–2010 point estimates of prevalence were approximately 50% among Hispanic adults in the third and fourth decade of life. The lowest prevalence was among U.S.-born non-Hispanic whites ($< 20\%$ among adults aged 20–59 years), similar to findings in a more extensive analysis of NHANES data (61). These NHANES estimates suggest that a large proportion of the U.S. adult population is susceptible to acute HAV at ages when the risk for illness and death is greatest.

TABLE 4. National prevalence of total antibody to hepatitis A virus, by age group — National Health and Nutrition Examination Survey, United States, 1999–2000 and 2009–2010

Age group (yrs)	Anti-HAV prevalence				
	1999–2000		2009–2010		p value
	No. positive/tested	% (95% CI)	No. positive/tested	% (95% CI)	
6–11	173/805	18.9 (10.4–31.8)	547/916	47.0 (39.2–54.8)	<0.01
12–19	402/1737	20.0 (14.4–27.1)	449/1024	35.5 (27.7–44.1)	<0.01
20–29	116/518	17.5 (13.5–22.2)	166/695	22.2 (18.9–25.9)	0.10
30–39	123/509	18.9 (14.7–24.0)	92/650	13.5 (10.2–17.8)	0.09
40–49	217/469	34.8 (30.1–39.7)	94/632	13.6 (10.7–17.1)	<0.01
50–59	177/381	37.8 (31.4–44.7)	159/560	20.9 (16.8–25.8)	<0.01
≥60	828/1,132	64.3 (56.7–71.2)	625/1376	36.9 (32.6–41.4)	<0.01
All (≥6)	2,036/5,551	31.2 (28.1–34.6)	2,132/5,853	26.5 (23.3–30.0)	0.06

Abbreviations: CI = confidence interval; HAV = hepatitis A virus.

TABLE 5. National prevalence of total antibody to hepatitis A virus (anti-HAV) by race/ethnicity — National Health and Nutrition Examination Survey, United States, 2009–2010

Age group (yrs)	Anti-HAV prevalence					
	White, non-Hispanic		Black, non-Hispanic		Hispanic	
	No. positive/tested	% (95% CI)	No. positive/tested	% (95% CI)	No. positive/tested	% (95% CI)
6–11	86/284	28.4 (22.6–34.9)	98/186	50.8 (41.7–60.0)	326/385	84.0 (73.7–90.8)
12–19	85/371	23.6 (16.6–32.4)	92/234	38.9 (31.0–47.5)	245/357	69.4 (57.8–79.0)
20–29	61/368	17.6 (14.0–21.9)	31/155	20.4 (15.2–26.9)	62/135	47.0 (41.4–52.7)
30–39	38/417	9.7 (6.6–13.9)	24/120	20.2 (12.9–30.4)	18/87	21.4 (11.5–36.2)
40–49	49/424	12.0 (8.6–16.4)	22/124	17.4 (9.6–29.4)	21/71	31.7 (19.9–46.4)
50–59	63/352	16.6 (12.4–22.0)	57/133	43.0 (35.8–50.5)	38/69	57.2 (35.9–76.2)
≥60	343/965	32.3 (28.7–36.2)	149/243	62.8 (55.0–70.0)	124/153	83.8 (74.2–90.2)
All (≥6)	725/3,181	20.3 (18.1–22.8)	473/1,195	35.0 (31.7–38.5)	834/1,257	60.1 (53.1–66.7)

Abbreviations: CI = confidence interval; HAV = hepatitis A virus.

HAV remains endemic in much of the world (9,12,13,57). International travel and the global food economy create conditions that could contribute to HAV infection among an increasingly susceptible U.S. adult population. Targeted or risk-based vaccine recommendations are reported to be more complex to implement than age-based recommendations (62). The current ACIP recommendations for vaccinating adults with identified risk for HAV infection (e.g., travelers, persons with chronic liver disease, and MSM) require providers and patients to have timely knowledge of risk, vaccination history, and possible susceptibility to HAV infection. Lack of provider and patient knowledge has been identified as a barrier to adult vaccination (63). Universal childhood vaccination and risk-based approaches to adult HepA vaccination have been successful in preventing HAV-related hospitalizations (64). However, this success falls short, as demonstrated by very low ($\leq 20\%$) adult HepA vaccination coverage among travelers and persons with chronic liver disease, and accompanied by a high proportion of cases of disease among travelers, and hospitalizations among adults with chronic liver disease and other comorbid conditions (37,39,64,65). The increasing proportion of HAV disease cases among adults with identified

and unidentified sources of exposure adds importance to considering new strategies for preventing HAV infection among U.S. adults.

Limitations

The findings presented in this report are subject to at least six limitations. First, ACIP recommends that the first dose of HepA vaccine be administered to children at age 12–23 months and the second dose 6–18 months later. Because NIS surveys children aged 19–35 months, NIS coverage data probably underestimated ≥ 2 -dose HepA completion rates in children receiving a second dose after age 35 months (e.g., at school or child care entry) (66). Second, sample size was insufficient for reliable estimates of vaccine coverage and anti-HAV prevalence among some racial/ethnic groups, as indicated by wide 95% CIs. Third, race/ethnicity were not categorized similarly in survey data from NIS and NHANES, which prevented certain comparisons. Fourth, NHANES is representative of the non-institutionalized U.S. civilian population, and results might not be generalizable to the entire U.S. population. Fifth, changes in surveillance methods, definitions, and reporting have occurred

over the years, which might have resulted in underestimating or overestimating the number of cases diagnosed and nationally reported. Finally, these changes also might account for apparent discrepancies in acute HAV disease rates reported for the same periods (3,5,6,15).

Conclusion

ACIP-recommended childhood HepA vaccination in the United States has eliminated most absolute disparities in HAV disease by age, racial and ethnic group, and geographic area with relatively modest ≥ 1 -dose and ≥ 2 -dose vaccine coverage. Although population protection (as indicated by vaccination coverage and seroprevalence of anti-HAV) is increasing among children, the proportion of adults with protection has declined. New racial/ethnic-related disparities in protection are becoming evident. It will be years before HepA-vaccinated children replace adults in the population who currently lack protection. Rates of HAV disease have decreased overall; however, since 2007, rates have been higher among adults than among children aged ≤ 9 years, and rates among older age groups have plateaued or increased since 2011. The gap in HAV disease between young children and adults is an emerging health disparity that will require new strategies to continue progress toward elimination of HAV infection.

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Adaptation and National Dissemination of a Brief, Evidence-Based, HIV Prevention Intervention for High-Risk Men Who Have Sex with Men

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Summary

CDC's high-impact human immunodeficiency virus (HIV) prevention approach calls for targeting the most cost-effective and scalable interventions to populations of greatest need to reduce HIV incidence. CDC has funded research to adapt and demonstrate the efficacy of Personalized Cognitive Counseling (PCC) as an HIV prevention intervention. Project ECHO, based in San Francisco, California, during 2010–2012, involved an adaptation of PCC for HIV-negative episodic substance-using men who have sex with men (SUMSM) and a randomized trial to test its efficacy in reducing sexual and substance-use risk behaviors. Episodic substance use is the use of substances recreationally and less than weekly. PCC is a 30-minute to 50-minute counseling session that involves addressing self-justifications men use for engaging in risky sexual behavior despite knowing the potential for HIV infection. By exploring these justifications, participants become aware of the ways they make sexual decisions, become better prepared to realistically assess their risk for HIV during future risky situations, and make decisions to decrease their HIV risk. The findings of Project ECHO demonstrated the efficacy of PCC for reducing HIV-related substance-use risk behaviors. The study also demonstrated efficacy of PCC for reducing sexual risk behaviors among SUMSM screened as nondependent on targeted drug substances. CDC has identified PCC as a “best evidence” HIV behavioral intervention and supports its national dissemination. Several features of PCC enhance its feasibility of implementation: it is brief, delivered with HIV testing, relatively inexpensive, allows flexibility in counselor qualifications and delivery settings, and is individualized to each client. The original PCC and its adapted versions can contribute to reducing HIV-related health disparities among high-risk MSM, including substance users, by raising awareness of and promoting reductions in personal risk behaviors.

Introduction

Gay, bisexual, and other men who have sex with men (MSM) are affected disproportionately by human immunodeficiency virus (HIV) in the United States. Although approximately 3% of the adolescent and adult U.S. male population is estimated to have engaged in same-sex behavior in the past year (1), in 2011, MSM accounted for 65% of the estimated 49,273 new HIV infections and 82% of the estimated 38,825 HIV diagnoses among all males aged ≥ 13 years (2). Sexual risk behavior accounts for most HIV infections among MSM, and anal intercourse without a condom is the primary route for transmitting HIV infection to an uninfected person.

Over the past decade, the United States has demonstrated improvements in preventing new HIV infections. During 2002–2011, the annual HIV diagnosis rate decreased by 33.2% overall (from 24.1 per 100,000 population in 2002 to 16.1 per 100,000 population in 2011), with statistically significant decreases reported among women, persons aged

35–44 years, persons of multiple races, and injecting drug users (3). Although the annual number of HIV diagnoses during 2002–2011 remained stable for MSM overall, those aged 13–24 years and ≥ 45 years experienced increases in HIV diagnoses (3). MSM aged 13–24 years experienced a 133% increase in HIV diagnoses during that time period.

Racial/ethnic minority MSM are particularly affected by HIV. In 2011, black MSM accounted for an estimated 38% of all new HIV infections among all U.S. men, compared with an estimated 34% among white MSM (2). During 2008–2010, HIV infections increased 20% among young black MSM aged 13–24 years, and HIV infections increased 39% among Hispanic/Latino MSM aged 25–34 years (4). In contrast, increases in HIV infections during the same period were lower among white MSM aged 13–24 years and aged 25–34 years (18% and 20%, respectively) (4). In addition, in 2011, HIV continued to be listed among the top 10 leading causes of death among all U.S. men aged 25–54 years (5). Together these data indicate that improving the effectiveness

of HIV prevention efforts for MSM in the United States is a critical public health goal (6).

Many MSM experience HIV-related disparities in access to and receipt of medical care (7,8). Analysis of data from the 2006–2010 National Survey of Family Growth indicated that sexually active MSM (i.e., men who reported having sex with another man in the past 12 months) reported suboptimal rates of preventive services for HIV and other sexually transmitted diseases (STDs), including screening for infection and receiving behavioral counseling to reduce risk behaviors, as compared with men who only have sex with women (9). According to a National HIV Behavioral Surveillance survey of approximately 8,000 MSM, 11% of respondents self-reported being HIV-positive; among these HIV-positive men, 25% reported delayed linkage to HIV medical care, and 12% reported receiving no HIV care, and of those reporting at least one health care visit, 30% were not receiving life-sustaining antiretroviral medication (10). Racial/ethnic minority MSM report significantly lower rates of HIV testing and, if they test HIV-positive, lower rates of linkage to HIV medical care, retention in HIV medical care, access to antiretrovirals, and HIV viral suppression than their white counterparts (11–14). Data reported in 2010 from CDC's National HIV Surveillance System and Medical Monitoring Project indicated that black MSM, compared with white and Hispanic/Latino MSM, experience lower levels of linkage to HIV medical care (71.6% blacks versus 82.9% whites and 80.3% Hispanics/Latinos), retention in HIV medical care (46.3% versus 52.1% and 54.1%), access to antiretroviral prescriptions (47.1% versus 49.6% and 49.2%), and HIV viral suppression (37.0% versus 43.9% and 41.5%) (15). These data indicate increasing access to HIV care and treatment is critical for improving health outcomes and reducing HIV transmission among MSM.

HIV-related health disparities experienced by some MSM might be due to individual, interpersonal, community, and societal factors that can hamper access to health care and treatment. For some MSM, personal experiences of stigma, discrimination, and homophobia regarding their sexual orientation can result in adverse mental health outcomes, including depression, anxiety, elevated stress, and suicidal thoughts and attempts (16–21). Discrimination by health care providers (22), limited access to gay-friendly health services (23), and barriers to health insurance (23–25) also can contribute to HIV-related disparities experienced by MSM. The physical and mental health of MSM can be affected by syndemic conditions, which are conditions that individually or in combination can increase HIV risk. These syndemic conditions include, but are not limited to, substance use and abuse, mental health problems, prevalence of STDs in

the community, poverty, unemployment, and experiences of emotional and physical violence and abuse (7).

National survey data suggest that many MSM consume alcohol and other drugs that can impair judgment and increase risky behavior (26,27). Among MSM populations, methamphetamine, amyl nitrate (poppers), cocaine, and heavy alcohol use (i.e., binge drinking) are the substances most consistently associated with risky sexual behavior (28–30) and increased HIV risk (31). Many substance-using MSM (SUMSM) use these substances episodically* or recreationally, and many of these men might not be aware of their level of risk (32).

On the basis of the disproportionate occurrence of HIV among MSM and the national priority to reduce new infections among these men (33), evidence-based behavioral interventions are needed to reduce HIV-related sexual and substance-use risk behaviors. Few HIV prevention interventions exist for MSM (34), and of those that do exist, none have proven efficacy for reducing risky sex with concomitant substance use (30,35). Personalized Cognitive Counseling (PCC) is an evidence-based behavioral intervention that reduced events of anal sex without condoms among HIV-negative MSM in two efficacy trials. In one trial the intervention was delivered by professional mental health counselors (36), and in the second trial the intervention was delivered by paraprofessional counselors (37). Secondary analysis of data in a 2007 trial indicated PCC reduced events of anal sex without condoms among men of color, including men who were black, Hispanic/Latino, Asian, and of mixed race/ethnicity (38). A third trial testing the efficacy of a two-session PCC adapted for HIV-infected MSM did not show efficacy (39). Together these studies indicate PCC is an efficacious behavioral intervention for reducing sexual risk behavior (anal sex without condoms) among HIV-negative MSM.

PCC involves a brief counseling session for addressing self-justifications men use for engaging in risky behavior despite knowing the potential for HIV infection. By exploring self-justifications used for increased risky behavior, participants become aware of the ways they make decisions about sex, become better prepared to realistically assess their risk for acquiring HIV during future risky situations, and make decisions that decrease their HIV risk (40). PCC is delivered in conjunction with HIV testing and can contribute to reducing HIV-related health disparities among MSM by raising awareness of and promoting reductions in personal risk behaviors. The counseling session, HIV testing service, and referral process emphasize the importance of HIV prevention among men and their sex partners.

* Episodic substance use is the use of substances recreationally and less than weekly.

This report summarizes published findings of a CDC-funded research study to adapt and demonstrate the efficacy of the adapted PCC for reducing HIV-related risk behaviors among a high-risk population of episodic SUMSM. The report also describes efforts by CDC to translate the PCC curriculum into a package of user-friendly materials and to disseminate the intervention throughout the nation.

CDC's Office of Minority Health and Health Equity selected the intervention analysis and discussion that follows to provide an example of a program that might be effective in reducing HIV-related health disparities affecting high-risk MSM, including substance users. Criteria for selecting this program are described in the Background and Rationale for this supplement (41).

Methods

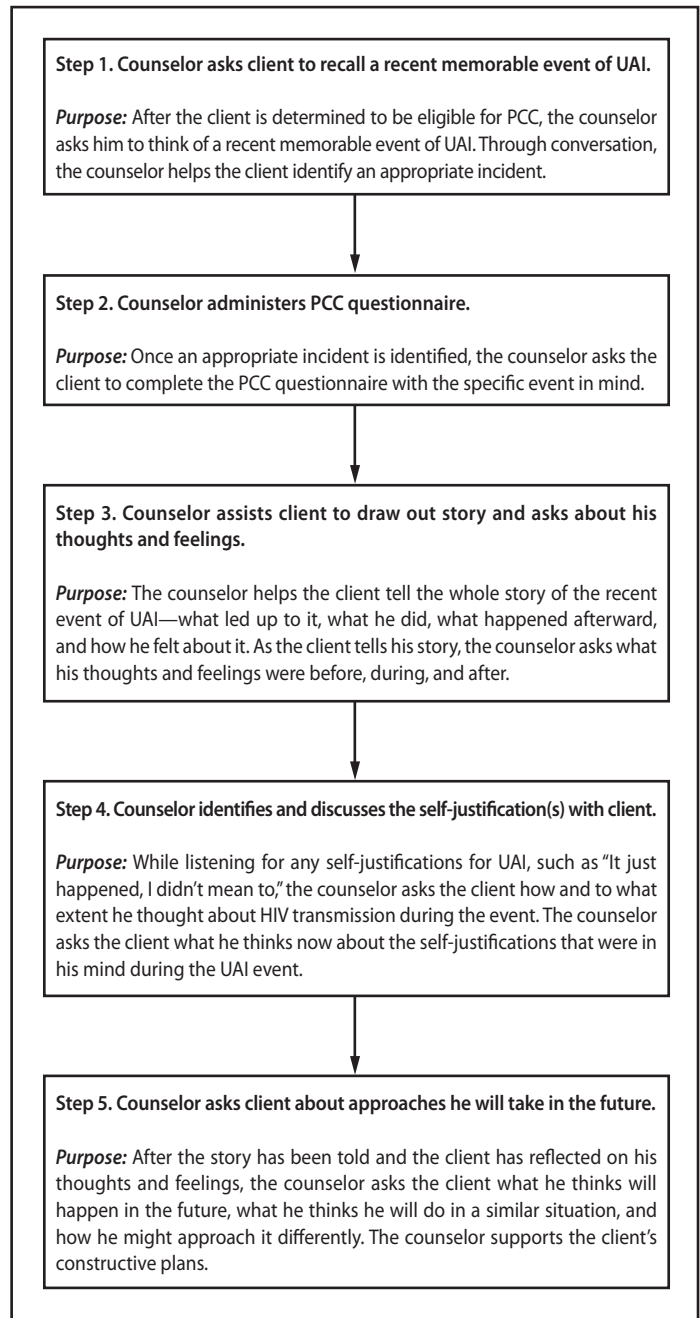
Intervention Methods

In 2007, CDC funded Public Health Foundation Enterprises to conduct a research study in collaboration with the San Francisco Department of Public Health (42). The study, Project ECHO, involved a systematic adaptation of PCC for HIV-negative episodic SUMSM (43) and a randomized trial to test the efficacy of the adapted PCC in reducing sexual and substance-use risk behaviors in this population at high risk for HIV (44,45). Episodic substance use was defined as use of substances recreationally and less than weekly.

PCC is a 30-minute to 50-minute counseling session delivered in conjunction with routine HIV testing. MSM clients work with a trained counselor to appraise their personal HIV risk and discuss less risky alternatives for future behavior. PCC is delivered in five steps: 1) the client recollects a memorable event of anal intercourse without a condom (or unprotected anal intercourse [UAI]), 2) the client completes a questionnaire containing self-justifications he might have used during the UAI event, 3) the counselor helps the client draw out the story of the memorable UAI event, 4) the counselor helps the client identify self-justifications that facilitated the UAI, and 5) the client decides how to handle future risky situations (Figure).

PCC was adapted for episodic SUMSM by focusing on self-justifications for engaging in UAI and concurrent substance use. The adapted PCC questionnaire included 17 items retained from the original PCC and 31 newly developed items specific to episodic SUMSM (43). A list of the most common self-justifications endorsed by SUMSM and details regarding the adaptation are reported elsewhere (43).

FIGURE. Five steps to implementing PCC risk-reduction intervention for men who have sex with men



Source: Adapted from University of California San Francisco, AIDS Health Project. Personalized cognitive counseling implementation manual. San Francisco, CA: University of California San Francisco; 2011. https://effectiveinterventions.cdc.gov/docs/default-source/pcc-docs/13-0204_PCC_Final_IM_Appendices_and_Workbook.pdf?sfvrsn=0.

Abbreviations: PCC = Personalized Cognitive Counseling; UAI = unprotected anal intercourse.

Data Collection and Analysis

The randomized trial occurred during May 2010–May 2012 in San Francisco. Episodic SUMSM who reported engaging in UAI while under the influence of alcohol and other drugs were recruited via street outreach at community venues frequented by MSM (e.g., outside of bars, clubs, gyms, and grocery stores). To recruit a racially and ethnically diverse sample, recruitment also occurred at community-based organizations serving black, Latino, and Asian/Pacific Islander MSM.

Eligible MSM included those reporting UAI with men while under the influence of one or any combination of substances (methamphetamine, poppers, crack or powder cocaine, or alcohol [if binge drinking]) 2 hours before or during sex within the past 6 months. Men were assigned randomly to either the intervention group (i.e., adapted PCC plus a rapid HIV test; $n = 162$) or the control group (i.e., rapid HIV test only; $n = 164$). All participants completed assessments at baseline and at 3- and 6-month follow-up, received a rapid HIV test following CDC's guidelines for HIV testing in health care settings (46), and received monetary incentives for participation. PCC participants received a booster intervention session after completing the 3-month follow-up assessment. Details regarding the adapted intervention and study methods are reported elsewhere (43). All study activities took place at the San Francisco Department of Public Health, and the University of California Committee on Human Research approved the study protocol.

Sexual risk outcomes reported during the past 3 months included number of UAI events (by type [insertive or receptive] and total number), number of UAI partners, number of UAI events with three most recent nonprimary partners, number of serodiscordant UAI events, and number of condom-protected anal intercourse events. Substance-use outcomes during the past 3 months included use of the following substances: alcohol when binge drinking (i.e., five or more drinks per occasion), ecstasy, gamma-hydroxybutyrate (GHB), marijuana, methamphetamine, poppers, crack, cocaine, prescription opioids (codeine, Vicodin, and OxyContin), and erectile dysfunction drugs (Viagra, Levitra, and Cialis). Substance use concurrent with sexual risk outcomes (e.g., number of UAI events) during the past 3 months were also assessed. Baseline self-reported substance dependence for methamphetamines, poppers, cocaine, and alcohol were defined according to the Severity of Dependence Scale (47).

Intervention efficacy was evaluated using generalized estimating equation models to test group-specific linear trends on outcomes across three study visits: baseline and 3- and 6-month follow-ups. Overall, 96% of participants completed the 3- and 6-month follow-up assessments. Intervention efficacy

analyses were stratified according to substance dependence. For analyses assessing substance-use outcomes, event-level data were collected on substances used within 2 hours before/ during UAI events. Intent-to-treat analyses were conducted according to random allocation to study arm and including all observed study data. Logistic (binary outcomes) and negative binomial (events outcomes) generalized estimating equation models with robust standard errors were used to evaluate linear trends in alcohol and substance-use outcomes throughout the 6 months of follow-up. Economic or cost data were not assessed in this study.

Results

Among the 326 participants, 47% were white and 53% were nonwhite, including 26% Hispanic/Latino, 11% Asian/Pacific Islander, 10% black, and 6% mixed or other race (44). The mean age of participants was 33.6 years. At baseline, 89% of participants self-reported binge drinking, 42% reported popper use, 34% cocaine use (powder or crack), and 10% methamphetamine use. A total of 138 participants (42% of the 326 SUMSM) were classified as substance dependent based on the Severity of Dependence Scale, including 7 men for methamphetamines, 12 for poppers, 21 for cocaine, and 122 for alcohol. Among the total sample of 326 participants, two tested HIV-positive at the baseline visit, three at the 3-month visit, and none at the 6-month visit. No statistically significant between-group differences were found in the overall sample of episodic SUMSM on demographic characteristics; the primary sexual risk outcomes of number of UAI events, number of UAI partners, and number of UAI events with three most recent nonprimary partners; and the primary substance-use outcomes including use of methamphetamines, poppers, cocaine (powder or crack), and binge drinking.

PCC participants exhibited a trend for greater reductions in number of receptive UAI events over the entire study period than control participants (rate ratio [RR]: 0.57; 95% confidence interval [CI]: 0.33–1.01) (44). A planned subgroup analysis of 188 nondependent, episodic SUMSM (93 PCC and 95 control) found a 44% greater reduction in the number of UAI events with three most recent partners among PCC participants relative to controls (RR: 0.56; 95% CI: 0.34–0.92) over the study period. In subgroup analyses of nondependent SUMSM of color (i.e., men who were black, Hispanic/Latino, Asian, or mixed race/ethnicity) (44 PCC and 51 control), PCC participants reported a 59% greater reduction in total number of UAI events (RR: 0.41; 95% CI: 0.18–0.95) and 63% greater reduction in number of UAI events with three most recent nonprimary partners (RR: 0.37;

95% CI: 0.16–0.87) than controls over the study period. No significant intervention effects were found among the 138 substance-dependent participants.

For substance-use outcomes in the total sample of 326 SUMSM (45), PCC participants reported significantly greater rates of abstinence from alcohol (RR: 0.93; 95% CI: 0.89–0.97), abstinence from marijuana (RR: 0.84; 95% CI: 0.73–0.98), and abstinence from erectile dysfunction drugs (RR: 0.51; 95% CI: 0.33–0.79) than controls over the study period (44). In addition, PCC participants reported a 46% greater reduction in frequency of alcohol intoxication (RR: 0.54; 95% CI: 0.34–0.85) and a 74% greater reduction in mean number of UAI events while under the influence of methamphetamine (RR: 0.26; 95% CI: 0.08–0.84) than controls over the study period.

Discussion

On the basis of the evidence of two randomized trials (36–38), CDC identified PCC as a “best evidence” HIV behavioral intervention. The intervention is listed in CDC’s online *Compendium of Evidence-Based Interventions and Best Practices for HIV Prevention* (48). The findings of Project ECHO, a rigorous evaluation of the adapted PCC intervention for episodic SUMSM, further demonstrated the efficacy of PCC for reducing HIV-related substance-use risk behaviors (45). The study also demonstrated efficacy of PCC for reducing sexual risk behaviors among SUMSM who are not dependent on targeted substances (44).

These findings add to a growing body of evidence that PCC reduces risk behaviors among HIV-negative MSM (36–38). The delivery of PCC in conjunction with HIV testing is critical for high-risk MSM who might be unaware of their HIV serostatus. The intervention delivered within this context can also support linkage of these high-risk HIV-negative MSM to other HIV prevention programs and services, like antiretroviral preexposure prophylaxis (PrEP) for HIV prevention (49,50).

In 2007, CDC funded the development of a user-friendly intervention package of the original PCC (51). The package includes a starter kit, implementation manual and workbook, cost estimate worksheet, and guidance on technical assistance (52). These materials are available online for use by HIV prevention providers (53). A PCC training curriculum and an agency manager training program are also available online (54).

Since 2011, CDC has supported the national dissemination of PCC to agencies serving high-risk, HIV-negative MSM. To maximize the impact of HIV prevention in the United States, CDC redirected approximately \$20 million in fiscal year 2014 HIV prevention funds to better align

community-based organizations (CBOs) activities with CDC’s high-impact HIV prevention approach (55). CBO resources were redirected toward high-impact HIV prevention strategies and interventions, including HIV testing, linkage to and engagement and retention of HIV-diagnosed persons in medical care, and use of evidence-based behavioral interventions that are scalable, cost-effective, and scientifically proven (56). PCC is one of nine behavioral interventions for high-risk, HIV-negative persons prioritized by CDC for implementation by CBOs (57).

As of August 2014, of the 48 CBOs funded by CDC under three separate funding opportunity announcements to deliver PCC, 43 (90%) are delivering PCC to MSM and transgender persons. These CBOs are located in 19 states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands and serve MSM and transgender persons of diverse races and ethnicities. Additional HIV prevention programs are funded by U.S. state, local, and territorial health departments to implement PCC.

During February 2011–June 2014, a total of 932 persons, representing 344 HIV prevention service organizations, completed one of 67 trainings for counselors offered by CDC on the PCC curriculum. These 932 persons represent 155 CBOs, 48 health departments, and 141 other agencies, including health clinics, private practices, and universities and represent various occupations (e.g., health educators, substance abuse counselors, clergy/faith-based counselors, and social workers). Persons attending PCC trainings serve diverse MSM and transgender populations at high risk for HIV infection, including incarcerated and paroled persons, homeless persons, persons who abuse substances, sex workers, and refugees and migrants. On the basis of the results of Project ECHO, the San Francisco Department of Public Health is supporting implementation of the adapted PCC to address binge drinking among MSM (D. Geckeler, San Francisco Department of Public Health, personal communication, July 2014).

Feasibility

Several features of PCC enhance the feasibility of its implementation. The intervention is brief, delivered with HIV testing, and of relatively low cost (i.e., estimated \$145 per client served) (58). These features make the intervention attractive to diverse HIV prevention agencies. As a single-session intervention, issues of client engagement and retention commonly associated with multisession interventions are minimized (59). Because of the brevity of PCC, counselors only attend 2 days of classroom training, which reduces the amount of time agency staff are away from the office. In addition, as demonstrated by Project ECHO, clients might receive more

than one PCC session that can be tailored to address persistent risky behavior.

PCC also allows for flexibility in counselor qualifications and delivery setting. PCC has demonstrated efficacy when delivered by both professionals (36) and paraprofessionals (37,44). The intervention can also be conducted in clinical and nonclinical settings as long as confidentiality can be assured. Because PCC is frequently conducted within HIV testing programs, existing HIV test counselors can be trained to screen for and conduct the intervention.

HIV behavioral interventions that can be combined with effective biomedical interventions (e.g., antiretroviral PrEP for HIV prevention) are critically needed (60). The feasibility of implementing PCC with HIV testing suggests the intervention can help screen MSM at substantial risk for acquiring HIV infection who are likely to benefit from PrEP.

CDC is committed to sustaining the implementation of high-impact, evidence-based, behavioral interventions, including PCC. The CDC approach involves eight key activities: 1) planning dissemination of interventions with both researchers and public health stakeholders; 2) marketing interventions to encourage customer choice; 3) supporting changes to policies regarding funding announcements, clinical guidelines, and program guidance that support evidence-based practices; 4) disseminating intervention resources; 5) providing intervention training; 6) building capacity for and providing technical assistance with the intervention; 7) improving quality; and 8) evaluating dissemination (61). CDC funds capacity-building assistance providers to support PCC implementation.

PCC is flexible in addressing the risk-reduction needs of diverse clients because each session is individualized and addresses the client's unique thought process during a recent and memorable risky event. Moreover, PCC efficacy trials demonstrated the intervention remained efficacious among MSM of various races/ethnicities (39,44). Implementation funding from CDC has resulted in applications of the intervention in new populations and contexts. For example, guidance is available on adapting the original PCC curriculum for transgender women who have sex with men (62). Implementation materials are also available in Spanish. CDC supports technical assistance on adapting PCC for different populations and settings.

Limitations

The Project ECHO efficacy study is subject to at least three limitations. First, similar to many behavioral intervention trials, intervention efficacy might be over- or under-estimated

because behavior might not result in significant reductions in incidence of STDs including HIV infection. Second, sexual risk and substance-use behaviors were self-reported and might be subject to recall and social-response biases. Third, the PCC efficacy trials, including Project ECHO, were conducted in San Francisco, California, and might not be generalizable to other U.S. jurisdictions. San Francisco is a city with a long history of HIV infection among MSM, strong community norms regarding risk behavior, and well-established partnerships between the health department, community members, and local organizations, which allows for the design and delivery of effective HIV prevention programs and services (63). However, HIV surveillance data reported by the San Francisco Department of Public Health for 2013 indicated that newly diagnosed white MSM cases declined from 2006 to 2013, but new diagnoses among Hispanic/Latino, African American, and other racial/ethnic groups of MSM were fairly stable during this same period (64). Additional studies are needed to demonstrate the effectiveness and generalizability of PCC among diverse MSM populations, delivery settings, and geographic regions.

The PCC intervention is subject to at least one limitation, the brevity of the 30-minute to 50-minute counseling session. Although brief behavioral counseling might be appropriate for most at-risk MSM, some MSM might require intensive risk-reduction counseling and treatment. Importantly, the findings of Project ECHO suggest PCC might not be appropriate for MSM who are dependent on alcohol and other drugs. Moreover, one efficacy trial suggests PCC is not appropriate for reducing risky sexual behavior among MSM living with HIV infection (39).

Conclusion

Although MSM continue to be affected disproportionately by HIV infection in the United States, evidence-based behavioral interventions for these men remain limited (34). The efficacy of the adapted PCC intervention for reducing HIV-related risk behaviors in a group of white and nonwhite episodic SUMSM in San Francisco, particularly among those who were nondependent episodic SUMSM, has potential for public health impact within the context of persistent rates of HIV infection among MSM. PCC is an efficacious brief counseling intervention designed to reduce HIV-related risk behaviors among diverse groups of MSM. The adapted PCC for episodic SUMSM is the only behavioral intervention with proven efficacy to reduce substance-use risk behaviors among MSM. In addition, PCC is an important component of a comprehensive HIV prevention program for high-risk MSM and is consistent with the goals of the National HIV/

AIDS Strategy (33) and CDC's high-impact HIV prevention approach (56). PCC can be delivered to diverse populations of MSM in conjunction with rapid HIV testing and can be used to identify MSM at substantial risk for HIV infection who could benefit from additional prevention programs. The original PCC and its adapted versions can contribute to reducing HIV-related health disparities among high-risk MSM by raising awareness of and promoting reductions in personal risk behaviors.

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The HoMBReS and HoMBReS Por un Cambio Interventions to Reduce HIV Disparities Among Immigrant Hispanic/Latino Men

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Summary

Hispanics/Latinos in the United States are affected disproportionately by human immunodeficiency virus (HIV) infection, acquired immunodeficiency syndrome (AIDS), and other sexually transmitted diseases (STDs); however, few effective evidence-based prevention interventions for this population exist. This report describes the Hombres Manteniendo Bienestar y Relaciones Saludables (Men Maintaining Wellbeing and Healthy Relationships) (HoMBReS) intervention, which was developed by a community-based, participatory research partnership in North Carolina and initially implemented during 2005–2009. HoMBReS is an example of an effective intervention that uses lay health advisors (known as Navegantes [navigators]) in the context of existing social networks (i.e., recreational soccer teams) to promote consistent condom use and HIV and STD testing among Hispanic/Latino men. In 2012, HoMBReS was classified as a best-evidence community-level HIV prevention intervention (CDC. Compendium of evidence-based behavioral interventions and best practices for HIV prevention. Atlanta, GA: US Department of Health and Human Services, CDC; 2015). The intervention has been implemented elsewhere, enhanced, and further evaluated in longitudinal intervention and implementation studies. HoMBReS has been adapted for other populations, including men who have sex with men and transgender persons. Additional evaluation has found that Navegantes continue in their roles as health advisors, opinion leaders, and community advocates after study support ends. Hispanic/Latino men's social networks can be leveraged to promote sexual health within the community by decreasing HIV risk behaviors among Hispanics/Latinos in the United States.

Introduction

Hispanics/Latinos in the United States are disproportionately affected by human immunodeficiency virus (HIV) infection, acquired immunodeficiency syndrome (AIDS), and other sexually transmitted diseases (STDs). Hispanics/Latinos have the second highest rate of AIDS diagnoses of all racial/ethnic groups and three times the rate for non-Hispanic whites (1). Reported rates of gonorrhea, chlamydia, and syphilis are two to four times higher among Hispanics/Latinos than among non-Hispanic whites (2). Despite the risks for both exposure and transmission among Hispanics/Latinos, few effective evidence-based prevention interventions for this population exist. Although health promotion and disease prevention strategies that use lay health advisors have been promoted by researchers and practitioners, more rigorous studies are needed to build the evidence base that strategies involving lay health advisors can change community health outcomes (3). Lay health advisors are informal community leaders trained to work with other community members within their social networks to access hard-to-reach populations, bridge gaps in health care access, and extend health services.

This report summarizes published and unpublished findings from an ongoing effort to develop, test, and enhance community-level behavioral social network interventions for HIV prevention among Hispanic/Latino men. Intervention development, implementation, evaluation, and ongoing enhancement were initiated and continue to be led by a community-based participatory research (CBPR) partnership in North Carolina. This partnership includes lay community members, including Hispanic/Latino men and women, representatives from community-based organizations, public health department personnel, and research scientists from universities and federal agencies.

CDC's Office of Minority Health and Health Equity selected the intervention analysis and discussion that follows to provide an example of a program that might be effective in reducing HIV-related disparities in the United States. Criteria for selecting this program are described in the Background and Rationale for this supplement (4).

Growth of the Hispanic/Latino Community in the Southern United States

The proportion of the U.S. population that identifies as Hispanic/Latino has expanded substantially since 1990. Between the 2000 and 2010 censuses, the Hispanic/Latino population in the United States grew by 43% and is projected to account for 31% of the U.S. population by 2060 (5–7). Approximately one of 11 immigrants in the United States lived in a new Hispanic/Latino settlement state, compared with one of 25 in 1990. New Hispanic/Latino settlement states are defined as those that had small numbers of Hispanics/Latinos before 1990 but have experienced rapid Hispanic/Latino population growth since that time (5–7). In North Carolina, the number of Hispanics/Latinos increased 111%, representing one of the fastest-growing Hispanic/Latino populations in the United States (8).

Much of this new growth has occurred in rural communities. Jobs in farm work, construction, and factories, combined with dissatisfaction with the quality of life in traditional settlement states with substantial Hispanic/Latino immigration (e.g., Arizona, California, and Texas), have led many immigrant Hispanics/Latinos to leave the more densely populated regions of the United States and relocate to the southern United States and to North Carolina in particular (9). However, immigrant Hispanics/Latinos increasingly are arriving in the South directly from their countries of origin, bypassing traditional Hispanic/Latino settlement states. Compared with Hispanics/Latinos in traditional settlement states, immigrant Hispanics/Latinos in North Carolina and the South overall tend to be younger and disproportionately male, come from rural communities in southern Mexico and Central America, have lower levels of educational attainment, and settle in communities without substantial histories of Hispanic/Latino immigration. These communities also lack the infrastructure to meet their needs (e.g., limited bilingual and bicultural services) (9).

Methods

Intervention Methods

HoMBReS: Hombres Manteniendo Bienestar y Relaciones Saludables (Men Maintaining Wellbeing and Healthy Relationships) is a community-level intervention that was developed in Spanish by a CBPR partnership in North Carolina in response to a need for culturally congruent, effective interventions to reduce the disproportionate effects of HIV and other STDs among Hispanics/Latinos. HoMBReS

promotes consistent condom use and HIV and other STD testing among Hispanic/Latino men by using the existing social networks of recreational soccer teams and incorporating lay health advisors. These advisors are chosen because they are natural helpers. They are persons to whom other community members naturally turn for advice, emotional support, and tangible aid; they become sources of reliable information within their social networks (3).

This report includes the first published description of the HoMBReS program characteristics and implementation, as well as the subsequent enhancements and revisions of the program. Each soccer team selects one teammate to serve as the team lay health advisor, or *Navegante* (navigator). Potential *Navegantes* are assessed on the basis of personal, performance, and situational characteristics. Personal characteristics should include a sense of humor, self-esteem, and being dedicated, respectful, and realistic. In addition, potential *Navegantes* are assessed to determine whether they are or have the potential to be trained to be comfortable discussing and offering sound advice regarding sensitive issues such as sexual behavior, HIV, and condoms, and maintaining confidentiality. Performance characteristics should include the ability to read low-literacy Spanish-language materials, collect data describing the intervention implementation process, and communicate clearly, as well as a willingness to participate in meetings and work with their social networks. Situational characteristics should include having enough time to be an advisor and access to reliable transportation. Potential *Navegantes* with these characteristics are trained by two Hispanic/Latino men in four sequential sessions (lasting a total of 16 hours) to fulfill three primary roles: health advisor, opinion leader, and community advocate. The theoretical underpinnings include social cognitive and empowerment theories. Intervention training sessions include group discussions, games, and other activities to teach factual information and role plays to enhance skill building, including how to effectively assist others (10). *Navegantes* received a meal and \$50 for each training session; after training was complete, *Navegantes* received \$50 monthly for process data collection. The Wake Forest School of Medicine Institutional Review Board provided study human subject protection and oversight.

As health advisors, *Navegantes* increase awareness and provide information about prevention, care, and treatment for HIV and other STDs; distribute resources, including condoms; and develop specific skills among the teammates, including condom use, condom negotiation skills (i.e., strategies to increase condom use with sexual partners), and how to overcome barriers to accessing health department clinical services. As opinion leaders, *Navegantes* bolster positive and reframe negative sociocultural values and expectations such as

fatalism, which might lead some Hispanics/Latinos to believe that they have limited control over what happens to them and that HIV infection is driven by fate, and machismo, which might lead some Hispanic/Latino men to use risky sexual behaviors to prove their masculinity (11,12). As community advocates, Navegantes work toward positive social and environmental change.

Data Collection and Analysis

In the original HoMBReS study in North Carolina during 2005–2009, Navegantes worked with their teammates for 18 months (10). Self-reported data were collected before and 18 months after lay health advisor training using an interviewer-administered Spanish-language questionnaire from a random sample of teammates from 15 intervention and 15 control teams. Intervention teams conducted the HoMBReS intervention; each Navegante was selected, trained, and served as the lay health advisor for his team. The control teams comprised the delayed-intervention group and received the intervention after follow-up data were collected. Data were collected by trained study staff members, not by the Navegantes. The entire soccer league had 89 teams, for a total of 1,600–1,800 men. These 30 teams comprised approximately 570 men; however, the number of members per team fluctuated as men decided not to play, transferred among teams, and moved out of the area (e.g., for jobs).

The intervention teams included teams from the southern region of the league, and the control teams included teams from the northern region of the league because 1) formative data already existed on local resources, referral procedures, and health care service delivery in the southern region and 2) intervention and control teams needed to be geographically and socially distinct to minimize contamination (i.e., the potential that intervention participants would interact with the delay-intervention participants and skew study findings). Data were collected longitudinally from a random sample of 222 teammates (mean age: 29 years) who participated in one of the 30 teams. A standard random numbers table was used for randomization (13). All were immigrants, with 60% from Mexico and 40% from Central America. All self-identified as heterosexual; six reported having had sex with men in the past year.

Process evaluation data also were collected by using a low-literacy activity log that each of the 15 Navegantes completed and submitted monthly throughout the 18 months to document his informal helping activities (e.g., one-on-one advice about HIV and STD testing at public health departments) and formal activities (e.g., leading a planned

condom demonstration with his soccer team). Individual in-depth interviews with the Navegantes were conducted after the study was completed to understand the intervention and their roles as lay health advisors from their perspectives.

Potential differences between the intervention and delayed-intervention groups were assessed using t-tests and chi-square analyses. A multivariable logistic regression model using generalized linear mixed modeling was used to test whether the intervention increased condom use and HIV testing, while adjusting for baseline scores, relationship status, and within-team clustering. Adjusted odds ratios (AORs) and confidence intervals were calculated.

Results

As reported previously (10), the mean age of the participants was 29.8 (standard deviation [SD]: 8.3) years; 60.8% reported being originally from Mexico, 14.0% from El Salvador, 6.8% from Guatemala, 5.9% from Honduras, 1.8% from Colombia, and 6.4% from other areas. Approximately half (52.7%) reported educational attainment of ≤ 8 years. Mean length of time in the United States was 8.8 (SD: 7.6) years, 70.4% reported year-round employment, and 69.1% reported estimated annual salaries $\leq \$21,999$. All self-identified as heterosexual; six reported having had sex with men within the past year. No statistically significant differences in sociodemographic characteristics were found between the intervention and delayed-intervention groups.

Intervention participants reported more consistent condom use (i.e., always used condoms) (65.6%) during sex in the 30 days before the follow-up questionnaire than control participants (41.3%; unadjusted analysis, $p < 0.001$) (10). Intervention participants also reported a higher level of HIV testing since baseline (64.4%) than control participants (41.8%) (unadjusted analysis, $p < 0.001$). After adjustments were made for baseline scores, relationship status, and within-team clustering, participants in the intervention were more likely to report consistent condom use in the past 30 days (AOR: 2.3; 95% confidence interval [CI]: 1.2–4.3) and HIV testing since baseline (AOR: 2.5; 95% CI: 1.5–4.3) (10).

Process evaluation findings indicated that the intervention Navegantes conducted 2,364 activities, with a mean of 8.8 activities per Navegante per month. The most common activity was condom distribution. Most activities were conducted with men; approximately 2% were conducted with Hispanic/Latina women within the social networks of the Navegantes. Among activities conducted with men, half were conducted with soccer teammates and half with nonteammates. Postimplementation interviews with Navegantes indicated that Navegantes also

provided resources and distributed condoms to a few female sex workers and Hispanic/Latino men who have sex with men (MSM). Thus, the influence of Navegantes extended beyond the soccer team; they served as lay health advisors to numerous men and some women who were not part of the soccer league (14).

Discussion

HoMBReS is a Spanish-language community-level intervention that extended beyond the initially intended social network. In addition to delivering the intervention to their soccer teammates, Navegantes reported engaging in informal and formal helping activities with other men and a few women within the community who were not part of their teams. Although the intervention is likely to be successful with these nonteammates, the effectiveness in nonteammate populations was not evaluated; therefore, the impact of trained Navegantes on nonteammates within and outside of their social networks deserves exploration in future studies.

Furthermore, Navegantes continued to serve in their roles as health advisors, opinion leaders, and community advocates even when the study ended, serving as resources to promote community health. Because of the approximately 50,000 new HIV infections per year and the high numbers of STD infections in the United States (1,2), sustainable strategies are needed and essential to reach numerous persons with ongoing resources to reduce infection rates and promote access to existing health care services, including testing, care, and treatment.

On the basis of these positive outcomes, in 2012, HoMBReS was included as a best-evidence community-level HIV prevention intervention in the CDC *Compendium of Evidence-Based Behavioral Interventions and Best Practices for HIV Prevention* (<http://www.cdc.gov/hiv/prevention/research/compendium/rr/index.html>). During 2011–2013, HoMBReS was implemented successfully in Indianapolis, Indiana, by an AIDS service organization; new HIV and STD cases were identified, resulting in linkages to care and treatment (15). This intervention is commercially available in English from a company that sells program kits (with user's guides and curricula) for many of the evidence-based interventions (<http://www.socio.com>).

Enhanced Intervention: HoMBReS Por un Cambio

The CBPR partnership that developed HoMBReS is committed to ongoing quality improvement, maintaining materials that are responsive to changes in the community,

and learning from past experiences (16), including the postimplementation interviews with Navegantes. As such, the intervention has been enhanced and subsequently implemented and evaluated. The enhanced intervention is known as HoMBReS Por un Cambio (Men for Change). Two main enhancements include 1) DVD segments designed to supplement Navegante training and to be used by Navegantes with their teammates and 2) temas del mes (themes of the month) designed to help guide Navegante activities.

The DVD segments reinforce intervention messages and serve as triggers for group discussions during Navegante training. Some of these segments, which are based on local formative data and were developed to represent reliably the perspectives and experiences of Hispanic/Latino men, are also used by Navegantes as they work with their teammates. Segments include the impact of the HIV pandemic worldwide and within Latin America, the United States, and North Carolina; guidance on how to access and overcome barriers associated with accessing public health department HIV and STD testing services; and what life is like as a Hispanic/Latino man living with HIV. One segment uses role models to show ways that men can support other men to reduce risky sexual behaviors, promote sexual health, and initiate condom use with a female partner.

Themes of the month include topics that Navegantes focus on each month. For example, in the first month, an inauguration ceremony is held for each Navegante with his team to celebrate his training and affirm his availability to assist his teammates. In subsequent months, Navegantes focus on various topics with their teammates including HIV, chlamydia and gonorrhea, syphilis, and herpes. Navegantes also use the DVD segments, which include guidance on how to access public health department HIV and STD testing services, what life is like living with HIV, and how to initiate condom use with a female partner.

Although lay health advisors are assumed to stay in their roles after a project has ended, this is not well established through evidence (3). The CBPR partnership collected data from former Navegantes of HoMBReS Por un Cambio (n = 20) and their retained teammates (n = 202) 1 year after the study ended to assess whether Navegantes continued to serve as lay health advisors and, if so, which roles they continued to maintain. All Navegantes reported engaging in intervention-related activities (e.g., talking about sexual health and risk reduction with individual persons and groups, providing informational materials, demonstrating how to use condoms correctly, offering referrals to public health departments, and using the DVDs). Some Navegantes continued to provide referrals to community-based organization partners; however, this was less frequent, perhaps because they no longer were as connected to

these organizations through the CBPR partnership and study. These findings suggest that training of lay health advisors might have a long-term effect on the community, an outcome that might be particularly important as HIV infection rates continue to increase among some populations such as certain subgroups of MSM. Larger numbers of persons need to be reached through sustained strategies, such as those that involve lay health advisors.

Implementation Study

A better understanding of how to implement HIV and STD prevention interventions in the community outside a research study is important. Thus, the CBPR partnership is conducting an ongoing study by helping organizations that commonly implement HIV prevention interventions (e.g., AIDS service organizations, organizations that serve Hispanics/Latinos, and public health departments) to implement HoMBReS Por un Cambio, providing an opportunity to compare implementation challenges and successes. This implementation study includes the development of a comprehensive, online toolkit designed to facilitate and sustain implementation of the intervention with fidelity. For example, staff at AIDS service organizations might need training on Hispanic/Latino cultures and the relation between immigration and HIV and STD risk, whereas staff at organizations that serve Hispanics/Latinos might need more information about HIV and STDs. The toolkit includes sections on the theoretical and scientific bases of and the evidence supporting HoMBReS Por un Cambio; staffing and budgeting for intervention implementation; HIV and STD knowledge; soccer leagues, their structures, and how to connect with them; selecting the best Navegantes; using cross-cultural strategies; and the immigration experience.

Hispanic/Latino MSM and Transgender Persons

The CBPR partnership also revised HoMBReS to make the intervention relevant for Hispanic/Latino MSM and transgender persons. Although the revised intervention, known as HOLA, remains focused on lay health advising (17), rather than using the social networks of soccer teams, HOLA involves the naturally existing informal social networks of Hispanic/Latino MSM and transgender persons. One Navegante from each social network is trained to 1) promote awareness of the magnitude of HIV and STD infection; 2) increase knowledge of the types of infections, modes of transmission, signs, symptoms, and prevention strategies; 3) provide information about and offer guidance on accessing local counseling, testing, care, and treatment services, eligibility requirements,

and what to expect during health care encounters; 4) increase condom-use skills (e.g., how to communicate effectively and how to properly select, use, and dispose of condoms); 5) change health-compromising norms associated with the sociocultural environment (e.g., machismo, fatalism, homophobia and transphobia, and discrimination) and perceptions of Hispanic/Latino men; 6) develop and bolster supportive relationships and sense of community; and 7) assist with developing the skills to successfully help others. This study is underway in North Carolina (2011–2016). The CBPR partnership is using an intervention-delayed intervention design with randomization at the network level.

Limitations

The findings in this report are subject to at least two limitations. First, the population of Hispanics/Latinos in North Carolina might not be representative of Hispanics/Latinos in other U.S. regions. Although the demographics of Hispanics/Latinos immigrating to North Carolina tend to be similar to the demographics of Hispanics/Latinos immigrating to the other parts of the United States more broadly (9), the assumption that they are representative of this population has not been well tested, which might be particularly relevant given the heterogeneity within Hispanic/Latino communities. This intervention might need to be modified for use in other U.S. regions. Second, because all outcome data were self-reported, condom use might be underestimated and HIV testing might be overestimated as a result of social desirability bias; however, self-reported data have been found to highly valid when carefully measured (18).

Conclusion

The HoMBReS study provides evidence that strategies involving lay health advisors can increase condom use and HIV testing among Hispanic/Latino men. Social networks among Hispanic/Latino men can be used to promote sexual health within the community. Because the populations disproportionately affected by HIV and STDs often lack needed prevention resources, wide implementation of interventions that harness community social networks, such as HoMBReS, HoMBReS Por un Cambio, and HOLA, could decrease behaviors that increase risk for HIV infection among Hispanics/Latinos in the United States, including MSM and transgender persons. In addition, the strategy might be effective among other populations and applicable to other health issues.

Because Navegantes continued to serve in their roles as health advisors, opinion leaders, and community advocates,

they promoted community health after study support ended. Approximately 50,000 new HIV infections occur per year in the United States, and numbers of STD infections are high (1,2); sustainable strategies are needed to reach large numbers of persons with ongoing resources to reduce infection rates and promote linkages to existing health care services, including testing, care, and treatment.

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Preventing Violence Among High-Risk Youth and Communities with Economic, Policy, and Structural Strategies

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Summary

Youth violence is preventable, and the reduction of health disparities is possible with evidence-based approaches. Achieving community-wide reductions in youth violence and health disparities has been limited in part because of the lack of prevention strategies to address community risk factors. CDC-supported research has resulted in three promising community-level approaches: Business Improvement Districts (BIDs) in Los Angeles, California; alcohol policy to reduce youth access in Richmond, Virginia; and the Safe Streets program in Baltimore, Maryland. Evaluation findings indicated that BIDs in Los Angeles were associated with a 12% reduction in robberies (one type of violent crime) and an 8% reduction in violent crime overall. In Richmond's alcohol policy program, investigators found that the monthly average of ambulance pickups for violent injuries among youth aged 15–24 years had a significantly greater decrease in the intervention (19.6 to 0 per 1,000) than comparison communities (7.4 to 3.3 per 1,000). Investigators of Safe Streets found that some intervention communities experienced reductions in homicide and/or nonfatal shootings, but results were not consistent across communities. Communitywide rates of violence can be changed in communities with disproportionately high rates of youth violence associated with entrenched health disparities and socioeconomic disadvantage. Community-level strategies are a critical part of comprehensive approaches necessary to achieve broad reductions in violence and health disparities.

Introduction

Racial/ethnic minority youth aged 10–24 years are affected disproportionately by violence. The homicide rate in 2013 for non-Hispanic black youth (27.6 per 100,000) was 13 times higher than the rate for non-Hispanic white youth (2.1 per 100,000), 16.2 times higher than the rate for Asian/Pacific Islander youth (1.7 per 100,000), 4.3 times higher than the rate for Hispanic youth (6.3 per 100,000), and five times higher than the rate for American Indian/Alaska Native youth (5.5 per 100,000) (1). Homicide is the leading cause of death among black youth, the second among Hispanic youth, the third among American Indian/Alaska Native youth, and the fourth among Asian/Pacific Islander youth (1). Despite national decreases in youth violence since the 1990s, minority youth continue to experience disproportionate rates of violence, and the downward trends are less pronounced among this group (2).

Decades of research have resulted in the development and implementation of evidence-based programs that aim at preventing violence, including among minority youth, by modifying individual or family risks (3). However, when these approaches are implemented in isolation, communitywide reductions in youth violence are limited because they do not address underlying community factors that exert a powerful influence on the development and epidemiology of violence.

Community risk factors include high levels of neighborhood disorganization, availability of illegal drugs and firearms, weak economies, low community cohesion, and physical environments that increase the likelihood of violence (4). Comprehensive prevention strategies can have communitywide sustained impacts on violence and health disparities by simultaneously addressing individual, relationship, and community risks, and have broader reach (5).

Few community-level strategies for preventing youth violence have been evaluated (5). Increasing the availability of these strategies is a primary focus for CDC's Division of Violence Prevention.

Results are presented for three CDC-funded evaluations of economic, policy, and structural strategies implemented within communities with disproportionately high youth violence rates and minority youth. These evaluations demonstrate the growing opportunity for communitywide reductions in youth violence and health disparities in violence. The findings are summarized across the three previously published evaluations to highlight opportunities for promising community-level strategies for youth violence prevention.

CDC's Office of Minority Health and Health Equity selected the intervention analysis and discussion that follows to provide examples of programs that might be effective in reducing

violence-related disparities in the United States. Criteria for selecting these programs are described in the Background and Rationale for this supplement (6).

Methods

Intervention Methods

Business Improvement Districts

Establishing Business Improvement Districts (BIDs) is an economic development strategy that includes the collection and investment of resources from local merchants or property owners into area service provision and activities such as place promotion, street cleaning/beautification, and public safety (7). During 1996–2003, a total of 30 BIDs were implemented in the city of Los Angeles, California, across 179 neighborhoods. Los Angeles is characterized by substantial racial/ethnic disparities in youth crime and homicide (7). During the study period, approximately 46% of residents were Hispanic, 11% of families lived in poverty, and the unemployment rate was approximately 10%. The Los Angeles City Clerk's Administrative Services Division manages the city's BID program (8,9). An evaluation of the Los Angeles BIDs was conducted by the RAND Corporation through a CDC-funded cooperative agreement (7,9).

Alcohol Policy

Approximately 57% of the population of Richmond, Virginia, in 2003 was black, and 64% of youth aged 10–24 years were black. The 2008 homicide rate (46.0 per 100,000 population) was nearly three times the national average (5.7 per 100,000 population). Most homicide deaths were among racial/ethnic minority youth aged 15–24 years (10). Community leaders in Richmond examined data about violence-related injuries and alcohol use to develop a policy that restricted licenses for the sale of single-serve alcoholic beverages by convenience stores during January–June 2003 (10). Despite strong initial support for these license restrictions, enforcement ended after 6 months in response to opposition by grocery store owners. The timing of the licensing restrictions allowed researchers to evaluate its impact by tracking injuries before and during the restrictions, and after the restrictions were reversed. The CDC-funded Center of Excellence in Youth Violence Prevention at Virginia Commonwealth University (VCU) collaborated with the Virginia Alcohol Beverage Control Board, the VCU Health System, the Richmond Medical Examiner, the Richmond Vital Registry, the Richmond Ambulance Authority, and the Richmond Department of Juvenile Justice to examine the policy's impact (10).

Baltimore Safe Streets

Safe Streets is a street outreach and community mobilization strategy to interrupt the transmission of violence, change community norms about the acceptability of violence, and build positive community connections through community events (10). Safe Streets was implemented in four Baltimore, Maryland, neighborhoods that had rates of homicides and nonfatal shootings (NFS) within the top 25% in the city. The neighborhoods were populated almost exclusively by racial/ethnic minorities. One neighborhood began implementing Safe Streets in 2007, and the program was expanded to one additional neighborhood in February 2008 and to two more in November 2008. Monthly evaluation data span 2007–2010 for the first neighborhood, 2008–2010 for the second, and 2009–2010 for the third and fourth. To evaluate Safe Streets, the CDC-funded Center of Excellence in Youth Violence Prevention at Johns Hopkins University worked with the Baltimore City Health Department, Baltimore police, and community-based organizations, including the Park Heights Renaissance, Family Health Centers for Baltimore in Cherry Hill, and the Living Classrooms Foundation in McElderry Park (11).

Data Collection and Analysis

Business Improvement Districts

RAND investigators examined before and after changes in the incidence or rate of violent crimes during 1994–2005 using a longitudinal analysis of neighborhoods exposed ($n = 179$) and not exposed ($n = 893$) to BIDs. Data included yearly counts of robbery and a violent crime index that included homicide, rape, robbery, and aggravated assault (7).

Alcohol Policy

VCU investigators used an ecological panel study to examine the impact of Richmond's alcohol policy on intentional-injury-related ambulance pickups during July 2001–December 2004 (10). Investigators compared rates of ambulance pickups for violent injuries among youth aged 15–24 years in five census tracts affected by the policy to rates in demographically similar control census tracts across three phases: 18 months before the policy was in effect, 6 months when the policy was in effect, and 18 months after the end of the policy. Investigators then analyzed changes in ambulance pickups for intentional injuries with a multilevel modeling approach in which the three phases were nested within census tracts.

Baltimore Safe Streets

Using a quasi-experimental design, JHU investigators examined Safe Streets' impact on homicides and NFS within four Baltimore communities (11). Monthly panel datasets were created for homicides and NFS incidents for 39 police posts in Baltimore for January 2003–December 2010; four police posts were inside the intervention neighborhoods while the remaining 35 were outside the intervention neighborhoods. Investigators estimated program effects using negative binomial regression appropriate for modeling outcomes represented as incident counts. Models estimated program effects by contrasting changes in target communities with changes in communities that did not have the program, while controlling for baseline levels of violence.

Results

Business Improvement Districts

Evaluation findings indicated that implementation of BIDs was associated with substantial reductions in violence. Evidence from police reports indicated that BIDs in Los Angeles were associated with a 12% reduction in robberies (one type of violent crime) and an 8% reduction in violent crime overall (12).

Alcohol Policy

The five census tracts (containing 18 stores) where license restrictions were in place represented the intervention communities, and five demographically similar census tracts were selected as comparison communities. Intervention and comparison communities at baseline did not differ substantially on neighborhood characteristics (e.g., proportion of residents who were black, living at or below the poverty level, or having less than a high school education). Evaluation findings indicated that the monthly average of ambulance pickups for violent injuries among youth aged 15–24 years had a significantly greater decrease in the intervention (19.6 to 0 per 1,000 population) than comparison communities (7.4 to 3.3 per 1,000 population) when the alcohol policy was enacted ($p = 0.011$). During the 18 months after the policy was ended, the rate in the intervention communities increased to 11.4 per 1,000 population while the rate in comparison communities (2.5 per 1,000 population) was not statistically different from baseline (95% posterior probability interval -5 to 21) (9).

Baltimore Safe Streets

Evaluation findings indicated that in one of four intervention communities, Safe Streets was associated with a 56% reduction in homicides (incident rate ratio [IRR]: 0.44; $p < 0.001$) and a 34% reduction in NFS (IRR: 0.66; $p < 0.001$). Investigators found that the program was associated with decreases of 26% for homicide (IRR: 0.74; $p = 0.003$) and 22% for NFS (IRR: 1.22; $p = 0.001$) in a second community, no change in homicides and a 34% reduction in NFS (IRR: 0.66; $p < 0.001$) in a third, and a 44% decrease in NFS (IRR: 0.56; $p < 0.001$) in a fourth but a 2.7 times increase in the homicide rate (IRR: 2.70; $p < 0.001$) (11). Several possible reasons might account for this increase, including the fact that the program was only implemented for 18 months in that particular community compared with ≥ 2 years in other communities, and high rates of gang activity at the time of initial program implementation. Additional information on program implementation, including the frequency of conflict mediations, can help explain variation in program effects across communities (11).

Discussion

Results for CDC-funded evaluations of BIDs, alcohol policy interventions, and Baltimore Safe Streets suggest communitywide rates of violence can be changed in communities with disproportionately high rates of youth violence associated with entrenched health disparities and socioeconomic disadvantage. These evaluations are an important step forward in building the evidence base for community violence prevention strategies. If these community-level strategies are used in conjunction with other evidence-based individual and family prevention strategies, communities can have significant impact on the health and safety of minority youth (2).

The potential national impact of community-level prevention strategies is enhanced by their ability to be implemented in different types of communities. Programs like Safe Streets are being replicated in many cities in the United States and internationally (<http://cureviolence.org/partners>). BIDs continue in over 30 communities in Los Angeles, and similar approaches have been implemented across the country, mostly in urban areas such as New York City, Philadelphia, Houston, Chicago, and the District of Columbia (13). Once these strategies are implemented, they often are sustained. For instance, a form of Safe Streets has been implemented consistently in Chicago since 2000, and BIDs have been implemented in Los Angeles since 1994.

However, effective community change strategies are subject to competing community pressures. Despite the substantial promise demonstrated by Richmond's alcohol policy, it was ended after only 6 months of implementation in response to pressure from grocery store owners.

The continued evaluation of scalable community-level strategies and the broad dissemination of findings are critical to helping communities make data-informed prevention decisions. CDC's National Centers of Excellence in Youth Violence Prevention and the Striving to Prevent Youth Violence Everywhere initiatives involve assistance to high-risk communities to select comprehensive evidence-based strategies and develop collaborative public health approaches to implement and evaluate strategies. Continued focus on identifying effective community prevention strategies and building implementation capacity can lead to implementation of policies and strategies that result in decreased violence-related health disparities.

Limitations

The findings in this report are subject to at least two limitations. First, the evaluations used administrative measures from police or health records that do not include unreported incidents of violence. Second, although the studies provide support for the effectiveness of the prevention strategies, additional evaluations are needed to confirm and replicate these findings in other communities.

Conclusion

Racial/ethnic minority youth are at particularly high risk for morbidity and mortality associated with violence, including homicide. These youth often live in communities that have disproportionately high violence rates and community conditions associated with violence and violent injuries. Community-level strategies are a critical part of comprehensive approaches that are necessary to achieve broad reductions in violence and health disparities. CDC's emphasis on evaluating these strategies is addressing a critical gap. CDC-funded evaluations of BIDs, alcohol policy to reduce youth access, and Baltimore's Safe Streets program found significant reductions in violence associated with the implementation of these community-level strategies. These community-level strategies have potential for broader impact on health disparities by addressing important health-related community characteristics.

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Living Well with a Disability, a Self-Management Program

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Summary

Approximately 56.7 million persons in the United States have functional impairments that can lead to disability. As a group, persons with disabilities show disparities in measures of overall health when compared with the general population. Much of this can be attributed to secondary conditions rather than to the impairment itself. Persons with disabilities can prevent and manage many of the conditions that contribute to these disparities. The Living Well with a Disability program was developed to support persons with disabilities to manage their health. The curriculum helps participants achieve early success in self-management of quality-of-life goals to build confidence for making health behavior changes; it includes 11 chapters that facilitators use to conduct an orientation session and 10 weekly, 2-hour sessions. The program has been implemented by 279 community-based agencies in 46 states. On the basis of the data from the field trial, these community applications have served approximately 8,900 persons since 1995, resulting in an estimated savings of \$6.4–\$28.8 million for health care payers. Persons with disabilities have unique needs that can be addressed through multiple levels of intervention to reduce health disparities. The Living Well with a Disability program is a promising intervention that has demonstrated improvements in health-related quality of life and health care use.

Introduction

Approximately 56.7 million persons (18.7%) in the United States live with one or more communicative, mental, or physical disabilities (1). Disability occurs when a person's environment does not accommodate their functional ability (2). Persons with disabilities are at higher risk for poor health (3–9). Evidence indicates that approximately half of all health care expenditures can be accounted for by the 15%–20% of the population who have a disability (10). However, persons with disabilities often have not been included in health promotion research or programs (6,11,12). Disability advocates and those studying disability and health have demonstrated that, among other factors, improved self-management skills among persons with disabilities can lead to improved health and wellness and improved ability to advocate for structural changes, which can improve their access to quality health care in the United States (12–14).

The definition and operationalization of disability is the subject of ongoing discussion (15,16), which has helped to clarify and distinguish disability status from health outcomes (11,17,18). The *International Classification of Functioning, Disability, and Health* combines medical and social models to

highlight the interaction of function and environment in the creation of disability (2). This framework for understanding disability presumes that disability and related health disparities can be improved through improved physical and social functioning (e.g., assistive technology, physical therapy, peer support, and employment) and through modifications that make the environment accessible to persons regardless of functional ability (e.g., accessible buildings, information technology, and social policy) (19,20).

A growing body of literature indicates that persons with disabilities experience significant health disparities including poorer overall health and more chronic conditions (6,21), some of which have been referred to as secondary conditions (13,22). Secondary conditions are health conditions that are more frequent among persons who have disabilities than among those without disabilities. Various studies have shown that persons with disabilities frequently have to manage multiple secondary conditions that might further limit activities and participation, stress health-promoting routines, and lead to acute health care episodes, including emergency care visits and hospitalizations (5,23–25). In 2010, approximately five times more persons with disability reported fair or poor health compared with persons

without disability (39.4% versus 8.6%) (26). Furthermore, persons with disability reported 10.2 days of poor physical health in the past 30 days, whereas persons without disability reported 1.8 days of poor physical health (26).

Health disparities have led to a growing interest in public health interventions that can have far-reaching effects and that can make healthy behavior easier and more likely among diverse populations (27). For persons with disabilities, multiple levels of intervention are needed to address environmental, health systems, and individual behavior determinants of health (6). Many health problems experienced by persons with disabilities can be prevented and managed by health education interventions that target a person's ability to self-manage chronic disease risk and overall health status (11,14,28). Significant improvements in health status following implementation of health promotion programs have been reported for persons with spinal injury (29), amputation (30), stroke (31), multiple sclerosis (32), arthritis (33), and intellectual and developmental disabilities (34,35). All of these studies focused on subsets of the population with disabilities defined by a single specific medical condition; few have investigated effects among diverse populations with disabilities. To address this gap, the Living Well with a Disability program was developed in partnership with the national network of Centers for Independent Living (CILs) as a self-management program intended to support healthy living among persons with mobility impairments irrespective of their medical condition.

CDC's Office of Minority Health and Health Equity selected the intervention analysis and discussion that follows to provide an example of a program that might be effective in reducing disability-related disparities in the United States. Criteria for selecting this program are described in the Background and Rationale for this supplement (36).

Methods

Intervention Methods

Living Well with a Disability was developed to address self-management needs of persons with mobility impairments. A community-based participatory research (CBPR) approach was used to shape the curriculum content based on participant input and epidemiological research (37–40). Input from this process confirmed that adults with mobility impairments experienced a wide range of secondary conditions (e.g., pain, depression, and obesity) and social conditions that limited their ability to participate in desired events and activities. These findings led to discussions on the ecological context of persons with mobility impairments to design suitable interventions. Persons in the general population can learn skills to prevent

and manage chronic conditions (41,42). Because strategies for effectively delivering health promotion content to persons with functional impairments were unknown, CBPR methods were used to help specify the nature of the problem more accurately and to design an inclusive intervention.

Federally funded CILs are organizations that meet criteria for having access to the target population and organizational features that make these centers capable of meeting intervention objectives (43,44). CILs are nonresidential resource and advocacy centers that support the needs of persons with disabilities to help them live independently in the community. They are organized into a national network with approximately 600 offices that share 1) a common philosophy about the nature of disability consistent with the social model of disability; 2) a consistent approach to helping persons live independently that focuses on personal responsibility, choice, and control; and 3) a core set of services including information and referral provisions, peer support, independent living skill development, and personal and systems advocacy to increase the accessibility of community environments (45). Before development of the Living Well with a Disability program, health promotion was not a service commonly provided by CILs (45).

Previous research suggested that an effective self-management strategy should incorporate life skills that facilitate the development of meaningful life activities to provide a context for addressing health behavior change (46). This strategy encourages persons with disabilities to set quality-of-life goals that include health behavior changes as essential objectives.

The Living Well with a Disability curriculum is geared to helping participants achieve early success in self-management of quality-of-life goals that build confidence and motivation for making health behavior changes (47). The program includes 11 chapters that facilitators use to conduct an orientation session and 10 weekly, 2-hour sessions. The first chapter, an orientation session, addresses the recruitment and retention challenges identified by community sites (and identified in research as barriers to program participation experienced by persons with disabilities). In this session, participants explore potential obstacles to attendance (e.g., fear and anxiety when going to a venue that might not accommodate their needs, such as having an accessible restroom), examine the potential benefits of participating in the program, and consider strategies they might use to overcome barriers. The next four sessions encourage peer support through a supportive solution-focused group process; they help participants develop hope that they can achieve a more meaningful and healthy life while addressing the early challenges of pursuing new goals. These sessions build analysis and problem-solving skills (e.g., frustration management and self-monitoring for depression to

identify needs for clinical intervention). The last six sessions focus on specific self-management skills for improving health status, including 1) strategies for effective communication with health care providers, 2) strategies for information acquisition and use, 3) strategies for increasing activity (through six levels from sedentary to recommended levels of exercise), 4) strategies for improving diet (based on U.S. Department of Agriculture guidelines), 5) strategies for advocating for both personal and health care systems improvements, and 6) cognitive and behavioral strategies for maintaining health behavior changes over time (Table 1). Additional program information is available at www.livingandworkingwell.org.

Data Collection and Analysis

The Living Well with a Disability program has been assessed in several published studies that are summarized in this report. No new findings are presented. The program was originally evaluated in a pilot study in 1992 (46) and revised before evaluation (1998–1999) using a randomized, quasiexperimental, staggered baseline design that included a convenience sample of 246 CIL consumers from nine sites geographically distributed across eight states in the United States (California, Kansas, Mississippi, Montana, Missouri, New Hampshire, New York, and Texas) (48,49). Participant demographics (e.g., mean age: 45 years; range: 18–85 years; 82.4% white; 64.2% women) were representative of the U.S. population of persons with mobility impairments. Participants had been living with an impairment for an average of 17.5 years (standard deviation [SD] = 15.7) (49).

Program effectiveness was evaluated by collecting data on secondary conditions (23), symptom days, life satisfaction (50), health care use as reflected by costs (e.g., primary care and emergency department visits, outpatient surgery, and hospital days), and healthy lifestyle (Table 2) (51). Data were collected 2 months prior, immediately before the intervention, immediately after the intervention, and at 2 months, 4 months, and 12 months after the intervention. Because of the staggered baseline design that requires implementation of the intervention with all participants, outcome data were analyzed by using separate between-subject (i.e., logistic regression) and within-subject procedures (i.e., repeated measures analysis of variance). The level of statistical significance for all analyses conducted was $p < 0.05$.

Results

Between-subject results indicated that participants in the intervention group were significantly more likely than those in the control group to be below the median for secondary

conditions (adjusted odds ratio [AOR]: 3.05; 95% confidence interval [CI]: 1.33–7.01), symptom days (AOR: 1.96; 95% CI: 0.91–4.26) and health care use (AOR: 1.94; 95% CI: 1.03–3.67) after adjusting for demographics and preintervention status with respect to the median of each variable (49).

The within-subject analysis indicated that observed changes in all outcome measures occurred during the intervention period and were maintained up to 12 months for secondary conditions, healthy lifestyle, and life satisfaction. Symptom days returned to baseline at 12 months, and health care costs returned to baseline at 2 months (Table 2). No change was observed over the extended baseline period (i.e., period without treatment prior to the intervention) on any of the outcomes measured, indicating that observed differences resulted from the Living Well with a Disability program rather than from instrumentation effects associated with the measurement procedures (48).

Discussion

In addition to person-level outcomes, a cost analysis of the Living Well with a Disability (Living Well) program was conducted. The cost analysis used the payer perspective, which reflects the costs incurred by health insurers and other payers (52). Self-reported health care utilization data were used to compute health care unit costs incurred by study participants at each measurement period (53). Overall, cost outcomes for the entire sample indicated a 6-month cost savings of \$3,227. To examine outcomes for participants without high health care expenditures (i.e., more than three standard deviations above the mean), a sample trimmed to include only persons with seven or fewer hospital nights during any measurement period was also reported. The 6-month health care cost savings for this sample was \$723. Overall, the Living Well program recovered all costs of program implementation, including in-person facilitator training and data collection (\$596 per participant), within 4 months of program delivery for both the complete and the trimmed sample populations (53).

By May 2015, the Living Well program had been implemented by 279 community-based agencies in 46 states to approximately 8,900 persons with disabilities. On the basis of the 6-month cost savings observed in the field trial (i.e., \$723 and \$3,227), these community applications are estimated to have saved \$6.4–\$28.8 million, which would have been incurred since February 1995 by health care payers without program implementation.

Several factors might affect dissemination of this program. Historically, health promotion has not been a mandated service in the U.S. health care system. In addition, many organizations,

TABLE 1. Living Well with a Disability curriculum content, objectives, and rationale for intervention components

Chapter	Primary objective	Rationale
Orientation	Provides introductory information about the program, so persons can learn about it before committing to attend	Persons are reluctant to commit to a class and need information to make an informed choice.
Goal setting	Introduces the process for identifying and setting meaningful quality-of-life goals; develops skills for writing goal statements	Setting meaningful quality-of-life goals provides motivation for participants to improve their health and to achieve their goals.
Problem solving	Teaches skills in identifying problems and generating solutions; helps participants anticipate and plan for problems while working toward goals	Problem-solving skills help participants anticipate problems and identify solutions in support of making progress towards goals.
Healthy reactions	Teaches cognitive-behavioral skills and encourages peer support for dealing with frustration and setbacks as participants work toward goals	Learning to be optimistic and develop healthy reactions to setbacks supports goal-directed activity.
Beating the blues	Provides an overview of discouragement and depression and offers additional resources for seeking help with prevention and management	Depressed mood can occur as a result of frustration and discouragement and disrupts goal-directed activity.
Healthy communication	Teaches the importance of clear communication with a focus on developing skills for communicating health issues with physicians and service providers	Goal-directed activity often depends on the help and support of others in the community. Communication skills promote cooperation in support of goal achievement.
Information seeking	Provides resources for identifying needed health information, evaluating the reliability of health information sources, and effectively using the information once found	Learning to find and apply reliable information specific to the individual needs of the participants is an important skill for improving health in support of goal achievement.
Physical activity	Presents information on and provides guidelines for increasing healthy activity and motivates participants to make simple changes to incorporate more physical activity into daily life	Secondary health conditions can be reduced or prevented through healthy physical activity.
Eating well	Provides information on nutrition and nutrition resources and presents strategies for monitoring eating habits and increasing the intake of healthy foods while limiting the intake of unhealthy foods	Secondary conditions can be reduced or prevented through improvements in nutrition.
Advocacy	Provides information and resources for self and systems advocacy and draws upon the skills learned in previous chapters to support participants' advocating for and meeting their needs	Learning the steps and skills of self and systems advocacy can solve problems that impede goal-directed activity (e.g., problems with access to exercise facilities).
Maintenance	Offers information and strategies for monitoring progress toward goals and maintaining health behavior changes	Health-behavior change must be supported with strategies for maintenance.

Sources: Adapted from Ravesloot C, Seekins T, Young Q-R. Health promotion for people with chronic illness and physical disabilities: the connection between health psychology and disability prevention. *Clin Psychol Psychother* 1998;5:76–85; Ravesloot C, Ruggiero C, Ipsen C, et al. Disability and health behavior change. *Disabil Health J* 2011;4:19–23.

such as CILs, that serve persons with mobility limitations struggle to meet their core mission across a large geographical area on small budgets. When they add a service, such as the Living Well program, they do so with limited funds. For other organizations, the functional approach adopted by the Living Well program might be unfamiliar and substantially different from the medical model of disability (2), which also might limit their ability to implement it.

The Living Well program improved the health-related quality of life and reduced health care utilization in a randomized controlled trial. Some health-status and health-related, quality-of-life improvements were still evident 12 months after the intervention. Scalability of the program is possible because it has been tested in geographically diverse parts of the United States and implemented across various organizations, including CILs, Aging and Disability Resource Centers, outpatient rehabilitation centers, and interdisciplinary wellness centers. In addition, three payers, L.A. Care Health Plan,

Inland Empire Health Plan, and the Montana 1915(c) Home and Community-Based Waiver Medicaid programs, have provided reimbursement to CILs for delivering the program. The facilitator and client workbooks are available in English, Spanish, and Korean.

The Living Well program was designed for compatibility with implementation in rural areas that often lack health promotion resources. Approximately 7.24 million noninstitutionalized persons with disabilities live in rural areas of the United States (54), and CILs have conducted Living Well trainings successfully even in remote counties and frontier counties, which have fewer than six persons per square mile. The combination of a distance training program with a workbook focused intervention has facilitated availability of the Living Well program in areas where limited resources exist for persons with disabilities.

The Living Well program has had a long history of development with funding from various sources including

TABLE 2. Mean scores of five outcome measures collected from participants* in the Living Well with a Disability program before, immediately after, and at 2, 4, and 12 months after intervention — eight states,† 2000

Measure	Pretest	Posttest	2 months	4 months	12 months
Secondary conditions [§]	28.3	24.6 [¶]	24.6 [¶]	23.4 [¶]	24.7 [¶]
BRFSS symptom days ^{**}	9.3	8.1 [¶]	7.7 [¶]	7.6 [¶]	8.3
Healthy lifestyle ^{††}	2.4	2.6 [¶]	2.6 [¶]	2.6 [¶]	2.6 [¶]
Life satisfaction ^{§§}	2.8	3.0 [¶]	3.0 [¶]	3.0 [¶]	3.0 [¶]
Health care costs ^{¶¶}	\$1,507	\$724 [¶]	\$895	\$1,306	\$1,296

Source: Adapted from Raveslout C, Seekins T, White G. Living well with a disability health promotion intervention: improved health status for consumers and lower costs for health care policymakers. *Rehabil Psychol* 2005;50:239–45.

Abbreviations: BRFSS = Behavior Risk Factor Surveillance System; HPLP II = health-promoting lifestyle profile II; HRQOL = health-related quality of life.

* N = 126.

† California, Kansas, Mississippi, Montana, Missouri, New Hampshire, New York, and Texas.

§ Secondary conditions values are summed across 43 conditions (item range: 0–4) using the Secondary Conditions Surveillance Instrument (Source: Seekins T, Smith N, McCleary T, Clay J, Walsh J. Secondary disability prevention: involving consumers in the development of a public health surveillance instrument. *J Disabil Policy Stud* 1990;1[3]:21–36).

¶ Denotes statistically significant posthoc difference (t-test or least significant difference test) from the pretest (p<0.05).

** BRFSS symptom days is the average number of days experiencing the seven symptoms included in the HRQOL-14 questionnaire (range: 0–30 days).

†† Healthy lifestyle is the average item score across all 52 items included in the HPLP II questionnaire (range: 0–3) (Source: Pender NJ, Walker SN, Sechrist KR, Frank-Stromborg M. Predicting health-promoting lifestyles in the workplace. *Nurs Res* 1990; 39:326–32).

§§ Single item (range: 1–4).

¶¶ Health care costs (i.e., doctor visits, emergency department visits, outpatient surgery, and hospital days) in 2000.

the CDC. In September 2015, funding was received from National Institute on Disability, Independent Living, and Rehabilitation Research to develop and evaluate a multimedia version of the Living Well program that will update delivery methods, improve fidelity of program implementation in the field, and extend programmatic reach. Additional program information is available at <http://rtc.ruralinstitute.umt.edu/health-wellness/motivation-for-self-management>.

Limitations

The findings in this report are subject to at least two limitations. First, self-reported outcomes and convenience sampling can produce biases not accounted for in the experimental design. Second, the results are not generalizable beyond the population of persons with disability using CIL services.

Conclusion

Persons with disabilities have unique needs that can be addressed through multiple levels of intervention to reduce health disparities (6). CDC has responded to these needs by developing a novel effective intervention that has already realized a return on investment through its many applications at multiple sites. Because of the aging of the U.S. population, this intervention might generate greater returns as the need intensifies for interventions that address health disparities experienced by persons with disabilities.

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Epilogue

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In 1985, the Report of the Secretary's Task Force on Black and Minority Health was published (1) after the federal government convened the first group of health experts to analyze racial/ethnic health disparities among minorities. This analysis, also known as the Heckler report, revealed higher illness and death rates among minorities. The year 2015 marks the 30th anniversary of the Heckler Report and presents an opportunity to evaluate and continue to improve minority health at the national, state, tribal, territorial, and local levels.

Since 1985, the United States has made considerable progress in understanding the effects of health disparities across diverse populations. Populations affected by health disparities experience systematic social or economic discrimination and exclusion that affect health adversely (2). Health disparities have been associated with race/ethnicity, socioeconomic status, sex, age, sexual orientation, and geographic location (3). CDC has documented evidence of these disparities in several publications. The CDC health disparities and inequalities reports, published in 2011 (4) and 2013 (5), included such topics as social determinants of health, environmental hazards, health care access, mortality and morbidity, behavioral risk factors, and preventive health services.

To complement the health disparities reports, in April 2014, CDC published an initial report on related strategies to reduce these disparities, which included interventions for childhood vaccinations, motor vehicle crashes, HIV, and tobacco use (6). This supplement provides information on additional selected interventions that are increasing colorectal cancer screening; improving health-related quality of life for persons with disabilities; and reducing youth violence, hepatitis A, risk for HIV infection, and asthma attacks. The supplement also describes community-driven, participatory approaches to increase access to healthy foods (7). The purpose of these periodic reports is to evaluate and report on interventions and strategies that reduce health disparities while continuing to document them (5), highlight effective and promising strategies to eliminate health disparities (6), and document new models and expanded collaborative efforts to achieve health equity.

More work remains to be done. Data can be disaggregated by population subgroups, as demonstrated by the Hispanic

health Vital Signs report released by CDC in May 2015 (8). In addition, evidence should continue to be gathered regarding what works to improve minority health, reduce health disparities, and move the nation toward health equity. For example, the national health profile for lesbian, gay, bisexual, and transgender (LGBT) persons, or sexual minority populations, is largely undocumented and therefore not well understood. The 2011 Institute of Medicine report (IOM) on the health of LGBT persons is one of the first national assessments of health disparities in this population (9). This IOM report documented that LGB youths are at increased risk for suicidal ideation, suicide attempts, and depression and noted that small studies suggest the same might be true for transgender youths. In addition, the IOM report indicates that rates of smoking, alcohol consumption, and substance abuse might be higher among sexual minority populations. Expanding the collection of sexual orientation and gender identity data in large national data sets and conducting studies to determine the efficacy of targeted interventions to address health disparities can increase awareness among public health practitioners and health care providers of the magnitude of health disparities experienced by these populations, as well as the potential for remedying them.

This 2016 supplement on strategies for reducing health disparities describes focused public health actions that range from individual counseling to engaging community health workers to developing clinical, community, and environmental health connections (7). These actions address numerous health concerns disproportionately affecting particular populations, such as hepatitis A disease (10), HIV infection (11,12), colorectal cancer screening (13), youth violence (14), and pediatric asthma (15). This supplement also includes reports related to health self-management among persons with disabilities (16) and American Indian/Alaska Native communities rebuilding the traditional food system using traditional ecological knowledge about health (17).

Programs described in these reports raise questions and describe interventions that can help strengthen the evidence base for reducing health disparities. For example, two articles describe interventions that depend on community health workers (CHWs) and lay health advisors (LHAs) (12,15).

Since the 1960s, CHWs and LHAs have been recognized as an effective strategy to address disparities among minority populations (18). CHWs and LHAs are effective, in part, because they share the same cultural background and speak the same language as the population they serve, they are aware of indigenous health beliefs that influence healthy or unhealthy behaviors, and they understand barriers to health care experienced by their community. They can act as intermediaries between community members and health care providers, which increases use of health care and preventive health care screenings, increases adoption of recommended behavior changes, and reduces health care costs (19).

In a 2015 article on health equity, the authors argue for a health care system that promotes health equity (20). Health services that focus on health equity would identify specific communities at risk, collect meaningful data to understand local needs and priorities, make progress, and conduct ongoing assessments of health outcomes. Programs designed to build health equity are likely a smart investment as more payment systems adapt to reward better patient outcomes. Meaningful involvement of CHWs and LHAs is an example of the type of intervention that this report asserts is necessary for achieving health equity. Questions raised by two of the CHW and LHA programs described in this supplement include the following: What additional intervention research is needed to ensure the sustainability of CHW and LHA approaches? Which efforts are necessary to identify and provide requisite training and professional development? How can CHWs and LHAs be meaningfully involved in the design and implementation of culturally appropriate interventions, including culturally appropriate evaluation strategies (12,15)? Overall, how can CHWs and LHAs contribute to programs that advance health equity?

The published evidence on implementation science, program and policy evaluation, and performance management in public health practice is substantial and growing. Public health professionals can bolster the impact of strategies for reducing health disparities, disseminate and tailor these strategies to reach more communities, and determine how to expand these strategies for even greater impact by rigorously applying lessons learned from these efforts (21). Collaborating with affected communities, policymakers, and the health care system, health disparities can be reduced. Working together with multiple sectors that influence health outcomes, public health professionals can pursue health equity.

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