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In October 2011, Vanderbilt University Medical Center provided 12,850 flu vaccines in eight hours during an event called Flulapalooza. The mass vaccination clinic served to test the institution's pandemic response plan, while also giving the seasonal flu vaccine program a shot in the arm. Photo: Susan Urmy
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A Message from the Editor

It is anyone’s guess as to why one flu season can be mild while another is severe. What is for certain is that immunization is the best way to protect oneself and others from the flu.

In this issue of Public Health Reports (PHR), the National Vaccine Advisory Committee (NVAC) details strategies for achieving the Healthy People 2020 influenza vaccination coverage goal for health-care personnel (HCP). According to NVAC, one reason it is so critical that HCP receive the flu vaccine is because people who are at high risk of severe outcomes due to complications from influenza infection (i.e., people older than 65 years of age, pregnant women, people with chronic medical conditions, residents of long-term care facilities, and infants) are under the care of HCP in health-care settings. Influenza vaccination rates among HCP have risen to 67% in recent seasons, but those rates are still well below the 90% Healthy People 2020 goal. By taking the simple step of receiving the flu vaccine, HCP can do their part to lower the risk of getting the flu and, ultimately, infecting vulnerable populations. An accompanying commentary by Assistant Secretary for Health Dr. Howard Koh discusses the barriers to achieving the Healthy People 2020 goal and strategies for improving vaccination coverage among HCP.

Another article in this issue of PHR also focuses on vaccination. Simpson and colleagues report on the increase in meningococcal vaccination rates in Arizona after implementing statewide school-entry immunization requirements. On the topic of heart health, Rear Admiral Scott Giberson discusses the expanding role of pharmacists, especially as it relates to the national Million Hearts™ campaign, in concert with American Heart Month in February. And tobacco use is the focus of an article by Bruckman et al., which describes the challenges in enforcing a smoke-free workplace law in Ohio.

The subject of obesity is highlighted in two articles in this issue. In an article by Cockrell Skinner and colleagues, estimated and measured parental reports of children’s height and weight were examined to determine how they influence the estimates of the prevalence of childhood obesity. Their findings indicate that, generally speaking, estimated measurements were fairly accurate and did not significantly alter the overall population estimates of obesity. An article by Tsai and Rosenheck examines obesity among chronically homeless adults. A common misconception is that all homeless people are underweight because of not having enough food to eat. According to the authors, however, the majority (more than 50%) of chronically homeless adults are overweight or obese. They link this unexpected obesity issue to the food insecurity-obesity paradox, whereby inadequate economic resources to purchase food is linked with overconsumption of food. They also suggest that soup kitchens and shelters, many of which serve high-fat, energy-dense foods, are contributing to obesity in the homeless population.

This issue of PHR begins a new volume in the Journal’s 135-year history, and its continued publication is attributed to an excellent team of staff and contributors. I’d like to thank the dedicated volunteers who serve as guest editors, editorial committee members, column editors, special consultants, and peer reviewers for PHR. If you have published in PHR this past year, you are well aware of our outstanding scientific editorial team that prepares manuscripts for publication. Many of you have written to me to express your thanks for how smoothly and efficiently this process has been. Special thanks go to our production assistant, Mary McGonegle, who keeps the many submitted manuscripts well organized. Lastly, I want to recognize our managing editor, Julie Keefe, who is the heart and soul of PHR. She has been with the journal for 12 years, and those of you who have interacted with her know how competent and professional she is.

As I write this, I am preparing for my retirement as acting editor of PHR. With our dedicated staff and contributors, however, I know that PHR will continue to be a top-notch public health journal for years to come.

Janice Huy, MS
Captain (Ret.), U.S. Public Health Service

REFERENCE
In celebration of American Heart Month, Rear Admiral Scott Giberson, the Chief Pharmacy Officer for the U.S. Public Health Service, provides insight into the broadening role of pharmacists as health-care practitioners, especially as it relates to improving the cardiovascular health of Americans. During the past two decades, pharmacists working in community settings have become more involved in screening, direct patient care, and health education in addition to their traditional role of drug dispensers.

Janice Huy, MS, Acting Editor
Captain (Ret.), U.S. Public Health Service

MILLION HEARTS™: PHARMACIST-DELIVERED CARE TO IMPROVE CARDIOVASCULAR HEALTH

Scott F. Giberson, RPh, PhC, MPH

More than two million people have a heart attack or stroke each year in the United States. More than 2,200 Americans die of cardiovascular disease (CVD) each day, representing an average of one death every 39 seconds. However, many of these deaths are preventable.

Risk factors for heart disease and stroke include high blood pressure, high cholesterol, diabetes, smoking, obesity, nutritional choices, and lack of physical activity. Aiming to prevent one million heart attacks and strokes during a five-year period through appropriate aspirin therapy, blood pressure control, cholesterol management, and smoking cessation (ABCS), the Million Hearts™ campaign calls for a concerted effort in targeting cardiovascular health. Million Hearts has two primary goals: (1) to empower Americans to make healthy choices and (2) to improve care for people who need treatment.

In the September 2012 issue of Public Health Reports, the U.S. Surgeon General noted that such a comprehensive effort requires the commitment of many public health and medical professionals, among others, to improve Americans’ cardiovascular health. This commitment can be the stimulus needed to fully leverage existing cost-effective health-care delivery models. Million Hearts encourages regional, state, and local partners to identify and engage multiple approaches to realize the greatest health impact. The encouraged partnerships and approaches include expanded collaboration among health-care providers, pharmacists, and physicians, as well as efforts to maximize the use of each professional to the fullest extent of education and licensure.

Because CVD prevention and care involve both the clinical and community realms, pharmacists are uniquely positioned to contribute to the Million Hearts campaign goals. Evidence-based data demonstrate that pharmacists in many practice settings deliver clinical services that improve access to care, quality of care, cost-effectiveness, and patient outcomes, including those outcomes directly related to the ABCS of Million Hearts. As the most accessible health-care professionals in a community, pharmacists are trusted by patients and have the clinical training and the capacity to provide patient care throughout the continuum of chronic diseases, including prevention, chronic disease management, patient education, adherence counseling, and provider consultation. As essential members of the health-care team, pharmacists in multiple practice settings function as health-care providers to deliver patient care services, such as the ABCS for CVD.

Working in collaboration with other health-care providers, pharmacist-delivered patient care continues to evolve and transform as the pharmacist’s scope of practice expands to meet the nation’s health-care needs. This scope includes addressing the burden of CVD. As an example, federal pharmacists have managed chronic conditions collaboratively with other health-care providers for 50 years. Pharmacists in the Department of Veterans Affairs, Department of Defense, and U.S. Public Health Service (PHS) have been providing preventive services (e.g., smoking cessation) and direct patient care, such as the management of hypertension, diabetes, and dyslipidemia. In these settings, pharmacists conduct blood pressure screenings, monitor and interpret laboratory results, perform some physical assessment, and adjust patients’ medications as appropriate. They discuss therapeutic
lifestyle changes with patients, provide tobacco use screening and cessation services, consult with physicians on therapeutic plans, and provide follow-up care. Evidence-based data and physician input suggest this is a well-accepted paradigm of care that improves patient outcomes.6

Similarly, many nonfederal practice settings have also expanded pharmacists’ roles to provide these types of services through collaboration with physicians and health-care teams. State Medicaid programs are listed as potential partners for Million Hearts, and more than 40 states have specific regulatory authorization allowing pharmacists to provide expanded patient care through collaborative practice agreements with physicians.5 This type of collaboration through regulatory authorization can be leveraged to advance the goals of the Million Hearts campaign. Americans deserve this type of optimized and effective care. As suggested, it will take a commitment to work together.

With approximately 275 million people visiting pharmacies each week,14 and a pharmacy typically located within two miles of every home, pharmacists in the community setting are an incredible asset with unparalleled potential to greatly improve the nation’s health. Pharmacists can serve as key providers within communities to deliver services and serve as a point of entry to care for patients. The wide accessibility of pharmacists within communities means that patients have increased access to a cadre of highly trained health-care professionals who can help address prevention and chronic care through the use of medications.

As shown in the Figure, the pharmacy profession has joined the Million Hearts campaign nationwide and implemented numerous activities to engage students, communities, state legislatures, and patients, including:

- Pharmacy Blood Pressure Challenge: Launched by the American Pharmacists Association (APhA) Foundation, the challenge encourages pharmacists to perform blood pressure screenings and talk with at least one patient per day about blood pressure control. Pharmacists can report their impact online, and aggregated data will be shared to demonstrate pharmacists’ overall positive health impact.15

- Operation Heart: Led by APhA’s Academy of Student Pharmacists, Operation Heart reported that in only six months, about 5,700 students delivered services to approximately 42,000 patients and provided education outreach to approximately 1,850,000 patients.16

- The National Alliance of State Pharmacy Associations and the Alliance for Patient Medication Safety: These two organizations have also encouraged state pharmacy associations to develop community outreach activities and engage in policy development.

- Walgreens: The national retailer is engaging its more than 26,000 health-care providers to offer free blood pressure testing in consultation with a Walgreens pharmacist.

These wide-reaching national and community-based initiatives demonstrate the commitment and positive contribution to Million Hearts by pharmacists throughout the nation, regardless of practice setting.

In addition, serving as public health professionals across 15 agencies and five U.S. departments, Commissioned Corps pharmacists of the PHS are in a unique position to facilitate partnerships among stakeholders for a united effort against CVD through Million Hearts. Much of Commissioned Corps pharmacists’ work and contributions are accomplished through the diverse network of practice settings and duty assignments including patient care, regulatory science, research, policy development, Medicare enhancements, and public health. Since the publication of “Improving Patient and Health System Outcomes through Advanced Pharmacy Practice: A Report to the U.S. Surgeon General 2011,”7 various groups have moved forward to expand their scope of practice and officially recognize pharmacists as health-care providers. Academia, pharmacy organizations, and state and federal pharmacy continue to work together with physicians, other health-care and public health professionals, and health leadership to transform health-care delivery with the goal of improving patient care and the nation’s public health. This type of change increases the potential for pharmacists to provide additional support to programs such as Million Hearts and to sustain services that can help to reduce the nation’s CVD burden.

As a U.S. Assistant Surgeon General and the Chief Professional Officer for PHS Pharmacy, I have the privilege of working with many of the stakeholders to support the Million Hearts campaign. PHS Pharmacy encourages everyone to join in the Million Hearts campaign and improve the nation’s cardiovascular health. Some of the actions you can take include:

- Expanding your practice to include pharmacist-physician collaboration to meet a specific cardiovascular health need;

- Educating patients and other providers on all the services that could potentially be offered to assist in improving cardiovascular health;

- Integrating ABCS into collaborative practice or team-based care; and
### Figure. Pharmacy organizations with Million Hearts™-related activities

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<th>Organization</th>
<th>Million Hearts-related activities</th>
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| Academy of Managed Care Pharmacy (www.amcp.org) | • Team Up. Pressure Down. Developed by the Centers for Disease Control and Prevention (CDC), with practicing pharmacists and national pharmacist groups; an educational program that supports team-based care and provides resources and support for health-care professionals. The goal is to decrease the number of heart attacks and strokes among people with uncontrolled high blood pressure through medication adherence and effective blood pressure control.  
  - Prescription medication payer model involvement. |
| American Association of Colleges of Pharmacy (www.aacp.org) | • Team Up. Pressure Down. (see previous description).  
  - Public service campaign. |
| American College of Clinical Pharmacy (www.accp.com) | • Team Up. Pressure Down. (see previous description).  
  - Development of tools and resources that support team-based care in CVD management.  
  - Tools, resources, outcomes research, and best practices information dissemination.  
  - Member education. |
| American Pharmacists Association (APhA) (www.pharmacist.com) | • Team Up. Pressure Down. (see previous description).  
  - Operation Heart: a patient care program led by APhA’s Academy of Student Pharmacists. In Operation Heart, students reach out to communities, encourage lifestyle modifications, monitor risk factors, assess patient adherence to hypertension medications, and provide education about medications for heart disease. In only six months, about 5,700 students delivered services to approximately 42,000 patients and provided education outreach to approximately 1,850,000 patients.  
  - Pharmacy Blood Pressure Challenge: motivates pharmacists to perform blood pressure screenings and educate patients about their blood pressures, and allows pharmacists to log their patient outreach, education, and intervention activities online. Aggregated data will be shared with the Department of Health and Human Services and the public to show the overall impact pharmacists have on CVD prevention and care.  
  - Project ImPACT: Hypertension: a one-year demonstration project with Wayne State University aiming to reduce cardiovascular risk through pharmacist-delivered services, such as increasing identification of hypertensive patients and improving adherence to medications. |
| American Society of Health-System Pharmacists (www.ashp.org) | • Continuing education (CE) activities: more than 10 hours of CE programs on heart disease, stroke, and related conditions since December 2011.  
  - Publications: clinical guidelines on tobacco cessation, peer-reviewed articles on related topics in the American Journal of Health-System Pharmacy, and other publications such as Cardiovascular Pharmacotherapy: A Point-of-Care Guide.  
  - Information dissemination: shares information about Million Hearts and activities that support its goals through membership communication channels. |
| National Alliance of State Pharmacy Associations (NASPA) (www.naspa.us) and Alliance for Patient Medication Safety (APMS) (www.medicationsafety.org) | • Team Up. Pressure Down. (see previous description).  
  - State pharmacy association engagement: NASPA and APMS are encouraging state pharmacy associations and their members to engage in the Million Hearts campaign; promote leadership, sharing, learning, and policy exchange among state pharmacy associations and pharmacy leaders nationwide; and support pharmacists, patients, states, and communities working together to improve heart health. State pharmacy associations have also joined the Million Hearts campaign and shared heart health information with their membership. They have conducted heart health public awareness activities such as blood pressure screenings at health fairs and lobby days at state legislatures. |
| National Association of Chain Drug Stores (www.nacds.org) | • Team Up. Pressure Down. (see previous description).  
  - Supporting medication adherence education activities and research. |
| National Community Pharmacists Association (NCPA) (www.ncpanet.org) | • Team Up. Pressure Down. (see previous description).  
  - Simplify My Meds: a medication adherence program implemented in independent community pharmacies to provide pharmacists with tools to help coordinate patients’ prescription refills to a single day of the month to reduce the potential for gaps in medication therapy and promote improved medication adherence.  
  - Programs conducted by community pharmacists on blood pressure and lipid monitoring, as well as smoking cessation services.  
  - NCPA also serves as an adviser in CDC’s Pharmacy Outreach Project. |

*continued on p. 5*
### Figure (continued). Pharmacy organizations with Million Hearts™-related activities

<table>
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<tr>
<th>Organization</th>
<th>Million Hearts-related activities</th>
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| National Consumers League (NCL)—Script Your Future ([www.scriptyourfuture.org](http://www.scriptyourfuture.org))  | • Team Up. Pressure Down. (see previous description).  
• Script Your Future: a medication adherence education campaign aimed at increasing medication adherence by raising consumer awareness of the importance of taking medications as directed. The campaign targets patients with chronic conditions (including CVD, respiratory disease, and diabetes), their families, caregivers, and health-care professionals. The three-year campaign, launched in 2011, now includes more than 100 committed public and private partners. More than 80 pharmacy schools have participated, with approximately 40,000 student pharmacists and faculty providing education to more than 250,000 patients nationwide on medication adherence. The NCL is incorporating the goals of Million Hearts into the activities of Script Your Future, which features coordinated national communications and targeted outreach in six cities: Baltimore, Maryland; Birmingham, Alabama; Cincinnati, Ohio; Providence, Rhode Island; Raleigh, North Carolina; and Sacramento, California. |
| RxAlly ([www.rxally.com](http://www.rxally.com))  | • Heart to Heart: a blood pressure education campaign focused on the prevention and control of hypertension, in support of Million Hearts. RxAlly is a network of community pharmacies, including independent pharmacies, regional chain pharmacies, and Walgreens. In this campaign, participating community pharmacies offer free blood pressure screenings, and pharmacists are encouraged to educate patients about the importance of knowing their blood pressure readings and the steps to lower their blood pressures if necessary to decrease the incidence of heart attacks and strokes. |
| Walgreens ([www.walgreens.com](http://www.walgreens.com))  | • Engaging its more than 26,000 health-care providers to support the Million Hearts campaign's prevention goal by offering blood pressure testing at no charge in consultation with a Walgreens pharmacist.  
• Making Million Hearts resources available at their more than 7,760 drugstores nationwide. |

*This is a partial list of Million Hearts campaign-related activities. For additional information, go to: [http://www.millionhearts.hhs.gov](http://www.millionhearts.hhs.gov)*

**CVD = cardiovascular disease**

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**Executive Perspective**

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- Leading healthy lifestyles and being role models for health for our patients.

Taking any or all of these steps will put our nation on a path forward as we improve Americans’ cardiovascular health and overall health.

Rear Admiral Scott F. Giberson is a U.S. Assistant Surgeon General, the Chief Professional Officer for the U.S. Public Health Service (PHS) Pharmacy, and Director of Commissioned Corps Personnel and Readiness in the PHS, Office of the Surgeon General, in Rockville, Maryland.

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The findings and conclusions in this article are those of the author and do not necessarily represent the official position of the Office of the Surgeon General.

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Strategies to Achieve the Healthy People 2020 Annual Influenza Vaccine Coverage Goal for Health-Care Personnel: Recommendations from the National Vaccine Advisory Committee

EXECUTIVE SUMMARY

Influenza is a significant public health issue. Annual influenza-associated deaths range from 3,000 to 49,000 according to recent estimates, and more than 200,000 people are hospitalized each year for respiratory illnesses and heart conditions associated with seasonal influenza infections. Immunization is the most effective method for preventing infection from influenza and possible hospitalization or death. The Advisory Committee on Immunization Practices (ACIP) recommends that all people ≥6 months of age receive annual influenza vaccination. In addition, vaccination of all health-care personnel (HCP) is a particular focus of recommendations by the U.S. Department of Health and Human Services (HHS), the Centers for Disease Control and Prevention (CDC), and other health-care and public health agencies and professional organizations. Despite these recommendations, influenza immunization rates for HCP in the United States remain below the Healthy People 2020 (HP 2020) annual goal for influenza vaccine coverage.

To address this gap in immunization rates for HCP, the HHS Assistant Secretary for Health (ASH) directed the National Vaccine Advisory Committee (NVAC) to develop recommendations and strategies for the specific purpose of achieving the HP 2020 coverage goal. These issues were deliberated on by a Health Care Personnel Influenza Vaccination Subgroup, a subgroup of the NVAC Adult Immunization Working Group. Based on the analysis and evaluation presented by the subgroup, these recommendations were voted on and approved by the majority of NVAC members on February 8, 2012.

These recommendations include a tiered set of strategies for achieving the HP 2020 annual goal, including implementing and managing influenza prevention and vaccination programs, measuring and reporting vaccination coverage, and addressing issues surrounding the implementation of employer requirements for HCP vaccination. In approving these recommendations, NVAC maintained that HCP who are committed to promoting patients’ welfare and the health of the public, and to safeguarding their own and their colleagues’ well-being, have an ethical responsibility to take appropriate measures, including vaccination, to prevent the spread of influenza infections in health-care settings. NVAC realizes that health-care employers (HCEs) range in their scope of practice, from traditional hospital settings to in-home health-care settings, and no single strategy for improving immunization rates would be appropriate for all HCP. Thus, NVAC presents the following set of tiered options that can be applied to most health-care settings to improve immunization rates of HCP to reach the HP 2020 annual influenza vaccine coverage goal for HCP:
INTRODUCTION AND BACKGROUND

NVAC advises HHS on issues of vaccine policy. In 2010, the ASH and the National Vaccine Program Office charged NVAC with recommending strategies to achieve the HP 2020 objective for annual influenza vaccination coverage among HCP. The HP 2020 objective is intended to reduce influenza infection in HCP and their patients, thereby decreasing the physical and financial burden on the overall health-care system. NVAC established the Health Care Personnel Influenza Vaccination Subgroup, a subgroup of the Adult Immunization Working Group, to examine these issues. The Working Group developed the recommendations presented in this report based on an extensive review of the literature; discussions; and input from subject-matter experts, relevant stakeholders, and the public. A summary of stakeholder and public comments is found in the Appendix. The findings, conclusions, and recommendations of the Working Group were presented to and adopted by NVAC on February 8, 2012.

Definitions

HCP (health-care personnel), HCEs (health-care employers), and employer requirements are referred to throughout this report. The following definitions of these terms serve as the basis for discussion in this report:

HCP refers to all paid and unpaid people working in health-care settings who have the potential for exposure to patients and/or to infectious materials, including body substances, contaminated medical supplies and equipment, contaminated environmental surfaces, or contaminated air. HCP might include, but are not limited to, physicians, nurses, nursing assistants, therapists, technicians, emergency medical service personnel, dental personnel, pharmacists, laboratory personnel, autopsy personnel, students and trainees, contractual staff not employed by the health-care facility, and people (e.g., clerical, dietary, housekeeping, laundry, security, maintenance, billing, and volunteers) not directly involved in patient care but potentially exposed to infectious agents that can be transmitted to and from HCP and patients. Thus, HCP includes a range of those directly, indirectly, and not involved in patient care who have the potential for transmitting influenza to patients, other HCP, and others.

Recommendations

• Recommendation 1: NVAC recommends that HCEs and facilities establish comprehensive influenza infection prevention programs that include education of HCP as a key component. Comprehensive influenza infection prevention plans are recommended by CDC as an essential step for all HCEs and facilities to achieve the HP 2020 influenza vaccine coverage goal. NVAC recommends that the ASH strongly urge all HCEs and facilities to adopt these recommendations.

• Recommendation 2: NVAC recommends that HCEs and facilities integrate influenza vaccination programs into their existing infection prevention programs or occupational health programs. NVAC also recommends that the ASH assure that this recommendation is implemented in HHS facilities and services (including the Public Health Service [PHS], HHS staff, and Federally Qualified Health Centers [FQHCs]) and strongly urges all HCEs and facilities to do the same.

• Recommendation 3: NVAC recommends that the ASH encourage CDC and the Centers for Medicare and Medicaid Services (CMS) to continue efforts to standardize the methodology used to measure HCP influenza vaccination rates across settings. The ASH should also work with CMS to facilitate adoption of this recommendation.

• Recommendation 4: For those HCEs and facilities that have implemented Recommendations 1, 2, and 3 and still have not consistently achieved the HP 2020 goal for influenza vaccination coverage of HCP in an efficient and timely manner, NVAC recommends that HCEs strongly consider an employer requirement for influenza immunization. In addition to medical exemptions, HCEs may consider other exemptions in their requirement policies. NVAC also recommends that the ASH assure that this recommendation is implemented in HHS facilities and services (including PHS, HHS staff who are HCP, and FQHCs) and urge all other HCEs and facilities to do the same.

• Recommendation 5: NVAC recommends that the ASH encourage ongoing efforts to develop new and improved influenza vaccines and vaccine technologies including support for research, development, and licensure of influenza vaccines with improved effectiveness and duration of immunity, as well as steps that improve the immunogenicity and rapid production of existing influenza vaccines.
trol Practices Advisory Committee (HICPAC) and the Advisory Committee on Immunization Practices (ACIP), 2006.5

HCE refers to a person or entity that has control over the wages, hours, and working conditions of HCP in health-care settings.4 Health-care settings include, but are not limited to, acute-care hospitals; adult day programs or facilities, ambulatory surgical facilities, and long-term care facilities (LTCFs), such as nursing homes and skilled nursing facilities; outpatient clinics and physicians’ offices; and rehabilitation centers, residential health-care facilities, home health-care agencies, urgent-care centers, and outpatient clinics.

Employer requirements: For the purpose of this report, NVAC does not stipulate the scope and content of such requirements; it should be a decision made by the HCEs based on the concerns and needs of their HCP, their patients, and the public.

Influenza: a significant public health issue
In the U.S., CDC estimates that 3,000 to 49,000 influenza-associated deaths occur each year3 and, on average, more than 200,000 people are hospitalized each year for respiratory illnesses and heart conditions associated with seasonal influenza infections.6 Serious morbidity and mortality from influenza infection can occur in any person regardless of age. However, the following groups of people, who are often under the care of HCP in health-care settings, are at higher risk for severe outcomes due to complications from influenza infection:7

- People older than 65 years of age: From 1979 to 2000, studies showed that influenza hospitalization rates for elderly patients were two to 14 times higher than in the general population, and more than 90% of the patients who died from influenza infections were elderly.6,8
- Pregnant women: Pregnant women are at a higher risk of complications from influenza.9–11 In addition, newborns born from vaccinated mothers are less likely to become infected with influenza during infancy and are less likely to be born premature than those from unvaccinated mothers.12
- People with chronic medical conditions: During periods of high influenza incidence, hospitalizations of adults with diabetes, cardiovascular disease, or chronic lung, renal, or liver conditions may increase two- to fivefold, depending on age group.13 Influenza-related hospitalization rates in adults <65 years of age with cancer are significantly higher than for the general population, making this population a particularly high-risk group. In addition, all cancer patients, but especially those <65 years of age, are at higher risk of influenza-related deaths.14
- Residents of LTCFs: Residents in LTCFs have a greater risk for infection because they live in close proximity within closed settings and have contact with numerous caregivers.15 Many residents may have multiple underlying medical problems, and health-care-associated influenza outbreaks in LTCFs are often associated with significant morbidity and mortality.16–18
- Newborns and infants, especially those in neonatal intensive care units: Children younger than six months of age cannot be immunized for influenza and are at high risk of hospitalization for influenza.19,20

Immunization: the most effective way to protect patients and HCP from influenza infections
NVAC’s recommendations are built on the principles that influenza is a significant public health threat, that the influenza vaccine is safe and effective, and that vaccination is currently the most effective mechanism for preventing influenza infection.

According to ACIP, “The most effective strategy for preventing influenza is annual vaccination,” and routine influenza vaccination is now recommended for all people ≥6 months of age.11 ACIP and the Healthcare Infection Control Practices Advisory Committee (HICPAC), in addition to many other medical organizations and leaders, recommend that all HCP in the U.S. be vaccinated annually against influenza, establishing influenza vaccination as a standard of care.21 Immunizing HCP has two potential benefits: (1) directly protecting HCP from influenza for their own health, allowing them to continue to work and, thus, minimizing the disruption of health-care services; and (2) indirectly protecting other HCP and patients with whom they come in contact who may be at high risk for complications of influenza.15,22–25

Vaccination is the best-documented and most effective intervention to prevent influenza transmission.26 Determining the overall effects of HCP vaccination on patient outcomes is methodologically challenging, and the outcomes measured often vary between studies. Findings specific to the effectiveness of HCP influenza vaccination in protecting patients vary by setting, year, and population studied and may lead to differing interpretations of the available data.24,27–30 Collectively, the impact of HCP vaccination on patient morbidity and mortality in health-care settings requires continued investigation. While the Working Group discussed several scientific studies that evaluated the impact of
HCP influenza vaccination on reducing health-care-associated influenza infection among patients, evaluating the full merits of HCP vaccination was not included in the charge of the Working Group; therefore, it is not directly addressed in this report.

HCP immunization rates are well below the HP 2020 goal
HCP vaccination rates vary from year to year but are consistently well below the HP 2020 goal. For the 2009–2010 influenza season, 61.9% of HCP were vaccinated; for the 2010–2011 season, 63.5% were vaccinated. In a 2011 CDC report, vaccination coverage was reported to be higher among HCP working in hospitals (71.1%) than among HCP working in ambulatory or outpatient centers (61.5%), patient homes (53.6%), and other health-care settings (46.7%).

Vaccination coverage among physicians and dentists (84.2%) was similar to coverage among nurse practitioners and physician assistants (82.6%), and was significantly higher than for those working in all other occupational groups. Coverage also was significantly higher among HCP aged ≥60 years (74.2%) compared with those aged 18–29 years (56.4%) and 30–44 years (57.8%).

FINDINGS AND RECOMMENDATIONS
Implementing a comprehensive influenza prevention program for HCP in all health-care settings

HCP can acquire influenza infection and transmit it to patients. Exposure to influenza infection in health-care settings is an occupational hazard for HCP. Influenza infections range from asymptomatic/mild infections to severe infections and death. Asymptomatic HCP, along with those who come to work ill, can potentially transmit the virus to colleagues, their families, and patients. One study looking at serological testing of HCP in acute care hospitals found that 120 of 518 (23%) of HCP tested positive for influenza infection. Of these, 71 of 120 (59%) could not recall having an influenza infection, and 32 of 120 (27%) did not report experiencing any respiratory infection.

Patients who are at higher risk for influenza and its associated complications have frequent, close contact with HCP while seeking inpatient and outpatient medical services. Some of these patients may not always be easily identified as high risk. While unvaccinated HCP have been implicated as sources of influenza infections in outbreaks among adults and children in both acute and long-term care settings, attribution of the source of such infections is often difficult. One study at the University of Virginia Health System, a tertiary care center, reported an association between increased influenza vaccination among HCP (defined as hospital employees) and decreased health-care-associated influenza in hospitalized patients. In this study, a rise in HCP vaccination rates from 4% to 67% was associated with a significant decrease in the proportion of laboratory-confirmed influenza cases in HCP from 42% to 9% and a decrease in the number of health-care-associated influenza cases in hospitalized patients (32% to 0%). However, because influenza vaccination was part of a comprehensive multipronged intervention, these results cannot be attributed solely to the vaccination of HCP. Therefore, HCP immunization should be considered a necessary and vital component of infection-control programs intended to protect those at high risk from severe influenza infection. Patients have the right to be protected against influenza infection transmission by the HCP responsible for their care.

Comprehensive infection prevention plans that include immunization for influenza are the most effective method to protect HCP and their patients from infection. Other infection prevention practices, when used in conjunction with influenza immunization, may enhance the protection of HCP and their patients from influenza. A comprehensive influenza prevention plan should include, but not be limited to, (1) offering free influenza vaccination to all HCP across varying work shifts, locations, and days; (2) providing targeted, interactive education programs annually to all HCP to explain the impact of influenza, particularly among high-risk patients, and to address misconceptions and concerns about the safety of influenza vaccination; and (3) educating HCP about the importance of influenza vaccination in promoting patient and employee safety.

A comprehensive influenza prevention plan should include implementation of hand and respiratory hygiene and cough etiquette, screening for and appropriate isolation of HCP and patients identified with acute respiratory tract infections, appropriate management of ill HCP, adherence to standard precautions for all patient care activities as well as implementation of transmission-based precautions as indicated, and implementation of engineering and environmental infection prevention measures as outlined in CDC’s “Prevention Strategies for Seasonal Influenza in Healthcare Settings.”

Comprehensive infection prevention plans that include voluntary influenza vaccination have been shown to improve influenza vaccination rates in HCP in some health-care facilities. St. Jude Children’s Research Hospital in Memphis, Tennessee, specializes in the care of severely immunocompromised children, and essentially all
patients are at a significant risk for complications from severe influenza infection. The hospital achieved and sustained high voluntary compliance to influenza vaccination among HCP (defined in this analysis as any staff member with direct patient care duties) due to implementation of a comprehensive program that included focused educational campaigns, increased availability of vaccine, and individual follow-up with an infection-control officer. Prior to the introduction of a comprehensive program, the hospital reported HCP vaccination rates of 44.7%. However, the introduction of a comprehensive program was successful in increasing and sustaining rates of 80%–96%. The program’s success was attributed to educating HCP on the importance of HCP vaccination in protecting vulnerable patients, an idea reflected in surveyed HCP’s attitudes toward vaccination. On the other hand, it was also acknowledged that these results may be unique to St. Jude Children’s Research Hospital due to its high-risk patient population and the impact of the hospital’s medical director, who championed a culture of individual accountability.\(^{35}\)

The Iowa Healthcare Collaborative (IHC), a provider-led organization, initiated a program to increase influenza vaccination rates among HCP (defined as paid employees) in acute care hospitals throughout the state. This program included a number of evidence-based strategies for improving HCP vaccination rates, including common educational materials and a data reporting system that enabled individual hospitals to track their performance compared with the target vaccination rate of 95% established by the IHC. Within two years, the median vaccination rate had increased from 73% to 82% (2006–2008).\(^{36}\) A follow-up report tracking the program’s success showed that median vaccination rates among acute care hospitals had reached 93% after four influenza seasons. Several factors may have contributed to the program’s overall success including strong leadership support, strong collaborations with the Iowa Infection Control and Epidemiology Education and Consultation program, a challenging and time-limited vaccination target goal, reporting of vaccination coverage rates among hospitals, and the use of several evidence-based strategies for increasing vaccinations among HCP. In addition, several hospitals reported implementing mandatory vaccination policies in the fourth influenza season, and this strategy likely contributed to a number of hospitals reaching their target goal. In this study, the median vaccination rate in hospitals that implemented mandatory policies was 96% vs. 87% in hospitals without such policies.\(^{37}\)

**Conclusions.** Annual influenza vaccination has been determined by many health-care organizations to be the most effective strategy for preventing influenza. Coupling vaccination with a comprehensive infection prevention plan may improve protection of HCP and their patients from influenza infection. Influenza vaccination programs that include a number of evidence-based strategies can achieve increased rates if they are strongly supported by leadership and are backed by an aggressive focus on vaccination as a patient safety measure. However, these strategies may not be as effective in all health-care settings, and HCEs may need to employ additional strategies to reach target vaccination rates among all HCP.

NVAC believes that HCEs and HCP have a joint responsibility to protect patients by adopting all reasonable interventions to reduce the transmission of influenza, including vaccination.

**Recommendation 1.** NVAC recommends that HCEs and facilities establish comprehensive influenza infection prevention programs that include education of HCP as a key component. Comprehensive influenza infection prevention plans are recommended by CDC as an essential step for all HCEs and facilities to achieve the HP 2020 influenza vaccine coverage goal. NVAC recommends that the ASH strongly urge all HCEs and facilities to adopt these recommendations.

**Managing influenza vaccination programs**

**Comprehensive influenza vaccination programs are multifaceted and have proven to be successful.** Vaccination of HCP should be part of a multifaceted, comprehensive influenza prevention program that emphasizes all aspects of an influenza prevention program, such as full, visible leadership support with the expectation for vaccination fully and clearly communicated to all HCP; provision of adequate resources and support for the HCP vaccination program; and inclusion of all practices necessary to reduce the spread of influenza in health-care settings, including patient isolation, use of personal protective equipment, applying hand and respiratory hygiene and cough etiquette, and restriction of ill visitors and ill HCP.\(^{38}\) These practices have been proven to reduce the spread of influenza. Additionally, leadership support and the provision of adequate resources have been shown to have a direct impact on HCP compliance with disease prevention strategies.

CDC finds that successful HCP vaccination programs are multifaceted and that single-component interventions will likely be minimally effective in achieving desired vaccination coverage levels. CDC recommends the following:\(^{5}\)

- Education and campaigns: Basic knowledge about influenza and influenza vaccination has been
associated with vaccine receipt. Participation in structured in-service education or conferences has been associated with improved vaccination rates.

- Role models: Vaccination of senior medical staff or opinion leaders has been associated with higher vaccination acceptance among staff.
- Improved access: Removing administrative barriers and providing vaccine in locations and at times easily accessible by HCP can substantially improve vaccine acceptance.
- Measurement and feedback: Posting of vaccination coverage levels in different areas of the hospital is a component of successful vaccination programs.

**Influenza vaccination programs are cost-effective and cost-saving approaches to influenza prevention.** Three entities have offered evidence to support that influenza vaccination programs are cost-effective and cost-saving approaches to influenza prevention.

- The National Business Group on Health, representing approximately 330 large employers who provide coverage to 55 million Americans, reports that direct medical costs of influenza average $10.4 billion annually and that lost earnings due to illness and loss of life associated with influenza epidemics average $16.3 billion each year.\(^{39}\)
- The National Foundation for Infectious Diseases cites studies in which vaccination has been found to be a highly cost-effective and cost-saving measure. One study reported those who received the influenza vaccine had 25% fewer episodes of respiratory illness, 43% fewer days of sick leave from work due to respiratory illness, and 44% fewer visits to physicians’ offices for upper respiratory illness than those who received a placebo.\(^{40}\)
- CDC finds that vaccination can reduce medical costs and indirect costs such as those from lost work productivity. The report states that vaccination could result in 13%–44% fewer health-care provider visits, 18%–45% fewer lost workdays, 18%–28% fewer days working with reduced effectiveness, and a 25% decrease in antibiotic use for influenza-like illness (ILI). In addition, vaccination may contribute to $60–$4,000 in savings per illness in healthy adults <65 years of age depending on the cost of vaccination, the influenza attack rate, and vaccine effectiveness against ILI.\(^3\)

**Employers of HCP will encounter barriers to immunizing HCP.** An in-depth literature review describing universal influenza vaccination attitudes among hospital-based HCP identified a number of reasons commonly cited for not receiving the vaccine. In 21 studies in nine countries, the authors reported that the five most frequently reported categories for vaccine refusal included (1) fear of adverse reactions, (2) lack of concern (i.e., perception that influenza does not pose a serious public health risk), (3) inconvenient delivery, (4) lack of perception of own risk, and (5) doubts regarding vaccine efficacy. These studies also found that HCP are more likely to be vaccinated to protect themselves against influenza than to be vaccinated for the protection of patients.\(^{11}\) Similarly, a recent CDC report found that beliefs regarding influenza and influenza vaccination differ between vaccinated and unvaccinated HCP. This study found that 92.7% of vaccinated HCP believed that getting vaccinated could protect them from influenza infection, while only 54.2% of those who were unvaccinated shared that belief. Notably, the CDC study also indicated that 55.4% of unvaccinated HCP do not believe that vaccination better protects those around them from influenza infection. The most important factor facilitating vaccine acceptance was a desire for self-protection, with previous receipt of influenza vaccine, perceived effectiveness of vaccine, and older age also contributing to vaccine acceptance.\(^{52}\) Collectively, these studies highlight the importance of educating HCP on the seriousness of influenza as a public health threat and the importance of vaccination as a safe and important infection prevention measure.

**The use of a signed declination statement for HCP who refuse vaccination has had mixed results in increasing vaccination rates.** The Society for Healthcare Epidemiology of America (SHEA) supported the use of signed declination statements in 2005. As more data on the impact of these statements became available, showing only modest increases in vaccination rates, SHEA has altered its position, now stating that declination statements work best as part of a comprehensive program.\(^{42}\) The American Academy of Pediatrics notes that the use of declination statements in 22 hospitals resulted in only a modest increase in influenza immunization.\(^{15}\) The American College of Occupational and Environmental Medicine finds mixed results from the use of declination statements to document vaccine refusal, from improved rates to no effect.\(^{44}\)

**Education and training are vital components of a comprehensive influenza vaccination program.** Providing comprehensive education and training about the risks...
of influenza and the safety and efficacy of influenza vaccine are essential components of a comprehensive approach. Comprehensive training required under the Occupational Safety and Health Administration’s (OSHA’s) Bloodborne Pathogens Standard has contributed to increasing hepatitis B vaccination rates and reducing hepatitis B cases among HCP from 17,000 a year to fewer than 400 a year based on a 1995 study.45 A similar comprehensive educational approach may also contribute to improving influenza vaccination coverage.

It is important that educational materials are appropriate in content and vocabulary for the educational level, literacy, and language of targeted HCP. HCP should be educated regarding the benefits of influenza vaccination and the potential health consequences of influenza illness for themselves and their patients; the epidemiology and modes of transmission; diagnosis; treatment; and non-vaccine infection prevention strategies, in accordance with their level of responsibility in preventing health-care-associated influenza. The completion of required education must be monitored and enforced by the health-care facility staff, and compliance with education should be tracked in conjunction with vaccination rates.

Conclusions. Annual influenza vaccination is the most effective strategy for preventing influenza, especially when provided as a component of a comprehensive influenza vaccination and prevention program. A comprehensive influenza vaccination program should be multifaceted, consider known barriers to immunization, and provide for substantial education and training on influenza regarding both the benefits and risks of receiving influenza vaccination. As with Recommendation 1, the implementation of a comprehensive influenza vaccination program can improve HCP vaccination rates.

NVAC believes that the best practices for vaccinating HCP are for HCEs and facilities to integrate influenza vaccination programs into their existing infection prevention or occupational health programs. To implement these best practices, HCEs will need to prioritize building capacity for a comprehensive influenza vaccination program within the context of their overall infection prevention programs and assess which mechanisms, or combination of mechanisms, are appropriate for their particular institution and workforce.

A comprehensive influenza vaccination program should be only one component of a multicomponent influenza prevention program. Each HCE should implement as many components as are applicable to protect both patients and HCP against influenza infection. HCEs and facilities should involve HCP, their representatives, managers, and professional staff in the planning, implementation, and evaluation of their programs to improve quality and increase the opportunity for program success. Factors to consider include the content and delivery of infection prevention education, HCP access to vaccination, involvement of senior leadership, local community variables, and how other health-care settings have met HP 2020 goals.

Recommendation 2. NVAC recommends that HCEs and facilities integrate influenza vaccination programs into their existing infection prevention or occupational health programs. NVAC also recommends that the ASH assure that this recommendation is implemented in HHS facilities and services (including PHS, HHS staff, and FQHCs) and strongly urges all HCEs and facilities to do the same.

Measuring and reporting HCP influenza vaccination coverage

Measuring and reporting influenza vaccination rates helps to increase vaccination of HCP. Reporting individual facility influenza vaccination rates as an indicator of an institution’s commitment to the delivery of safe, quality care can help to increase influenza vaccination rates. In a study of influenza vaccination rates in acute care hospitals in Iowa, the authors observed a 10% increase in vaccination rates that they attributed to the anticipation of the public release of hospital vaccination rates.37 Likewise, significant increases in voluntary vaccination rates among HCP within BJC HealthCare hospitals were attributed to the use of a “Best in Class” scorecard, a quality report provided to leadership at each hospital to reach target goals.46 In addition, ACIP suggests that monitoring vaccination coverage by facility area (e.g., ward or unit) or occupational group could pinpoint areas where vaccination levels are low and interventions should be targeted.3

Standardized methodologies are being developed to facilitate measuring and reporting of HCP influenza vaccination rates within specified health-care facilities. Work is currently under way to standardize methodologies used to measure and report HCP influenza vaccination rates within health-care facilities. In 2008, CDC proposed a standardized measure for assessing influenza vaccination of HCP to the National Quality Forum (NQF). The measure (NQF #0431, Influenza Vaccination Coverage Among Healthcare Personnel) was designed to ensure that reported HCP influenza vaccination rates were comprehensive within a single health-care facility and comparable across facilities, and was pilot-tested.
in a number of health-care facilities including acute care hospitals, ambulatory surgical centers, LTCFs, outpatient clinics, and renal dialysis centers. A revised measure was endorsed by the NQF. \textsuperscript{47}

CMS recently adopted a rule for reporting influenza vaccination rates among HCP. Starting in January 2013, CMS will require acute care hospitals to report HCP influenza vaccination rates through CDC’s National Healthcare Safety Network system using the NQF measure as part of the Hospital Inpatient Quality Reporting (IQR) program. Data from the IQR program will be made publicly available on the HospitalCompare.gov website. In addition, starting in 2015, acute care hospitals that fail to report these quality measures will be subject to a 2% payment reduction in the annual payment update from CMS. CMS also has proposed implementing this measure in outpatient and ambulatory care settings. However, this proposal is still under review. Details on this measure can be found at http://www.cdc.gov/nhsn. \textsuperscript{48}

\textbf{Conclusions.} Measuring and reporting HCP influenza vaccination rates leads to improved vaccination levels among HCP. While HCEs may differ in their HCP populations, it is important that all HCEs develop strategies for measuring HCP vaccination coverage with the purpose of using these data to evaluate and inform existing influenza vaccination programs. Likewise, standardized methodologies to measure and report HCP vaccination rates within specified health-care facilities will provide comparable data that can be used to help improve HCP vaccination rates. NVAC believes that measuring influenza vaccination coverage of HCP is a prerequisite for achieving and sustaining high coverage levels.

\textbf{Recommendation 3.} NVAC recommends that the ASH encourage CDC and CMS to continue efforts to standardize the methodology used to measure HCP influenza vaccination rates across settings. The ASH should also work with CMS to facilitate adoption of this recommendation.

\textbf{The role of employer requirements for HCP vaccination in influenza infection prevention}

\textbf{Many health-care facilities have difficulty achieving and maintaining high vaccination coverage rates of HCP despite efforts to implement comprehensive infection prevention and voluntary influenza vaccination programs.} Although ACIP has long recommended annual influenza vaccination for HCP, a national estimate of influenza vaccination coverage of HCP for the 2010–2011 influenza season was 63.5%. \textsuperscript{31} At the institutional level, the progressive incorporation of evidence-based strategies into voluntary influenza vaccination campaigns has often produced marginal increases in vaccine uptake during the course of several seasons. \textsuperscript{49}

For example, a study conducted at BJC HealthCare hospitals analyzed 10 years of aggregate data on vaccination coverage of HCP (defined as hospital employees) and found that progressive voluntary interventions implemented during a period of several years were not sufficient to reach the hospital system’s target vaccination rate of 80%. \textsuperscript{46} More generally, voluntary opt-in programs have not been successful as an approach to achieve and sustain high influenza vaccination coverage worldwide among health-care organizations. \textsuperscript{50} The HP 2020 objective for influenza vaccination coverage for HCP, and its inclusion in proposed Joint Commission hospital accreditation requirements, may result in additional efforts to increase uptake. \textsuperscript{49}

\textbf{Employer requirements are effective in increasing HCP immunization rates.} During the 2010–2011 influenza season, CDC found that approximately 13% of HCP reported that their employers required influenza vaccination as a condition of employment. Among this group, vaccination coverage was 98.1%, compared with 58.3% among those without an employer requirement. \textsuperscript{31} A national survey of acute care hospitals conducted by Miller et al. found that 55.6% of the hospitals surveyed had implemented an institutional requirement, \textsuperscript{51} but that vaccination coverage rates increased most significantly in hospitals that also enforced consequences for vaccine refusal. \textsuperscript{49} Consequences ranged in severity from mandatory masking to employee termination for noncompliance. Examples of employer-required influenza vaccination policies and their impact on HCP vaccination rates include the following:

- Septimus et al. evaluated an influenza vaccination requirement for HCP (defined as clinical employees and individuals with access to patient care areas) implemented throughout the Hospital Corporation of America (HCA), Inc. national health-care system. Vaccination among HCP was required, but this policy permitted medical, religious, and philosophical exemptions. Unvaccinated HCP were required to either wear a surgical mask for the duration of the influenza season or revise their workflow to eliminate patient contact. Prior to the requirement, the study reported mean vaccination rates of 58%; post_requirement coverage levels rose to 96%. \textsuperscript{52}
- The Virginia Mason Medical Center in Seattle, Washington, was one of the first hospitals to report on its success using a mandatory vaccination program for HCP (defined in this study as
employees of the medical center including students, vendors, contractors, outside physicians, and volunteers) as a condition of employment. Medical and religious exemptions were considered, and exempt HCP were required to wear a surgical mask. Unionized nurses were also exempt from this policy. Within the first year of implementation, vaccination coverage rates increased from 54.0% in 2003 to 97.6% in 2005, and coverage levels were sustained at >98.0% for subsequent influenza seasons (2006–2009).55

- A mandatory influenza vaccination policy as a condition of employment was also implemented in hospitals within BJC HealthCare, following failed attempts by the organization to achieve target influenza vaccination rates through voluntary mechanisms. This policy defined HCP as all employed hospital staff (both clinical and nonclinical, including volunteers and vendors). Medical and religious exemptions were considered, and HCP that qualified for an exemption were encouraged to wear masks for the remainder of the influenza season. Noncompliant HCP were terminated for not meeting the conditions of employment. The authors reported increases in HCP vaccination coverage from 71% in 2007 to 98% in 2008. Within the BJC HealthCare system, 0.03% were terminated for failing to comply with hospital policy, similar to reports from the Virginia Mason experience.54

A comprehensive list of HCEs and facilities that have implemented employer requirements for influenza vaccination can be found on the Immunization Action Coalition Honor Roll for Patient Safety website.55

Requirements for vaccination are broadly used for HCP. In general, HCP must accept a number of strategies as necessary occupational precautions for mitigating the spread of disease, including hand hygiene, personal protective equipment (e.g., gloves), and vaccination against a number of communicable diseases. These policies are generally intended to improve workplace safety by reducing the risk of infectious disease transmission to HCP. Requirements for immunity to, or vaccination against, varicella, measles, mumps, and rubella are standard for most health-care facilities. Hepatitis B vaccination or documented declination is required under OSHA’s Bloodborne Pathogens Standard. While influenza vaccination must be completed annually, there are other comparable periodic requirements, such as tuberculin skin testing. However, tuberculin skin testing requirements are generally stratified according to occupational risk and are vari-

ably implemented with respect to documentation requirements and consequences for noncompliance.

PHS requires vaccination of its Commissioned Corps officers. The U.S. Department of Defense (DoD) requires vaccination for all civilian HCP who provide direct patient care in DoD treatment facilities.56 Additionally, as noted previously, HCEs and facilities require specific vaccines and a tuberculin skin test with varying policies regarding individual exemptions.

A state’s power to mandate vaccinations in the interest of the public health was established in 1905 with the smallpox vaccination. Some states simply require hospitals to have an influenza vaccination policy, some states require health-care facilities to offer influenza vaccination to their employees, while still other states require that some HCP receive influenza vaccination or indicate a religious, medical, or philosophical reason for not being vaccinated.43

Employer requirement programs need leadership buy-in, education, and resource allocation to be successful. Visible and vigorous leadership and accountability for vaccination are essential for programs requiring influenza vaccination as a condition for employment.58 The key points to consider in implementing an employer-required influenza vaccination policy include (1) having full support of health-care leadership; (2) tailoring the policy to the geographic setting, educational resources, financial assets, local culture, and potential language barriers; (3) providing free vaccinations to all HCP; (4) publicizing the program to HCP at all levels; (5) offering convenient times and locations for education and immunization administration; (6) clearly defining applicable exemption policies; and (7) developing policies for managing employees who are exempt from immunization or refuse immunization.45

Taking all appropriate measures to prevent the spread of infectious disease in health-care settings, including influenza vaccination, represents a duty of care among HCP.57 Arthur Caplan, the Emmanuel and Robert Hart Professor of Bioethics and director of the Center for Bioethics at the University of Pennsylvania, elaborates on three ethical reasons for requiring vaccination of HCP. First, Caplan points out that every code of ethics adopted by physicians, nurses, nurse aides, social workers, pharmacists, and other HCP states that the best interests of the patient must come first. Secondly, Caplan states that HCP are obligated to honor the core medical ethics requirement of “first, do no harm,” which includes taking necessary precautions to prevent transmission of infectious diseases, including influenza vaccinations. Finally, Caplan argues that HCP have a special duty to protect vulnerable patients, especially those that
cannot protect themselves, such as newborn babies, infants, and the seriously immunocompromised. Patient advocacy groups have echoed this sentiment.

Some have argued that vaccination programs should focus predominantly on HCP with direct contact to high-risk patients. This argument assumes that an individual patient’s risk category can be promptly and easily determined so that appropriate staff assignments or patient placement can be arranged. The rights of all patients should include knowledge that they will be cared for by HCP who are using all available infection-control methods including vaccination to decrease transmission. This inclusion should be done for both high-risk and lower-risk patients. Therefore, receiving influenza vaccination may not only be an ethical obligation of HCP, but non-vaccination can be considered a failure to provide patients with an appropriate standard of care. Patients are justified in the expectation that they should be informed if they are not being provided with health care that meets the national standard of care and current recommendations. They should then be given the opportunity to request an alternative. Caplan emphasizes that “few people pick their health-care providers or even know to ask if they have been vaccinated.”

George Annas, professor of health law, bioethics, and human rights at Boston University School of Public Health, also states that HCP have an ethical obligation to take all reasonable steps to protect their patients. However, he argues against mandatory influenza vaccination for HCP. Annas states that influenza vaccination should be based on an informed choice and that HCP should not be forced to become non-consenting patients. He argues that mandatory influenza vaccination may have negative impacts, including building opposition that could result in an unenforceable mandate if a significant number of HCP refuse vaccination. This refusal, in turn, could confuse the public regarding the safety of the influenza vaccine. Annas concludes, “The most effective way to maximize the numbers of the public being vaccinated is to send the message that physicians and nurses believe this is the most reasonable approach to take to prevent wide-scale death and disease.”

Hospitals that have implemented mandatory influenza vaccination programs have not reported the backlash by HCP predicted by Annas. The Children’s Hospital of Philadelphia surveyed a number of paid HCP (both clinical and nonclinical staff) and found that 74.4% of respondents indicated they agreed with the hospital’s vaccination policy even though a number of them (72.0%) described the influenza vaccine requirement as coercive. Finally, in addition to the protective benefits to HCP and their patients against influenza infection, requiring HCP to be vaccinated sets a good example to the public and could help to promote influenza vaccination in all populations.

Ethical and social concerns regarding employer requirements

HCP may oppose employer-required vaccination on the basis of worker autonomy, culture, or religion. When considering employer-required vaccination of HCP, HCEs should consider the following arguments:

• Worker autonomy: The rights of HCP to make their own health-care choices and have their autonomy respected are ethical considerations. One of the many ways autonomy is protected under the law is through the right to refuse medical treatment. Mandatory approaches are coercive, and it can be argued that these policies infringe on individuals’ autonomy to make informed choices about their health. However, an individual’s autonomy is not unlimited, and the duty of HCP to limit the transmission of influenza through vaccination to avoid causing significant harm to vulnerable patients may override personal autonomy.

• Culture: A Joint Commission report noted that cultural considerations may play an important role in HCP decisions to accept or decline vaccination. In studies comparing differences in HCP influenza vaccination declination, the authors found that HCP in North America cited fear of adverse reactions as the primary reason for refusing vaccination. In contrast, HCP in Switzerland cited the perception that they did not feel at risk for illness as the primary reason for refusing vaccination.

• Religion: Some HCP may oppose influenza vaccination based on religious convictions, and many mandatory vaccination policies have allowed religious exemptions for HCP who decline vaccination in good faith because of strongly held beliefs. However, HCEs should ensure that their exemption policies are in accordance with state-defined legislation.

Employer requirements for vaccination may be subject to the collective bargaining process for unionized workers. Employees represented by labor unions have successfully challenged mandatory influenza vaccination policies. These cases do not directly address whether influenza vaccination is safe or effective, but rather whether the implementation of mandatory influenza
vaccination policies that affect the job security and working conditions of HCP are subject to the collective bargaining process.

Several HCEs have indicated that mandatory influenza vaccination policies are necessary to achieve the core purpose of their facilities, which is to promote patient health and safety. These HCEs have argued that mandatory influenza vaccination policies are designed as patient protection measures, such that HCEs should not be obligated to negotiate these policies and the implementing procedures with unions. However, union representatives have successfully argued that mandatory influenza vaccination policies are subject to the usual collective bargaining process because the requirements constitute a change in the terms and conditions of employment.

Relevant decisions include the following:

• **SEIU 121RN and United Healthcare Workers West, and California HCA Hospitals:**
  In arbitration between five HCA-owned hospitals and the Service Employees International Union (SEIU), HCA contested that the majority of patient care policies outlined in the hospitals’ infection-control manuals were not subject to the collective bargaining process and claimed that implementation of the mandatory influenza vaccination policy was a management right. The Union argued that this policy was subject to the collective bargaining process because it proposed new terms and conditions of employment and the mandatory masking requirement created a discriminatory working environment that stigmatized unvaccinated HCP.

  The arbitrator upheld the right of the employer to implement the mandatory influenza vaccination policy as a patient safety measure, but ordered the employer to bargain with the Union “to determine a mutually agreeable means of enforcing its policy without violating the provisions cited, and reducing the potential for discrimination and/or violation of the just cause provisions of the Contract.”

• **Board of Regents, University of Iowa Hospitals and SEIU:**
  The hospital claimed that the implementation of a mandatory influenza vaccination policy was a management right directly related to patient safety and was contractually protected under the employer’s right “to change and modify programs and practices related to health and safety to address ongoing health and safety concerns as required or deemed necessary by regulatory agencies and changes in technology and information.”

  The arbitrator disagreed and ruled that the hospital had violated the collective bargaining agreement by implementing a mandatory influenza vaccination policy that instituted unpaid leave as a consequence for noncompliance. Instead of negotiating with the Union, the employer chose to unilaterally rescind its policy for both unionized and nonunionized HCP.

• **Virginia Mason Medical Center and Washington State Nurses Association:**
  The Washington State Nurses Association (WSNA) filed a successful grievance against the Virginia Mason Medical Center regarding its mandatory influenza vaccination program. As a result, the hospital modified its influenza prevention policy to require all unvaccinated nurses to initiate influenza antiviral drug prophylaxis or wear a mask as part of a comprehensive influenza infection prevention program.

  The Union then filed a second grievance, claiming that the hospital policy to require nonvaccinated HCP, who were not taking antiviral medication, to wear a facemask while at work constituted an unfair labor practice for failure to bargain and the implementation of unilateral change. The Administrative Law Judge (ALJ) sided with Virginia Mason, holding that the hospital was not required to bargain because the masking/antiviral requirement relates to the “core purpose” of the hospital.

  The Union appealed to the National Labor Relations Board. In August 2011, the Board issued a split decision that reversed the ALJ’s holding. The Board indicated that the unilateral implementation of a masking or medication policy is subject to the bargaining process and that the policy was outside the core purpose of the hospital. The case was remanded to permit the ALJ to prepare another decision. In November 2011, the ALJ found that the employer policy was protected under the management’s rights clause and that the policy did not constitute an unfair labor practice. The complaint was dismissed.

**Employer requirements raise vaccination rates, but the impact on patient safety needs continued evaluation.** The primary intent of all influenza vaccination programs for HCP is to reduce influenza infections in patients and in HCP. Surveillance for health-care-associated influenza is not routine. Without ongoing measurement of health-care-associated influenza or prospective controlled studies, significant gaps in understanding the impact of increasing vaccination rates on patient
safety will persist. Further studies are also needed to determine if patient risk assignment (i.e., high risk vs. lower risk) is reasonable and effective in preventing health-care-associated influenza infections.

Conclusions. NVAC realizes that employer-required vaccination of HCP against influenza is the subject of fervent discussion, both for the concept and against it. Such requirements have been shown to be effective methods of achieving high coverage but may face ethical, cultural, or collective bargaining issues. For those HCEs who cannot achieve the HP 2020 annual goals for influenza immunization of HCP through implementing a comprehensive influenza prevention program, managing influenza vaccination programs, or measuring and reporting HCP influenza vaccination coverage, employer-required vaccination then becomes the next option for increasing influenza immunization rates of their HCP. NVAC considered a variety of factors when evaluating the merits of employer requirements, including target vaccination rates, vaccine efficacy, whether herd immunity might reasonably be expected to decrease disease rates, and vaccine policy options, such as exemptions and consequences for noncompliance. NVAC does not stipulate the scope and content of employer requirement policies; these policies must be decided by the HCE based on the concerns and needs of HCP, patients, and the public.

NVAC believes that, at present, HCE or facility requirements for influenza vaccination are the most effective mechanism to rapidly reach and maintain the HP 2020 goal. Factors to consider when implementing such a policy include the vulnerability of the patient population cared for, what will be considered acceptable reasons for exemption from influenza vaccination, applicable bargaining agreements, and consequences of noncompliance with the policy. It is critical that patients know that everything possible is being done to protect them from health-care-associated influenza infection while in an inpatient, outpatient, or home situation.

NVAC recognizes that prior to the development of these recommendations, many HCEs have already implemented employer requirements in conjunction with, or following the implementation of, Recommendations 1, 2, and 3. This approach is consistent with NVAC recommendations. NVAC recognizes that local resources, patient safety needs, available expertise, labor concerns, and target vaccination goals must be taken into consideration when developing such policies. HCE or facility requirement policies should define affected workers and the affected employer, outline affected worker and employer obligations, and incorporate an exemption policy. NVAC notes that employer requirements need strong leadership, messaging and partnership with all HCP, and a focus on the goals of protecting patients and HCP consistent with the ethics of the health-care profession.

Recommendation 4. For those HCEs and facilities that have implemented Recommendations 1, 2, and 3 and still have not consistently achieved the HP 2020 goal for influenza vaccination coverage of HCP in an efficient and timely manner, NVAC recommends that HCEs strongly consider an employer requirement for influenza immunization. In addition to medical exemptions, HCEs may consider other exemptions in their requirement policies. NVAC also recommends that the ASH assure that this recommendation is implemented in HHS facilities and services (including PHS, HHS staff who are HCP, and FQHCs) and urge all other HCEs and facilities to do the same.

Supporting influenza vaccine development

Influenza vaccine effectiveness is highest when the vaccine strains are well matched to a circulating virus. In years when the circulating virus strains vary from the vaccine strains, vaccinated HCP and their patients may have an increased risk for contracting and spreading influenza infection compared with years when the vaccine is well matched. Vaccine efficacy can vary from year to year and from person to person, but usually some protection is provided against illness or severe illness. There is a great deal of debate regarding the effectiveness of the influenza vaccine. Previous studies found that annual immunization with a vaccine antigenically well matched to circulating strains reduced serologically confirmed influenza cases by 70% to 90% among healthy adults <65 years of age. However, recent studies estimate that vaccine effectiveness may be considerably lower. Osterholm et al. reported a pooled efficacy of only 59% in adults 18–65 years of age. Others have also reported reduced vaccine effectiveness in the range of 45%–75%. The lower estimates in more recent studies may reflect new information regarding diagnostic testing; vaccine effectiveness is overestimated when serology is used as an endpoint. While current vaccines are a critical component of reducing influenza infection, an opportunity exists to provide next-generation vaccines with improved effectiveness, broader protection, and increased duration of immunity. Additionally, novel approaches to improving influenza vaccines could result in vaccines that offer multiyear protection against numerous influenza strains, which could reduce the frequency of immunization.
Despite the significant progress in influenza vaccine technologies and manufacturing since 2009, vaccine shortages could remain a challenge to implementing vaccination as an employer requirement. In response to the 2009 H1N1 influenza pandemic, New York State became the first state to issue a mandate requiring HCP to be vaccinated against influenza. However, this regulation was stayed in a lawsuit brought by SEIU Local 4053, the New York State Public Employees Federation. A week after the regulation was stayed, the New York Department of Health rescinded the regulation due to a shortage of vaccine supplies. The Commissioner of Health noted that the requirement “...set up a dynamic where HCP covered under the regulation might compete for vaccine with people with underlying risk factors for adverse outcome of influenza infection.” Since the 2009 H1N1 response, national strategies have included improvements to the vaccine supply chain. Improved vaccine availability and stable supply chains will be necessary to ensure that HCEs and facilities can attain vaccination coverage rates that meet quality measures.

Conclusions. Improved efficacy and reduction in the need for annual vaccinations will make it easier to achieve and sustain high vaccination coverage rates among HCP. Ensuring that adequate vaccine supplies are available will also help HCEs and facilities to provide vaccine free of charge to HCP and, ultimately, achieve the HP 2020 annual goal of vaccination of HCP or even higher coverage rates.

An influenza vaccine that confers multiyear protection against influenza with increased efficacy and comparable safety relative to the current annual vaccines could facilitate achieving and maintaining high coverage rates for influenza immunization in HCP and other populations. An ideal influenza vaccine would not need to be updated each year depending on circulating influenza strains and could provide extended or lifetime immunity. A longer-lasting vaccine may contribute to higher coverage, reducing the need for employer requirements.

Recommendation 5. NVAC recommends that the ASH encourage ongoing efforts to develop new and improved influenza vaccines and vaccine technologies including support for research, development, and licensure of influenza vaccines with improved effectiveness and duration of immunity, as well as steps that improve the immunogenicity and rapid production of existing influenza vaccines.

Conclusions
Influenza is a significant public health issue. Annual influenza-associated deaths range from 3,000 to 49,000 according to recent estimates, and more than 200,000 people are hospitalized each year for respiratory illnesses and heart conditions associated with seasonal influenza infection. Immunization is the most effective method for preventing infection from influenza and possible hospitalization or death. For this reason, HHS, CDC, and other health-care and public health agencies and organizations recommend vaccination as a critical influenza prevention strategy. Despite these recommendations, immunization rates for HCP in the U.S. remain low.

To address this gap in immunization rates for HCP, NVAC, as directed by the ASH, developed the recommendations and strategies presented in this report for the specific purpose of achieving the HP 2020 objective for annual influenza vaccine coverage for HCP. These recommendations were carefully reviewed, deliberated, debated, and then approved by a majority of NVAC members. These recommendations present a tiered set of strategies for achieving the HP 2020 annual objective for influenza vaccination of HCP, including the implementation and management of influenza prevention and vaccination programs, and measuring and reporting vaccination coverage to employer requirements for HCP vaccination. NVAC realizes that HCEs range in their scope of practice, from the traditional hospital setting to the in-home health-care setting, and no single option for improving HCP immunization rates would work for all HCEs. Thus, a set of recommended options is presented that can be applied to most health-care settings to improve immunization rates of HCP.

In presenting these recommendations, NVAC acknowledges that there are individuals or groups that may be opposed to each recommendation in whole or in part for varied reasons, such as concerns about the quality of evidence in the literature regarding the impact of HCP vaccination on patient risk of health-care-associated influenza and the issue of workers’ rights. NVAC carefully considered all sides of the argument for each recommendation and believes that the recommendations made represent the most effective approach to achieving the stated goal of achieving the HP 2020 annual influenza vaccine coverage objective for HCP.
APPENDIX. SUPPLEMENTARY MATERIAL:
SUMMARY OF PUBLIC COMMENTS

This summary represents the public comments received by the National Vaccine Program Office as of January 20, 2012. Hard copies of the public comment are available upon request from the National Vaccine Program Office, Department of Health and Human Services, Hubert H. Humphrey Building, 200 Independence Ave. SW, Room 733G, Washington, DC 20201.

I. SOLICITATION OF PUBLIC COMMENT

The draft report and draft recommendations were released for public comment through the Federal Register process to solicit additional input on strategies and/or potential barriers to achieving the Healthy People 2020 (HP 2020) annual goal of 90% influenza vaccine coverage among health-care personnel (HCP) that are not addressed in the current report. Public comment was collated and summarized for consideration and deliberation by the National Vaccine Advisory Committee (NVAC).

II. SUMMARY OF PUBLIC COMMENT SUBMITTED BY INDIVIDUALS

Public comment was submitted by 145 individuals including a number of HCP across the health-care sector. These comments are almost exclusively in response to Recommendation 4 and represent opinions and personal accounts. In general, the majority of individual comments can be categorized into themes (themes represent ≥5 common responses).

Recommendation 4: For those health-care employers (HCEs) and facilities that have implemented Recommendations 1, 2, and 3 and cannot achieve and maintain the HP 2020 goal of 90% influenza vaccination coverage of HCP in an efficient and timely manner, the Health Care Personnel Influenza Vaccination Subgroup (HCPIVS) recommends that HCEs and facilities strongly consider an employer requirement for influenza immunization.

Individuals who oppose Recommendation 4:
• Personal autonomy (94 responses)
• Concern regarding adverse events (specific to the influenza vaccine) (45 responses)
• Concern regarding vaccine effectiveness (specific to the influenza vaccine) (43 responses)
• Concern regarding vaccine safety (specific to the influenza vaccine) (26 responses)
• Concern regarding exemption policies that did not include religious, philosophical, and personal exemptions (26 responses)
• Concern that there is an insufficient scientific basis for mandatory vaccine policies (23 responses)
• Concerns regarding vaccine safety (general) (20 responses)
• Concerns regarding adverse events (vaccinations in general) (19 responses)
• Liability for adverse events under mandatory policies (eight responses)

Individuals who support Recommendation 4:
• Support for draft recommendations (general) (10 responses)
• Support for draft Recommendation 4 (as a patient safety measure) (five responses)
III. SUMMARY OF PUBLIC COMMENT SUBMITTED BY ORGANIZATIONS/ASSOCIATIONS

Public comment was also submitted on behalf of 37 organizations/associations representing the following:

- 15 professional associations
- 13 labor organizations
- Five nonprofit organizations
- Two public health departments
- One federal agency
- One other

Public comments submitted by organizations/associations have also been grouped into themes that include general comments, recommendation-specific comments, and comments that directly address Recommendation 4.

General comments
Definitions of HCP and HCEs:
- Definitions should be expanded (three responses).
- HCPIVS definitions of HCP and HCEs do not match the definitions outlined in the National Quality Forum (NQF) and Centers for Medicare & Medicaid Services (CMS) reporting measures (two responses).

Additional resources are needed to implement the recommendations (five responses).

Education (general):
- Education is mentioned throughout the report but is not explicitly called out in the five recommendations (four responses).

Comments on Recommendations 1, 2, and 3
Recommendations 1 and 2:
- Recommendation 1 and 2 should state that HCP and their representatives should be directly involved in the development and implementation of influenza prevention programs and influenza vaccination programs (three responses).
- Vaccination programs should include free vaccine available during multiple shifts, locations, and days (general) (five responses).

Recommendation 3:
- HCPIVS should indicate the effects of vaccine shortages on CMS reporting (one response).
- HCPIVS should recommend that NQF measures be applied to ambulatory and outpatient settings (one response).
- Other key agencies such as the Occupational Safety and Health Administration (OSHA) should be included in defining incentives and requirements (one response).

Comments on Recommendation 4
Similar to the public comment submitted by individuals, the majority of public comment from organizations/associations focused on Recommendation 4.

Fifteen organizations/associations directly stated support for Recommendation 4:
- 13 professional associations
- Two nonprofit organizations

Sixteen organizations/associations directly opposed Recommendation 4:
- 12 labor organizations
- Two nonprofit organizations
- One professional association
- One federal agency

Six organizations/associations did not directly address Recommendation 4 in their comments.

Comments specific to Recommendation 4
Employer requirements (general):
- Language should be modified to more strongly support employer requirements (three responses).
- Recommendation should be changed to state that employer requirements include vaccination as a condition of employment and credentialing unless documented medical contraindications exist, or in states that allow personal exemptions (two responses).

Recommendation 4 should be eliminated (six responses).

Recommendation 4 should state that it does not support vaccination as a condition of employment (seven responses).

Requirements should be modeled after the OSHA Bloodborne Pathogens Standard for hepatitis B, which includes mandatory education/training and mandatory offering of vaccine (nine responses).

Exemptions/personal autonomy:
- Language in the report should state that exemptions are a state-specific decision in accordance with state legislation (one response).
• Recommendation 4 should support flexible exemptions (religious, philosophical, and personal) and should not indicate any punitive measures or discrimination for employees that opt out (10 responses).

Concern that vaccine effectiveness does not support mandatory policies (12 responses)

Concern that there is insufficient scientific evidence of the impact of HCP vaccination on patient safety to support policies that require influenza vaccination without exemptions (other than medical exemptions):
  • General (eight responses)
  • Suggestion to include a sixth recommendation that addresses surveillance and research evidence on vaccine impact and efficacy in HCP (two responses)
  • Limited to no data outside of long-term care facilities (LTCFs) on the impact of HCP vaccination on patient safety (three responses)

Concern that an overemphasis on vaccination as a preventive measure may lead to poor adherence to other infection-control practices:
  • General (eight responses)
  • Overreliance on vaccination as a public health measure during years of vaccine mismatch, unsuccessfully vaccinated HCP, or during vaccine shortages (three responses)

Employer requirements would be considered a unilateral change to the conditions and terms of employment and could be subject to collective bargaining negotiations (four responses).

Other comments general to Recommendation 4

HP 2020:
  • HP 2020 goals are voluntary objectives to strive for and are not public health mandates (two responses).
  • Evidence that a 90% vaccination coverage rate is the appropriate level (five responses)

Liability for adverse events under mandatory policies (not commented on in the draft report):
  • Compensation for employees who suffer any adverse effects under mandatory policies (one response)

Need to cover vaccine injuries under the National Vaccine Injury Compensation program and not workers’ compensation programs (one response)

Masking (not commented on in the draft report):
  • Request that recommendations state the infection prevention measures for unvaccinated HCP including the use of masks or to be precluded from working in certain areas (one response)
  • Request that LTCFs be exempt from any masking policies because of difficulties communicating with hearing-impaired patients and patients with dementia (one response)
  • Request that the report not endorse masking for unvaccinated HCP (three responses)
  • Request that the report comment on the safety and appropriateness of this type of requirement for vaccine refusal (one response)

This report was adopted by the National Vaccine Advisory Committee (NVAC) on February 8, 2012. Authors/contributors are acknowledged based on their important contributions as subject-matter experts. The positions expressed and recommendations made in this report do not necessarily represent those of the U.S. government, those of individual NVAC members, or of the working group members who served as authors of, or otherwise contributed to, this report.

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Breaking Through the Status Quo: Improving Influenza Vaccination Coverage Among Health-Care Personnel

No one wants to be admitted to a health-care facility, but when it is necessary, every patient expects to receive the highest quality care possible. Too often, however, admission leads to harm, not health. At any given time, one out of every 20 patients has an infection related to their hospital stay. Such has been the case for far too long. The passage of the Patient Protection and Affordable Care Act of 2010 has brought not only a heightened commitment to better systems of health-care infection prevention, but also new tools and resources to improve quality of care and protect patients.

Preventing the spread of seasonal influenza in health-care settings is an important element of any effort to improve patient safety. While influenza infections in patients and health-care personnel (HCP) often go undiagnosed or underreported, we know that influenza can spread from HCP to patients, from patients to HCP, and from HCP to HCP. In fact, evidence shows that HCP are at a greater risk of influenza infection than other healthy adults. For vulnerable patients, these transmissions can result in severe complications and sometimes even death.

Fortunately, improving policies for HCP influenza vaccination can substantially increase coverage and help reduce the likelihood that providers become infected or serve as vectors for infection. Although HCP influenza vaccination coverage rates have risen to nearly 67% in recent seasons, they remain well below the 90% Healthy People 2020 goal. Notably, coverage rates differ by health-care setting. HCP influenza vaccination rates (for the 2011–2012 influenza season) reached 76.9% within hospital settings but only 52.4% within long-term care facilities, where patients are at the highest risk of complications and death from influenza.

VACCINATION BARRIERS AND MISPERCEPTIONS

Known barriers to HCP vaccination primarily relate to misperceptions (i.e., knowledge and attitudes about influenza and the vaccine) and organizational challenges (i.e., availability and access). For example, HCP, like many others,
may not perceive influenza as a significant risk or may have misconceptions about vaccine safety and efficacy. The extent to which these barriers influence HCP decisions differs among occupation, age, and racial/ethnic groups\textsuperscript{18,19} and may contribute to coverage disparities observed among different types of health-care settings.

Studies in long-term care facilities have shown that vaccinating HCP reduces overall patient mortality, highlighting the potential benefits of such efforts in these settings\textsuperscript{20–24} However, a systematic review of the literature found that the available evidence was insufficient to conclude that HCP vaccination impacts patient outcomes.\textsuperscript{25} Clearly, continued research is warranted to evaluate the role of HCP vaccination in patient safety improvement efforts. In the meantime, complacency is not an acceptable alternative; vaccination is our most effective intervention in preventing influenza infections in HCP and in patients.

**IMPROVING VACCINATION COVERAGE**

So, how do we best improve HCP vaccination coverage? This question has triggered the interest of major health groups nationwide, including patient advocacy groups, professional associations, public health organizations, labor organizations, and employers. Debate surrounds the question of how best to make progress toward a goal that has been endorsed by all—based on our shared commitment to patient safety—even in the face of less-than-perfect evidence.

The Centers for Disease Control and Prevention (CDC) Advisory Committee on Immunization Practices (ACIP) has outlined key components for a comprehensive HCP influenza vaccination program.\textsuperscript{26} Essential elements include educating HCP on the benefits and risks of influenza vaccination, making the vaccine accessible and available at the worksite at convenient times and at no cost, and reporting coverage as a quality measure. However, many facilities have found that such a comprehensive program is necessary, but not sufficient, for success. Additional measures are needed.\textsuperscript{27}

Four major developments are accelerating the momentum for progress. First, in this issue of *Public Health Reports*, the U.S. Department of Health and Human Services (HHS) National Vaccine Advisory Committee (NVAC) presents evidence-based recommendations to improve HCP vaccination rates. The tiered approach, incorporating proven interventions, represents a call to action. The recommendations, which align with ACIP guidelines, include (1) implementing influenza prevention programs that highlight vaccination as an integral component of infection control, (2) managing influenza vaccination programs for HCP that address barriers to coverage, and (3) measuring and reporting HCP vaccination coverage as a mechanism to achieve target goals and improve existing programs. As these issues affect working conditions and personal choices, policies need to incorporate ethical considerations for patient care, employee rights, and individual autonomy.

Second, the NVAC recommendations add depth and detail to the HHS 2008 “National Action Plan to Prevent Healthcare-Associated Infections,” a comprehensive roadmap for hospitals and other health-care settings.\textsuperscript{28} An updated version of the Action Plan, which was anticipated to be released in late 2012, specifically emphasizes the need to improve HCP influenza vaccination, particularly in long-term care settings.

Third, the Joint Commission recently strengthened its standard for influenza vaccination of licensed independent practitioners and staff. This standard now states that by July 2013, all facilities seeking accreditation are required to develop influenza vaccination programs that meet defined elements of performance. These elements include setting incremental targets that stimulate commitment toward achieving national goals and then demonstrating progress toward meeting them.\textsuperscript{29} Incorporating influenza vaccination of HCP into formal accreditation standards can generate momentum and progress in hospitals across the country. All of these efforts remind us that the most successful public health interventions create new social norms and raise the expectations for what constitutes quality.

Fourth, starting in January 2013, the Centers for Medicare & Medicaid Services will require most acute care hospitals to report seasonal influenza vaccination coverage among HCP using CDC’s National Healthcare Safety Network as part of the Hospital Inpatient Quality Reporting program. Hospitals that fail to report will be subject to a 2% reduction in the annual payment increase under the hospital Inpatient Prospective Payment System.\textsuperscript{30} Data will be made publicly available on the www.hospitalcompare.hhs.gov website beginning in the 2013–2014 season. The measure, endorsed by the National Quality Forum, will help consumers make health-care decisions based on quality and will encourage acute care hospitals to improve integration of HCP influenza vaccination into infection-control programs. New data on annual vaccination rates among different health-care facilities will highlight high performers and could help to identify best practices for stimulating further improvements.
CONCLUSION

In short, heightened attention to maximizing HCP influenza vaccination rates can create safer working environments. We must break through the status quo and increase HCP influenza vaccination coverage rates, which have been low for far too long. The time has come for all of us to work together to determine not if, but how improving HCP influenza vaccination rates can create the higher standards for quality and safety that everyone deserves.

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Obesity Among Chronically Homeless Adults: Is It a Problem?

ABSTRACT

Objective. We examined rates of obesity and associated characteristics in the chronically homeless population to explore how a range of factors, including sociodemographics, housing, food source, physical and mental health, and health service use, were related to being overweight or obese.

Methods. We conducted multivariate regression analyses on a community sample of 436 chronically homeless adults across 11 U.S. cities to examine the prevalence of obesity.

Results. The majority (57%) of chronically homeless adults were overweight or obese. Chronically homeless adults who were female or Hispanic appeared to be at particular risk for obesity. There were few differences on physical and mental health by weight group. Although overweight and obese chronically homeless adults were more likely to discuss exercise with a health-care provider, they reported engaging in less exercise than those who were underweight or normal weight.

Conclusion. These findings underscore the need for greater attention to obesity in chronically homeless adults and demonstrate a food insecurity-obesity paradox or poverty-obesity link.
Obesity has become a worldwide epidemic. In the United States, 34% of adults are obese and 34% are overweight, meaning 68% are either overweight or obese. Obesity has been linked to various health problems, many of which have high morbidity and mortality, including diabetes, musculoskeletal disorders, cardiovascular disease, pulmonary disorders, and cancer. Thus, identifying and intervening with people who are overweight or obese has become important for primary and secondary prevention.

There has been little study of obesity among chronically homeless adults. Homeless adults represent a marginalized, neglected segment of the population and are known to experience poorer physical health than the general population. Because adults who are chronically homeless lack a stable, secure residence and often cannot afford regular, healthy meals, they are presumed to be underweight. However, this assumption has not been empirically examined, and there is evidence to suggest there may be an obesity problem among the homeless.

A nationally representative survey of 1,704 homeless adults and 400 soup kitchens and shelter providers in 20 cities found that 63% of homeless adults reported obtaining meals from soup kitchens and 51% from shelters in a one-week period. Only 17% of soup kitchens, food pantries, and shelters surveyed were working with a nutritionist or dietician. The nutritional value of food served in many soup kitchens and shelters has been found to be low in vitamins and to exceed fat, energy, and protein content recommendations.

A growing literature in the past decade has reported on a food insecurity-obesity paradox, whereby food insecurity, which often results from inadequate economic resources to purchase food, is associated with obesity, which is a consequence of overconsumption of food. Many theories have been proposed to explain this correlation, including the low cost of energy-dense foods, binge eating habits as an adaptive physiological response to food scarcity, and childhood poverty leading to obesity in adulthood. Related literature has also suggested a poverty-obesity link, finding that populations with high poverty rates and low education levels have the highest obesity rates.

Yet the question remains whether there is an obesity problem among chronically homeless adults, and no prior study could be found directly addressing this question. Thus, this study aimed to examine the prevalence of obesity in a multisite community sample of chronically homeless adults and explore how a range of variables known to be related to weight, including sociodemographics, income and insurance, housing, food source, physical and mental health, and health service use, may be related to being overweight or obese.

**METHODS**

**Data source**

We conducted secondary analyses on data from the Collaborative Initiative to Help End Chronic Homelessness (CICH). CICH was initiated by the U.S. Interagency Council on Homelessness and implemented in 11 cities from 2004 to 2009 to provide adults who are chronically homeless with permanent housing and primary health-care and mental health services. Criteria for eligibility as being chronically homeless were defined as an unaccompanied homeless individual with a disabling condition who has either been continuously homeless for one year or more or has had at least four episodes of homelessness in the past three years. A disabling condition included a physical and/or psychiatric disability.

**Sample**

Of 734 clients who consented to be evaluated in CICH, 436 (59.4%) provided information about their height and weight at baseline to be included in this study. This study focused on participants at baseline upon enrollment in CICH to examine chronically homeless adults before they received primary health-care and mental health services. Compared with clients who were excluded because they did not provide height and weight information, participants were more likely to be married, report poorer mental health, and have fewer years of lifetime homelessness.

**Measures**

**Body mass index (BMI).** We obtained height and weight from participant self-report to calculate BMI. As defined by international standards, a BMI >25 kilograms per meter squared (kg/m²) was classified as overweight and a BMI >30 kg/m² was classified as obese.

**Housing.** We derived the number of nights participants reported spending in different places during the three months before baseline and categorized them as follows: nights in own place (e.g., own apartment, room, or house), nights in someone else’s place, nights in a hotel/boarding home, nights in an institution (e.g., transitional housing, hospital, or jail), or nights homeless (e.g., shelters, outdoors, or in vehicles).

**Food source.** Participants were asked whether they obtained food from any of the following places in the past month: soup kitchen; food pantry; or a mobile van, wagon, or program providing free food.
Physical and mental health. We assessed physical health using the Short Form-12 (SF-12)\textsuperscript{25} and a list of 19 medical diseases/conditions, which were summed for a total score. These diseases/conditions included high blood pressure/heart condition, asthma/lung trouble, cancer, stroke, kidney/bladder trouble, arthritis/rheumatism, human immunodeficiency virus/acquired immunodeficiency syndrome, tuberculosis, hepatitis, diabetes, stomach/digestive disorder, liver trouble, seizures/epilepsy, walking problems, dental problems, chest infection/bronchitis, back/neck pain, skin problems, and foot problems.

Mental health diagnoses were self-reported by participants. Mental health was also assessed by the mental health component of the SF-12, three subscales of the Brief Symptom Inventory,\textsuperscript{26} an observed psychotic behavior rating scale,\textsuperscript{27} and the Addiction Severity Index (ASI).\textsuperscript{28}

Unhealthy behaviors. Participants were asked the extent to which they engaged in four health behaviors, derived from the Health-Promoting Lifestyle Profile,\textsuperscript{29} which included use of cigarettes, consumption of alcohol, consumption of fatty foods, and level of exercise. These behaviors were rated on a four-point scale, with higher scores indicating less healthy behaviors.

Health service use. Participants were asked about the total number and type of medical and mental health (including substance abuse) treatment visits they made during the past three months. Inpatient and outpatient treatment visits were differentiated.

Discussions with health-care professional. Adapted from items from the Adult Primary Care Assessment Tool,\textsuperscript{30} questions for participants included whether a health-care professional had discussed any of the following with them in the past year: exercise, alcohol use, drug use, emotional or mental problems, nutrition or diet, or smoking.

Data analysis

First, we conducted frequency analyses to summarize participants in each weight group. Second, we conducted bivariate analyses using analysis of variance and Chi-square tests to compare participants who were underweight/normal weight, overweight, or obese on various characteristics, including sociodemographics, income and health insurance, food source, physical and mental health, unhealthy behaviors, health service use, and discussions with health-care professionals. Post-hoc analyses were conducted using Fisher’s least significant difference test and pairwise Chi-square tests. Third, we included significant variables found in the bivariate analyses in a forward stepwise multinomial logistic regression to examine independent associations with each weight group, with the underweight/normal weight group serving as the reference group for the overweight and obese groups. We calculated odds ratios (ORs) and 95% confidence intervals.

RESULTS

Of the 436 participants, 42.7% were underweight or in the normal range (7.6% were underweight), 24.8% were overweight, and 32.5% were obese. Thus, 57.3% of all participants were either overweight or obese, and the mean BMI of the sample was 27.3 kg/m\(^2\) (standard deviation [SD] = 7.22).

Among the 327 men in the study, 48.3% were underweight/normal weight, 25.1% were overweight, and 26.6% were obese. Among the 109 women in the study, 25.7% were underweight/normal weight, 23.9% were overweight, and 50.5% were obese.

Bivariate analyses of the total sample determined that participants who were obese were significantly more likely to be female and Hispanic, and to have spent more days in a hotel/boarding home than those who were underweight/normal weight. There were no significant group differences in any other housing variables or in income, health insurance, or food source variables. The total sample reported a total mean income of $335.10 (SD=$332.57) in the past month, which equates to $4,021.20 annually. Of the total sample, 226 of 435 participants (52.0%) reported eating from a soup kitchen, 105 of 434 participants (24.2%) reported eating from a food pantry, and 136 of 434 participants (31.3%) reported eating from a mobile food van in the past month (Table 1).

There were no significant differences on any measures of physical and mental health, except that participants who were overweight had significantly higher ASI-Drug scores than those who were obese, and examination of individual medical diseases/conditions found that participants who were obese were significantly more likely to report high blood pressure or a heart condition than those who were underweight/normal weight.

In comparing unhealthy behaviors, participants who were obese reported greater efforts to smoke fewer cigarettes than those who were underweight/normal weight, and those who were obese or overweight reported a lower level of exercise (OR = 1.22 for obese and 1.34 for overweight) than those who were underweight/normal weight. Participants who were obese were more likely to discuss exercise with a health-care provider (OR=2.74) than those who were underweight/normal weight.
Table 1. Bivariate analyses of characteristics associated with weight group among chronically homeless adults enrolled in an 11-site supported housing initiative: U.S., 2004–2009

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Underweight/normal weight (n=186)</th>
<th>Overweight (n=108)</th>
<th>Obese (n=142)</th>
<th>Test of difference</th>
<th>Group difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>N or mean (SD)</td>
<td>N (percent)</td>
<td>N (percent)</td>
<td>N (percent)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sociodemographics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age in years</td>
<td>46.5 (8.1)</td>
<td>44.5 (8.8)</td>
<td>44.7 (9.0)</td>
<td>F(2,433) = 2.65</td>
<td>NS</td>
</tr>
<tr>
<td>Gender: female</td>
<td>28 (15)</td>
<td>26 (24)</td>
<td>55 (39)</td>
<td>χ²(2) = 24.15c</td>
<td>1,2 &gt; 3</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>66 (36)</td>
<td>35 (33)</td>
<td>55 (40)</td>
<td>χ²(6) = 14.01d</td>
<td>3 &gt; 1</td>
</tr>
<tr>
<td>Black</td>
<td>105 (57)</td>
<td>55 (51)</td>
<td>64 (46)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian/American Indian/Pacific Islander</td>
<td>10 (5)</td>
<td>10 (9)</td>
<td>6 (4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>4 (2)</td>
<td>7 (7)</td>
<td>14 (10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years of education</td>
<td>11.9 (2.3)</td>
<td>12.0 (2.0)</td>
<td>11.7 (2.3)</td>
<td>F(2,433) = 0.76</td>
<td>NS</td>
</tr>
<tr>
<td>Income and health insurance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment income, past month</td>
<td>$64.34 ($198.94)</td>
<td>$44.68 ($166.90)</td>
<td>$39.67 ($137.55)</td>
<td>F(2,433) = 0.93</td>
<td>NS</td>
</tr>
<tr>
<td>Public support income, past month</td>
<td>$264.77 ($305.07)</td>
<td>$267.93 ($291.39)</td>
<td>$277.45 ($314.00)</td>
<td>F(2,433) = 0.07</td>
<td>NS</td>
</tr>
<tr>
<td>Total income, past month</td>
<td>$346.55 ($345.85)</td>
<td>$322.81 ($301.86)</td>
<td>$329.45 ($338.84)</td>
<td>F(2,433) = 0.20</td>
<td>NS</td>
</tr>
<tr>
<td>Medicaid</td>
<td>37 (20)</td>
<td>22 (20)</td>
<td>33 (23)</td>
<td>χ²(2) = 0.69</td>
<td>NS</td>
</tr>
<tr>
<td>Medicare</td>
<td>13 (7)</td>
<td>7 (6)</td>
<td>9 (6)</td>
<td>χ²(2) = 0.05</td>
<td>NS</td>
</tr>
<tr>
<td>State or local medical assistance</td>
<td>74 (40)</td>
<td>36 (33)</td>
<td>56 (40)</td>
<td>χ²(2) = 1.37</td>
<td>NS</td>
</tr>
<tr>
<td>Private insurance</td>
<td>3 (2)</td>
<td>2 (2)</td>
<td>1 (1)</td>
<td>χ²(2) = 0.72</td>
<td>NS</td>
</tr>
<tr>
<td>No health insurance</td>
<td>40 (22)</td>
<td>18 (17)</td>
<td>23 (17)</td>
<td>χ²(2) = 1.75</td>
<td>NS</td>
</tr>
<tr>
<td>Housing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lifetime years homeless</td>
<td>7.7 (5.7)</td>
<td>7.3 (5.5)</td>
<td>7.9 (6.8)</td>
<td>F(2,433) = 0.24</td>
<td>NS</td>
</tr>
<tr>
<td>Age first homeless</td>
<td>34.2 (11.5)</td>
<td>34.2 (11.0)</td>
<td>32.3 (12.3)</td>
<td>F(2,433) = 1.24</td>
<td>NS</td>
</tr>
<tr>
<td>Nights in own place, past three months</td>
<td>4.5 (13.6)</td>
<td>7.0 (19.4)</td>
<td>5.6 (16.1)</td>
<td>F(2,433) = 0.85</td>
<td>NS</td>
</tr>
<tr>
<td>Nights in a hotel/boarding home, past three months</td>
<td>1.2 (5.9)</td>
<td>3.9 (15.1)</td>
<td>6.0 (19.0)</td>
<td>F(2,433) = 4.85e</td>
<td>3 &gt; 1</td>
</tr>
<tr>
<td>Nights homeless, past three months</td>
<td>59.8 (35.9)</td>
<td>57.5 (38.5)</td>
<td>54.7 (37.1)</td>
<td>F(2,433) = 0.75</td>
<td>NS</td>
</tr>
</tbody>
</table>

continued on p. 33
Table 1 (continued). Bivariate analyses of characteristics associated with weight group among chronically homeless adults enrolled in an 11-site supported housing initiative: U.S., 2004–2009

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Underweight/normal weight (n=186)</th>
<th>Overweight (n=108)</th>
<th>Obese (n=142)</th>
<th>Test of difference</th>
<th>Group difference&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food source</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used soup kitchen, past month</td>
<td>97 (52)</td>
<td>61 (57)</td>
<td>68 (48)</td>
<td>$\chi^2(2) = 2.04$</td>
<td>NS</td>
</tr>
<tr>
<td>Used food pantry, past month</td>
<td>50 (27)</td>
<td>24 (22)</td>
<td>31 (22)</td>
<td>$\chi^2(2) = 1.29$</td>
<td>NS</td>
</tr>
<tr>
<td>Used mobile food program providing free food, past month</td>
<td>60 (32)</td>
<td>33 (31)</td>
<td>43 (30)</td>
<td>$\chi^2(2) = 0.16$</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Unhealthy behaviors</strong>&lt;sup&gt;f&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of cigarettes, past three months</td>
<td>2.9 (1.2)</td>
<td>2.7 (1.2)</td>
<td>2.6 (1.2)</td>
<td>$F(2,432) = 4.19$</td>
<td>1&lt;sup&gt;→&lt;/sup&gt;3</td>
</tr>
<tr>
<td>Consumption of alcohol, past three months</td>
<td>2.2 (1.3)</td>
<td>2.0 (1.3)</td>
<td>1.9 (1.2)</td>
<td>$F(2,432) = 2.04$</td>
<td>NS</td>
</tr>
<tr>
<td>Consumption of fatty foods, past three months</td>
<td>2.4 (0.8)</td>
<td>2.3 (0.8)</td>
<td>2.4 (0.7)</td>
<td>$F(2,432) = 0.25$</td>
<td>NS</td>
</tr>
<tr>
<td>Low level of exercise, past three months</td>
<td>1.9 (1.2)</td>
<td>2.4 (1.3)</td>
<td>2.2 (1.3)</td>
<td>$F(2,432) = 4.85$</td>
<td>2&lt;sup&gt;→&lt;/sup&gt;3</td>
</tr>
<tr>
<td>Discussed with health-care professional in past year&lt;sup&gt;g&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise</td>
<td>60 (32)</td>
<td>47 (44)</td>
<td>71 (50)</td>
<td>$\chi^2(2) = 10.92$</td>
<td>3&lt;sup&gt;→&lt;/sup&gt;1</td>
</tr>
<tr>
<td>Alcohol use</td>
<td>105 (56)</td>
<td>67 (62)</td>
<td>70 (49)</td>
<td>$\chi^2(2) = 4.15$</td>
<td>NS</td>
</tr>
<tr>
<td>Drug use</td>
<td>93 (50)</td>
<td>60 (56)</td>
<td>75 (53)</td>
<td>$\chi^2(2) = 0.87$</td>
<td>NS</td>
</tr>
<tr>
<td>Emotional or mental problems</td>
<td>117 (63)</td>
<td>76 (70)</td>
<td>100 (70)</td>
<td>$\chi^2(2) = 2.72$</td>
<td>NS</td>
</tr>
<tr>
<td>Nutrition or diet</td>
<td>80 (43)</td>
<td>56 (52)</td>
<td>73 (51)</td>
<td>$\chi^2(2) = 3.16$</td>
<td>NS</td>
</tr>
<tr>
<td>Smoking</td>
<td>111 (60)</td>
<td>64 (59)</td>
<td>85 (60)</td>
<td>$\chi^2(2) = 0.01$</td>
<td>NS</td>
</tr>
</tbody>
</table>

<sup>a</sup>Five participants were missing data on race/ethnicity, four were missing data on use of state or local assistance or having no health insurance, three were missing data on Medicaid, two were missing data on the use of a food pantry or use of Medicare, and one was missing data on use of soup kitchens and mobile food vans, use of private insurance, and health behaviors.

<sup>b</sup>1 = underweight/normal weight, 2 = overweight, 3 = obese. Reference groups for categorical variables included female, white, and discussed exercise with health-care professional.

<sup>c</sup>p<0.001

<sup>d</sup>p<0.05

<sup>e</sup>p<0.01

<sup>f</sup>Unhealthy behaviors were rated on a four-point scale, with higher scores indicating more unhealthy behaviors.

<sup>g</sup>Percentages do not add up to 100% because participants could select more than one.

SD = standard deviation

NS = not significant
Using multivariate analyses, including only significant variables in a forward stepwise multinomial logistic regression model, we found that the strongest associations with being obese were being female (OR=3.85), discussing exercise with a health-care provider (OR=2.74), and reporting a low level of exercise (OR=1.22). The strongest associations with being overweight included discussing exercise with a health-care provider (OR=1.87), having higher ASI-Drug scores (OR=1.63), being female (OR=1.60), and reporting a low level of exercise (OR=1.34) (Table 2).

**DISCUSSION**

The majority (57%) of chronically homeless adults were overweight or obese, which is less than the 68% of obese or overweight individuals in the general U.S. population. However, given that this was a sample of homeless adults who reported an annual income ($4,021.20) that is less than half of the 2010 national poverty threshold for adults younger than 65 years of age ($11,344), and that the majority (52%) reported eating from a soup kitchen in the past month, this finding suggests that there is an unexpected obesity problem in this population, in line with the food insecurity-obesity paradox and the poverty-obesity link.

Various theories have been proposed about the association among food insecurity, poverty, and obesity, and the development of obesity is likely multifactorial, involving environmental, behavioral, and genetic factors. But one likely contributing factor to obesity among chronically homeless adults is their primary food source—i.e., soup kitchens and shelters, many of which have been found to serve foods that are high in fat and energy-dense. Despite no association between food source and obesity observed in this study, with the majority of homeless adults being obese, dietary education and improved access to nutritious, healthy food is imperative.

Obesity was especially prevalent among chronically homeless women, with 74% of homeless women compared with 52% of homeless men being either overweight or obese, which is a reverse gender trend.

Table 2. Forward stepwise multinomial logistic regression of variables associated with weight group among chronically homeless adults enrolled in an 11-site supported housing initiative: U.S., 2004–2009

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overweight</strong></td>
<td></td>
</tr>
<tr>
<td>Days in hotel/boarding home</td>
<td>1.03 (1.00, 1.06)</td>
</tr>
<tr>
<td>Use of cigarettes</td>
<td>0.80 (0.65, 0.99)</td>
</tr>
<tr>
<td>Race/ethnicity: white</td>
<td>0.30 (0.08, 1.13)</td>
</tr>
<tr>
<td>Race/ethnicity: black</td>
<td>0.25 (0.07, 0.94)</td>
</tr>
<tr>
<td>Race/ethnicity: Asian/American Indian/Pacific</td>
<td>0.53 (0.11, 2.57)</td>
</tr>
<tr>
<td>Islander</td>
<td>1.63 (1.16, 2.29)</td>
</tr>
<tr>
<td>Low level of exercise</td>
<td>1.34 (1.10, 1.63)</td>
</tr>
<tr>
<td>Discussed exercise with health-care provider</td>
<td>1.87 (1.11, 3.16)</td>
</tr>
<tr>
<td>Female</td>
<td>1.60 (0.84, 3.06)</td>
</tr>
<tr>
<td><strong>Obese</strong></td>
<td></td>
</tr>
<tr>
<td>Days in hotel/boarding home</td>
<td>1.03 (1.00, 1.06)</td>
</tr>
<tr>
<td>Use of cigarettes</td>
<td>1.03 (1.00, 1.06)</td>
</tr>
<tr>
<td>Race/ethnicity: white</td>
<td>0.23 (0.07, 0.80)</td>
</tr>
<tr>
<td>Race/ethnicity: black</td>
<td>0.15 (0.04, 0.53)</td>
</tr>
<tr>
<td>Race/ethnicity: Asian/American Indian/Pacific</td>
<td>0.14 (0.03, 0.72)</td>
</tr>
<tr>
<td>Islander</td>
<td>1.17 (0.80, 1.72)</td>
</tr>
<tr>
<td>Low level of exercise</td>
<td>1.22 (1.01, 1.48)</td>
</tr>
<tr>
<td>Discussed exercise with health-care provider</td>
<td>2.74 (1.65, 4.54)</td>
</tr>
<tr>
<td>Female</td>
<td>3.85 (2.16, 6.87)</td>
</tr>
</tbody>
</table>

Note: The underweight/normal weight category is the reference group. Race/ethnicity categories are compared with Hispanic as the reference group. ORs for ASI-Drug scores represent odds with every increase of 0.1 in scores.

\*p<0.05
\*p<0.01
\*p<0.001
OR = odds ratio
CI = confidence interval
ASI = Addiction Severity Index
in the general population, in which 64% of women vs. 72% of men are overweight or obese. This increased risk for overweight/obesity among homeless women is consistent with the literature on the food insecurity-obesity paradox. Additionally, after adjusting for other sociodemographic factors, being Hispanic also increased the risk for obesity and suggests that obesity may be particularly related to food insecurity in some racial/ethnic groups. Special attention may need to be given to the weight status of chronically homeless adults who are female and/or Hispanic; further research is needed on the diets and eating habits of these groups.

There were few differences on physical and mental health by weight group. We speculate the reason is that chronically homeless adults are an unhealthy population group in general, so obesity was not necessarily associated with worse health. Another reason may be that chronically homeless adults may be unaware of their medical conditions, and better outreach and screening procedures may be needed. Even though overweight and obese homeless adults were more likely to discuss exercise with a health-care provider, both groups reported a lower level of exercise than those who were not overweight or obese. This finding suggests that there are missed opportunities for intervention and prevention because obesity is not a common target outcome in this population.

**Limitations**

This study had several limitations. First, this study involved multiple comparisons, which were largely exploratory, so no causal conclusions could be made. Second, data were based on participant self-report, which may be susceptible to various response biases. Third, diet and food insecurity were not specifically measured, although it can be expected that homeless adults lack regular access to nutritional food. Detailed information on diets of this population will need to be collected in future research. Future research should also examine the timing of when obesity and homelessness occur, as this study was not able to rule out the possibility that obesity preceded homelessness. Lastly, this study was limited to participants who provided information about their height and weight, and the findings may not be generalizable to all chronically homeless adults.

**CONCLUSIONS**

There may be an obesity problem among chronically homeless adults, and women and Hispanic people appear to be particularly at risk. Given clear findings that obesity contributes to morbidity and mortality, and that there are few weight interventions for homeless adults, more attention and research in this area is needed.

The Collaborative Initiative to Help End Chronic Homelessness Funder’s Group representing the Departments of Housing and Urban Development, Health and Human Services, and Veterans Affairs provided essential support and guidance to this evaluation. The views presented in this article are those of the authors and do not represent the official position of any federal agency or of the U.S. government.

This study was approved by the Institutional Review Boards at VA Connecticut Healthcare System and Yale University.

**REFERENCES**


Uptake of Meningococcal Vaccine in Arizona Schoolchildren After Implementation of School-Entry Immunization Requirements

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ABSTRACT

Objectives. Meningitis and bacteremia due to Neisseria meningitidis are rare but potentially deadly diseases that can be prevented with immunization. Beginning in 2008, Arizona school immunization requirements were amended to include immunization of children aged 11 years or older with meningococcal vaccine before entering the sixth grade. We describe patterns in meningococcal vaccine uptake surrounding these school-entry requirement changes in Arizona.

Methods. We used immunization records from the Arizona State Immunization Information System (ASIIS) to compare immunization rates in 11- and 12-year-olds. We used principal component analysis and hierarchical cluster analysis to identify and analyze demographic variables reported by the 2010 U.S. Census.

Results. Adolescent meningococcal immunization rates in Arizona increased after implementation of statewide school-entry immunization requirements. The increase in meningococcal vaccination rates among 11- and 12-year-olds from 2007 to 2008 was statistically significant (p<0.0001). All demographic groups had significantly higher odds of on-schedule vaccination after the school-entry requirement change (odds ratio range = 5.57 to 12.81, p<0.0001). County demographic factors that were associated with lower odds of on-schedule vaccination included higher poverty, more children younger than 18 years of age, fewer high school graduates, and a higher proportion of Native Americans.

Conclusions. This analysis suggests that implementation of school immunization requirements resulted in increased meningococcal vaccination rates in Arizona, with degree of response varying by demographic profile. ASIIS was useful for assessing changes in immunization rates over time. Further study is required to identify methods to control for population overestimates in registry data.
Neisseria meningitidis (N. meningitidis) is a bacterium that causes meningitis and bacteremia, which often result in brain damage, amputations, and death. Meningococcal disease has an estimated case fatality rate of 10%–14%.1 N. meningitidis can be transmitted through contact with large-droplet respiratory secretions of infected patients or asymptomatic carriers. Meningococcal disease is a nationally notifiable disease in the United States; in 2009, 980 cases of meningococcal disease were reported (all serogroups).2

Three vaccines are currently licensed in the U.S. to prevent meningococcal disease. In May 2005, the Centers for Disease Control and Prevention’s (CDC’s) Advisory Committee on Immunization Practices (ACIP) recommended one dose of quadrivalent meningococcal conjugate vaccine (MCV4/Menactra3) for all children aged 11–12 years, those entering high school, and others at increased risk, such as people traveling to an infectious area or those with a preexisting medical condition.1 In 2007, ACIP’s recommendations were adjusted to include routine immunization of all 11- to 18-year-olds at the earliest opportunity.3 As a consequence, national uptake of the vaccine appears to be increasing. The National Immunization Survey-Teen (NIS-Teen) estimated that coverage of meningococcal vaccine was 53.6% (95% confidence interval [CI] 52.4, 54.9) in adolescents aged 13–17 years in the U.S. in 20094 and increased to 62.7% (95% CI 61.5, 63.9) in 2010.5 Arizona coverage rates for 13- to 17-year-olds were 69.7% (95% CI 63.4, 75.3) in 20094 and 78.9% (±5.3%) in 2010.5

Rates of vaccination against meningococcal disease for children and adolescents in Arizona can also be estimated using the Arizona State Immunization Information System (ASIIS). Since 1998, the Arizona Department of Health Services (ADHS) has used ASIIS to facilitate reporting and storage of immunization data for Arizona children.6 Under Arizona Revised Statute §36-135, providers are required to report all immunizations administered to children younger than 18 years of age to ADHS using ASIIS.7

In 2008, the Arizona school-entry requirements were changed to include new meningococcal vaccine specifications for children entering sixth grade.2,6 The requirements indicated that unless exempt, children who were 11 years of age or older entering sixth grade who had not yet received a vaccine to prevent meningococcal disease had to be vaccinated by September 1, 2008. The requirements also included grades seven through 12, but these grades were phased in incrementally, taking effect each year on September 1.

Immediately following these changes to the school-entry requirements, ADHS launched an education and awareness campaign. The campaign aimed to raise awareness of vaccination requirements and educate the public on the role of vaccines in preventing diseases caused by pathogens such as N. meningitidis. The campaign, which was designed by ADHS staff and CDC’s “It’s Their Turn” campaign partners, included print and electronic materials as well as media coverage. The 2008 summer and fall campaign targeted adolescents, their parents, school personnel, health-care providers, and community organizations. Results indicated that the campaign was successful and had a high degree of parental acceptance, but reported that a small yet significant proportion of the population chose not to vaccinate.8

Although meningococcal vaccine coverage appears to be increasing in Arizona and nationally, questions remain about the level of vaccine uptake in Arizona subpopulations and how changes to school immunization requirements affected uptake across the state. The purpose of this study was to use ASIIS data to determine the coverage rates for meningococcal vaccines in Arizona in 11- and 12-year-old children and determine the influence that statewide school vaccination requirements have on the odds of an on-schedule meningococcal vaccination. This study also aimed to enumerate demographic characteristics associated with differences in geographic response to vaccination requirements for school entry.

**METHODS**

**Data and inclusion criteria**
We extracted de-identified individual records for meningococcal vaccinations administered from January 2006 to January 2011, for children born between January 1, 1993, and January 1, 2000, from ASIIS. The dataset included records for children in the specified age range regardless of whether the child’s record contained a meningococcal immunization. Records containing ambiguous birth dates were excluded. We used the following variables in the analysis: patient ZIP code, patient date of birth, date of meningococcal vaccination, provider identification, and provider type (e.g., private or public). Patient ZIP codes were matched to corresponding Arizona counties, and records with ZIP codes indicating addresses outside of Arizona were omitted from county and regional analyses.

**Analysis of vaccination data from the immunization registry**
We calculated proportions of children vaccinated at 11 and 12 years of age for each school year (SY) for SY 2006–2007 through SY 2009–2010. Because ASIIS

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does not record a child’s grade level, and most children start sixth grade at either 11 or 12 years of age, we assumed that the school-entry requirement applied to all children who were 11 or 12 years of age (as of September 1 of the given school year). Children who received the meningococcal vaccine during their 11th or 12th years were considered on schedule.

We calculated overall vaccination rates for children aged 11 and 12 years, both prior to and after implementation of the school requirement (SYs 2006–2010). We calculated coverage rates using the number of children who were either 11 or 12 years of age with meningococcal vaccination, divided by the total number of children in ASIIS who were 11 or 12 years of age during that school year. For 2010, we also calculated immunization coverage rates using population estimates from the 2010 U.S. Census. Using this external source of population data helps provide perspective on limitations of ASIIS population estimates. To determine if the meningococcal vaccination requirement had a significant impact on vaccination uptake among eligible children in Arizona, we performed Pearson’s corrected Chi-square analysis for vaccination in 2007 vs. 2008.

Grouping county demographics followed by regression modeling

In addition to the changing school requirements for meningococcal vaccine, additional demographic factors (e.g., race/ethnicity, education level, and income) may influence vaccination rates. Many of these statistics are available at the county level from the 2010 U.S. Census. To determine which demographic variables may explain differences among Arizona counties and provide insight into how to cluster counties into groupings, we performed a principal components analysis (PCA). The PCA is a useful technique in exploratory data analysis for finding patterns in complex datasets with many dimensions (e.g., many potentially intercorrelated variables).\(^{10,11}\) Its goal is to extract the important information from the dataset, represent it as a set of new orthogonal variables called “principal components,” and display the pattern of similarity of the observations and the variables as points on a map.\(^{11}\) We used the PCA method because when a multitude of variables are available, such as in the case of U.S. Census data, variables are more likely to be correlated with each other. A major benefit of PCA is that it functions as an exploratory analysis that identifies the most important variables—that is, those variables that are responsible for the most variation in the response.

Variables for the PCA were taken from county-specific information reported in the 2010 U.S. Census. A total of 13 variables were included in the PCA, including the percentage of the population that is younger than 18 years of age; the percentage that is white, Hispanic, or Native American; the percentage of high school graduates; the percentage of home owners; the median home value, household income, and people per household; the percentage living in poverty; the number of people per square mile; federal dollars spent per capita; and the percentage of 2005–2009 U.S. veterans.

The PCA provides insight into which of the 13 variables are most important to drive demographic heterogeneity in meningococcal vaccine coverage among Arizona counties. Those variables considered most important were then selected to perform a hierarchical cluster analysis using Ward’s linkage to assign counties into groups with similar demographic compositions. We performed multivariate logistic regression to determine the odds of vaccination by end of age 12 years for each demographic group following the meningococcal immunization requirement in 2008.

RESULTS

The final dataset comprised 954,953 ASIIS records that met the aforementioned inclusion criteria. Annual immunization coverage rates for 2006–2010 were calculated as the number of children who received meningococcal vaccination by end of age 11 years according to ASIS, divided by the total number of 11-year-old children in ASIIS. We repeated the calculation for 12-year-olds, and again for all children aged 6–18 years. Across all years, 506,375 children (59.3% of the ASIIS population) received meningococcal vaccinations between 6 and 18 years of age. Of the 506,375 vaccinated children, the majority (\(n=339,801, 67.1\)% were vaccinated by 12 years of age, and 96.4% of those children were vaccinated at either 11 or 12 years of age (12,368 were vaccinated before 11 years of age). This finding suggests that the majority of Arizona children who received the immunization were vaccinated before entering sixth grade.

We also reported immunization coverage for 2010 using the U.S. Census for children aged 11 and 12 years and compared ASIIS-derived immunization rates with U.S. Census-derived rates. We found that in 2010, there were 89,797 11-year-olds in Arizona according to the U.S. Census, whereas ASIIS reported 139,747 11-year-olds for the same year. The lower population estimate from Census data resulted in a higher immunization rate of 74.9% compared with the ASIIS-only coverage rate of 48.8% (Table).
Increases in on-schedule vaccination rates following state requirement change

During SY 2006–2007, only 20.1% of 11-year-olds and 21.0% of 12-year-olds in the registry received the meningococcal vaccine. This proportion increased during SY 2007–2008 to 48.2% of 11-year-olds and 40.3% of 12-year-olds. Vaccination coverage for 11-year-olds remained constant, and the proportion of children vaccinated by the end of age 12 years continued to rise in SY 2008–2009 (Table). The increase in on-schedule vaccination rates between 2007 and 2008 was statistically significant (Pearson’s corrected Chi-square value = 2,426.07, degree of freedom = 1, p<0.0001) at 95% CI. We observed a large difference in observed immunization rates when data from the 2010 U.S. Census were used as denominators for coverage rate calculations.

Variability in vaccination uptake associated with demographics

Variability in county demographic characteristics can be reasonably described by the components from the PCA. The first three components described 75.74% of the total variability among Arizona counties. Component 1 accounted for 41.88%, Component 2 accounted for 20.70%, and Component 3 accounted for 13.16% of the variability.

Component 1 was driven by a high Native American population, fewer high school graduates, lower income, and higher poverty. Component 2 was driven by a high Hispanic population, more children younger than 18 years of age, fewer veterans, and higher income. Component 3 was driven by a high Native American population, fewer Hispanic people, more high school graduates, and higher home values.

We identified seven key variables from the first two components of the PCA that were responsible for the majority of demographic diversity among Arizona counties. We performed hierarchical cluster analysis with Ward’s linkage to assign counties to groups with similar demographic profiles based on the following key variables: percentage of the population younger than 18 years of age, percentage living in poverty, percentage Native American, percentage Hispanic, percentage white, percentage high school graduates, and percentage home owners (Figure 1).

Based on logistic regression modeling in all groups, the odds of an on-schedule vaccination (vaccination at 11 or 12 years of age) were significantly higher after the Arizona rule change. The odds ratios (ORs) for vaccination by age 12 years following the Arizona rule change ranged from 5.57 to 12.81, demonstrating that substantial variability in odds exists among the eight demographic groups (Group 1 OR = 5.57, Group 2 OR = 7.34, Group 3 OR = 10.55, Group 4 OR = 12.81, Group 5 OR = 11.14, Group 6 OR = 12.42, Group 7 OR = 9.58, and Group 8 OR = 8.66) (Figure 1). For

Table. Percentage of Arizona children with at least one dose of meningococcal vaccine, by school year and age:* ASIISb vs. 2010 U.S. Census-derivedc rates

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age: 11 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total population on September 1</td>
<td>133,306</td>
<td>135,107</td>
<td>138,634</td>
<td>139,747</td>
<td>89,797f</td>
</tr>
<tr>
<td>Vaccinated by September 1</td>
<td>26,852 (20.1)</td>
<td>65,075 (48.2)</td>
<td>67,019 (48.3)</td>
<td>68,167 (48.8)</td>
<td>67,230 (74.9)</td>
</tr>
<tr>
<td>Vaccinated between September 1 and most recent birthday</td>
<td>26,509 (19.9)</td>
<td>62,669 (46.4)</td>
<td>62,833 (45.3)</td>
<td>64,190 (45.9)</td>
<td>NA^</td>
</tr>
<tr>
<td>Age: 12 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total population on September 1</td>
<td>142,097</td>
<td>133,306</td>
<td>135,107</td>
<td>138,634</td>
<td>89,061f</td>
</tr>
<tr>
<td>Vaccinated by September 1</td>
<td>29,882 (21.0)</td>
<td>53,725 (40.3)</td>
<td>75,015 (55.5)</td>
<td>75,962 (54.8)</td>
<td>76,425 (85.8)</td>
</tr>
<tr>
<td>Vaccinated between September 1 and most recent birthday</td>
<td>24,053 (16.9)</td>
<td>26,873 (20.2)</td>
<td>9,940 (7.4)</td>
<td>8,943 (6.5)</td>
<td>NA^</td>
</tr>
</tbody>
</table>

*aAge as of September 1 of the specified school year
bAccording to records in ASIIS
cThe U.S. Census Bureau measures decennial Census data, thereby limiting U.S. Census-derived immunization rate comparison with 2010.
dAs of 2010
fVaccinated by 11 years of age
^Vaccinated by 12 years of age
ASIIS = Arizona State Immunization Information System
NA = not applicable
Figure 1. Eight demographic profiles of Arizona counties based upon similarities in household, education, income, and race/ethnicity, along with their associated odds of an on-schedule vaccination by end of age 12 years, following the 2008 statewide rule change requiring meningococcal vaccination

<table>
<thead>
<tr>
<th>Group</th>
<th>Post rule-change odds of vaccination by end of age 12 years (OR)</th>
<th>&lt;2.76 people per household</th>
<th>&lt;83.9% high school graduates</th>
<th>&lt;25.5% younger than age 18 years</th>
<th>&lt;25.7% college graduates</th>
<th>&lt;16.5% live in poverty</th>
<th>&lt;68.3% own home</th>
<th>&lt;$40,000 median household income</th>
<th>&gt;4.6% Native American</th>
<th>&gt;29.6% Hispanic</th>
<th>&gt;73.0% white</th>
<th>Demographic profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>5.57</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Group 2</td>
<td>7.34</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Group 3</td>
<td>10.55</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*Groups are listed in the order of their perceived sociodemographic risk profile.

*A 2008 statewide rule change required meningococcal vaccination for school entry at sixth grade.

*Statistics within each characteristic were assigned risk thresholds according to state-reported averages in the 2010 Census. Groups falling outside these thresholds are noted with a “yes” for that statistic and contributes to an overall group demographic profile.

*Denotes that the group has the lowest or highest value for that statistic.

OR = odds ratio
example, Group 1, which had the highest poverty rates, most children per family, fewer white people, and more Native Americans, had significantly lower odds of vaccination by end of age 12 years following the rule change (OR = 5.57, 95% CI 5.16, 6.02) than that of Group 4 (OR = 12.81, 95% CI 11.54, 14.21) (Figure 2). These findings suggest that additional demographic factors may be contributing to the observed differences in ORs.

Logistic regression using patient-level variables (e.g., age at vaccination, vaccination date, and provider type) found that provider type explained some of the variation in vaccination uptake rates; i.e., a patient’s odds of an on-schedule vaccination by a private provider were 1.5 to 4.5 times that of public providers (data not shown).

To explore which socioeconomic factors were associated with the lower odds of up-to-date vaccination following the rule change, we compared each group’s OR against several demographic characteristics. We found that groups with a higher percentage of Native Americans, lower percentage of white people, more children younger than 18 years of age, and higher percentage of people living in poverty were associated with a lower OR. Figure 3 shows that as the proportion of non-Hispanic white people increases, the odds of having an up-to-date vaccination following the rule change also increases.

**DISCUSSION**

Meningococcal vaccination rates increased during the study period, suggesting that 2008 adolescent school immunization requirements were successful in improving vaccine coverage. Similar results were found in a study of North Dakota adolescent immunization rates\textsuperscript{12} and in a study about hepatitis A vaccination uptake in Arizona\textsuperscript{13}. Concurrent activities—an educational campaign launched after the rule change,\textsuperscript{9} increasing provider focus on adolescent immunizations, and communication improvements surrounding meningococcal vaccine—may have also influenced trends in immunization rates.

We observed differences in vaccination coverage when using registry vs. Census-derived populations.

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**Figure 2. Logistic regression model ORs\textsuperscript{*} for meningococcal vaccination of children by end of age 12 years, by Arizona demographic groups based on household, income, education, and racial profiles**

\begin{table}[h]
  \centering
  \begin{tabular}{|c|c|c|}
    \hline
    Arizona demographic group & Vaccinated post-requirement change & Vaccinated by private provider \\
    \hline
    1 & 16 & 12 \\
    2 & 14 & 10 \\
    3 & 12 & 8 \\
    4 & 10 & 6 \\
    5 & 8 & 4 \\
    6 & 6 & 2 \\
    7 & 4 & 0 \\
    8 & 2 & 0 \\
    \hline
  \end{tabular}
\end{table}

\textsuperscript{*}This figure illustrates the relationship between the lower ORs in demographic groups 1, 2, and 8 as opposed to ORs in the other demographic groups. These three groups represent the demographic groups with overall highest poverty rates, more children per family, lowest educational attainment, and highest proportion of Native Americans with fewer white people. The ORs are for either the odds of an on-schedule (by end of age 12 years) meningococcal vaccination following the Arizona statewide rule change in 2008 requiring vaccination (dark gray bars), or the odds of an on-schedule vaccination (by end of age 12 years) given by a private provider vs. a public provider (light gray bars).

OR = \text{odds ratio}
In 2010, the U.S. Census Bureau reported 89,797 total 11-year-old children and 89,061 total 12-year-old children in Arizona. Closely corresponding year and birth date criteria (as of September 1, 2009) showed that ASIIS contained 139,747 records of 11-year-olds and 138,634 total 12-year-olds. Registry population overestimates have been observed in other states and may be explained by children who have left the state but remain active in the registry, an issue identified by the American Immunization Registry Association. Vaccine coverage estimates are higher when using the Census population because it is 60% of the registry’s population estimate. This discrepancy is a significant issue regarding the use of registry data vs. Census data. Because the Census Bureau lacks detailed data (by year, county, and age in a given year) for non-decennial Census years, we used registry information for vaccination coverage calculations and logistic regression analysis.

Our analysis revealed that patients were more likely to receive a meningococcal vaccination by end of age 12 years from private rather than public providers following the vaccination requirement change. Patients served by public providers may be less likely to have a medical home and have less adequate insurance coverage, resulting in lower odds of on-schedule immunization. However, to suggest that there is a reliance on private providers would be an oversimplification of very complex interactions among factors including socioeconomic status, insurance coverage, and availability of health care.

Communities with a greater proportion of individuals having a high school education, higher median household incomes, and a larger proportion of non-Hispanic white residents had the best odds of on-schedule vaccination following the requirement change. That is, the requirement change had less impact on vaccination rates in poorer communities with higher Native American populations and fewer high school graduates. Lower income, lower family education level, and nonwhite race have all been identified as risk factors for underimmunization in other national studies, and our findings suggest that these communities might also exhibit less reaction to state vaccination requirement mandates.

The observed difference in responses to requirement changes may be due to a stronger initial response to vaccine recommendations as opposed to requirements. In fact, demographic groups with lower

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**Figure 3.** Associations between demographic profiles and odds ratios for meningococcal vaccination of children by end of age 12 years, following the rule change in Arizona

<table>
<thead>
<tr>
<th>Demographic Profile</th>
<th>Odds Ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native American</td>
<td>-0.76,</td>
<td>0.03</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>0.85,</td>
<td>0.01</td>
</tr>
<tr>
<td>In poverty</td>
<td>-0.69,</td>
<td>0.058</td>
</tr>
<tr>
<td>&lt;18 years</td>
<td>-0.67,</td>
<td>0.067</td>
</tr>
</tbody>
</table>

* A 2008 statewide rule change required meningococcal vaccination for school entry at sixth grade.

* Pearson’s correlation coefficient p-value at 95% confidence interval

OR = odds ratio
observed response to the requirement change actually had higher immunization coverage prior to the requirement change. This finding suggests that there was a response by these communities to the initial ACIP recommendation in 2005, which leads to additional questions about the proportion of public providers who responded to the initial recommendation and differences between responses of public and private providers to recommendations vs. requirements. These questions merit further exploration, as they could impact future targeting of educational campaigns aimed at providers in Arizona.

Strengths and limitations
This study had several strengths and limitations. ASIIS offers a large dataset from a well-established surveillance system; in 2009, at least 95% of 19- to 35-month-olds in Arizona had two or more immunizations recorded in ASIIS. Data extracted from ASIIS were invaluable in completing this study, although systematic biases are present within this passive surveillance system. One limitation was the population overestimate observed in the immunization registry. Another limitation was that missing or incomplete records may have been present. Arizona does not currently conduct statewide reminder recalls, which may help in identifying children who no longer live in a certain jurisdiction. Still, the exceptional statewide coverage of ASIIS, the presence of individual-level rather than aggregated data, and data availability make it a sound choice for immunization coverage research. Further exploration of the issue of population overestimates will lead to analytically sound ways to address this challenge.

The NIS-Teen surveyed nationally a total of 2,947 adolescents aged 13–18 years in 2007, 17,835 in 2008, 19,066 in 2009, and 19,257 in 2010. In contrast, the 2011 ASIIS dataset used in our study contains a total of 816,980 Arizonans aged 13–18 years (born 1993–1999). The sheer number of patients within ASIIS demonstrates the power of using state immunization registries to investigate trends in vaccine uptake and coverage.

The use of ASIIS data allows for a population-level assessment and flexibility in the analyses that cannot be achieved using other vaccination data sources. Our study employed the use of PCA and OR methods that are more robust than simple rates, even with the inflated denominators in the ASIIS data. Our novel approach was useful for identifying population-level factors associated with changes in vaccination coverage estimates for jurisdictions smaller than the state level and between communities with very different demographic compositions.

We assigned ASIIS records to counties based on patient ZIP code, acknowledging several limitations. Some ZIP codes span several counties; in these cases, the record was assigned to the most populous county, potentially leading to inaccuracies in coverage estimates. Future analyses examining provider or school location may identify additional geographic patterns in vaccine uptake.

More extensive analyses should examine additional factors such as the year the child entered sixth grade, provider demographics, the child’s school, and differences in school practices regarding immunization requirements and exemptions. Because of imperfect data, we used several proxies in our analysis, including age, to estimate entry into the sixth grade. We also used the provider identified as “owner” as the provider of record for the child. This proxy cannot account for instances when a child has moved from one provider/owner to another between the date of meningococcal vaccine administration and when the data were extracted from ASIIS.

More detailed information from additional datasets could bolster future analyses. For example, we could account for children exempt from the immunization requirement, and although most sixth-grade exemptions in 2010 in Arizona were religious/philosophical rather than medical (3,026 of 3,428), examining these data will add valuable information for future public health initiatives. School district-level data and detailed demographic data on providers will facilitate exploration into other important areas that may influence immunization coverage. In addition, an exploration of the factors responsible for artificial denominator inflation observed in ASIIS might suggest ways to better account for that inflation in analyses.

CONCLUSIONS
This study offers a unique presentation of important population-level information about changes in vaccine coverage in Arizona in response to a new statewide meningococcal vaccination mandate. Our study made use of ASIIS, a rich and valuable data source, and used novel methods that allowed for flexible analyses of changes to coverage estimates. We also identified demographic characteristics of populations that may be less likely to respond to state mandates for vaccinations. The methods we used may be useful to other immunization programs in which similar initiatives and rules may be under consideration, or where such programs have been implemented but whose results have not yet been measured.

Immunization data from Arizona’s registry, ASIIS,
were useful in conducting a descriptive analysis of vaccine coverage for meningococcal vaccine in Arizona and in examining the impact of statewide policy changes in Arizona on the odds of on-schedule vaccination. Meningococcal vaccine coverage increased after ACIP recommendations were released, and again after school-entry requirements were changed in all Arizona demographic populations, but in varying magnitude associated with demographic compositions. The observed differences in response to the school requirement due to demographic factors are important and can help immunization programs effectively target educational messages and/or resources to support adherence to requirements. Issues regarding registry overestimates of the total population may lead to systematic errors in estimating vaccination coverage in a population; estimates should be reserved for understanding trends over time as opposed to an absolute measure of coverage. More work is necessary to determine the most appropriate methods for handling this bias inherent in immunization data sources.

The authors thank Patty Gast at the Arizona Department of Health Services (AZDHS) for her expertise and helpful feedback. The AZDHS determined that this study used de-identified data and was exempt from Institutional Review Board review.

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Source of Parental Reports of Child Height and Weight During Phone Interviews and Influence on Obesity Prevalence Estimates Among Children Aged 3–17 Years

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ABSTRACT

Objective. We compared parental reports of children’s height and weight when the values were estimated vs. parent-measured to determine how these reports influence the estimated prevalence of childhood obesity.

Methods. In the 2007 and 2008 North Carolina Child Health Assessment and Monitoring Program surveys, parents reported height and weight for children aged 3–17 years. When parents reported the values were not measured (by doctor, school, or home), they were asked to measure their child and were later called back. We categorized body mass index status using standard CDC definitions, and we used Chi-square tests and the Stuart-Maxwell test of marginal homogeneity to examine reporting differences.

Results. About 80% (n=509) of the 638 parents who reported an unmeasured height and/or weight participated in a callback and provided updated measures. Children originally classified as obese were subsequently classified as obese (67%), overweight (13%), and healthy weight (19%). An estimated 28% of younger children (<10 years of age) vs. 6% of older children (aged ≥10 years) were reclassified on callback. Having parents who guessed the height and weight of their children and then reported updated values did not significantly change the overall population estimates of obesity.

Conclusion. Our findings demonstrate that using parent-reported height and weight values may be sufficient to provide reasonable estimates of obesity prevalence. Systematically asking the source of height and weight information may help improve how it is applied to research of the prevalence of childhood obesity when gold-standard measurements are not available.
Measuring the effects of public health interventions to reduce the prevalence of childhood obesity will depend on accurate measurement of body mass index (BMI). BMI for age is the most commonly used measure of obesity in children, as it is a valid estimate of adiposity and is recommended by the American Academy of Pediatrics and the Centers for Disease Control and Prevention (CDC) when assessing childhood obesity. In large community surveys, classification of BMI status often relies on parental report of their children’s height and weight. To accurately estimate obesity prevalence, it is critical to determine the validity of these height and weight measures.

Studies to assess whether self-reported height and weight measures from adolescents or parents can be used to correctly classify a child’s BMI status have shown mixed results. One study of parents and adolescents demonstrated that adolescent self-report accurately classifies adolescents into weight categories. Correct classification of young children using parent-reported height and weight is more problematic. In a Canadian study, preschoolers’ mothers overestimated weight when they were asked to report child height and weight without measuring their children, but were generally accurate in reporting height. Another study comparing two U.S. nationally representative survey populations showed that parents indeed overestimated weight to a small degree, but more significantly underestimated height, particularly among younger children. When used systematically for BMI calculations, these specific inaccuracies in the parent-reported measures can lead to an overestimation in the prevalence of childhood obesity among young children.

There is limited information about how parents derive the information they provide for their reports of child height and weight, and whether height, weight, and BMI classification differ based on their source of information. Furthermore, no studies to our knowledge have examined how parental reports may change subsequent to their own measurements of their children. We used a statewide health assessment monitoring program with a unique data collection method with regard to children’s height and weight to achieve the following goals: (1) examine the source of information used by parents reporting their child’s height and weight in a population-based telephone survey, in which parents were asked prior to the survey to measure their child, and demographic characteristics associated with that source; (2) describe change in BMI status among children whose parents reported unmeasured initial height and weight to measured follow-up height and weight; and (3) compare estimated prevalence of childhood obesity using parent-reported unmeasured and measured height and weight.

**METHODS**

**Data**

We used cross-sectional data from the 2007 and 2008 North Carolina Child Health Assessment and Monitoring Program (NC CHAMP) surveys. The NC CHAMP is a follow-up to the Behavioral Risk Factor Surveillance System (BRFSS), an annual statewide telephone survey that uses a computer-assisted random-digit-dial telephone interview to assess health characteristics of noninstitutionalized adults aged 18 years and older. During the BRFSS interview, respondents living in households with children aged 0–17 years are asked to participate in NC CHAMP. One child is selected through a computerized randomization procedure, and the adult identified as most knowledgeable about the health of the selected child is called one to two weeks later to complete the NC CHAMP survey. The adult BRFSS participants are told during the scheduling of the call for the follow-up NC CHAMP survey that they will be asked about the child’s height and weight, given instructions on how to measure height and weight, and asked to have completed the measurements before they are called back.

During the NC CHAMP survey, responding parents of children aged 3–17 years are asked how much their child weighs and how tall their child is now. They are then asked how they arrived at their child’s height/weight and given the following responses to choose from: (1) your child told you (his/her) height/weight, (2) you estimated or guessed your child’s height/weight, (3) you used a bathroom scale/tape measure or yardstick within the past six months, (4) the child was weighed/measured at the doctor’s office within the past six months, (5) the child was weighed/measured at school within the past six months, or (6) you determined the measurements some other way. The option for “child told height/weight” was only available for parents of children aged 10 years and older. Respondents who reported option 1, 2, or 6 were deemed to have reported unmeasured height or weight, and were flagged for specific height/weight follow-up callbacks due to concerns of accuracy.

At the conclusion of the NC CHAMP survey, respondents flagged for the height/weight callback were asked to weigh their child with a scale and/or measure with a measuring tape. Those who agreed to do so were asked to weigh the child with shoes off and to measure height with the child’s shoes off and with his/her
back against the wall. Participants were provided with a toll-free number to call with the measurements; if the participant did not call, a callback occurred five days subsequent to the initial NC CHAMP interview.

**Measures**

BMI was calculated as weight (in kilograms) divided by height (in meters squared) for children with values for height and weight reported at initial interview (“initial BMI”). Updated measures of height and/or weight were obtained through follow-up (“callback BMI”) for children whose parents reported unmeasured height or weight at the initial interview and who agreed to the follow-up. Categories for BMI status were derived based on BMI for age and sex percentiles, as calculated using the 2000 CDC growth charts, and defined as follows: <5th percentile = underweight; 5th percentile to <85th percentile = healthy weight; 85th percentile to <95th percentile = overweight; and ≥95th percentile = obese. BMI-for-age percentiles are endorsed as the appropriate assessment of weight status in children.

Other measures were based on parental report. Race/ethnicity was classified as white, black, Hispanic, or other. We also included the sex of the respondent, such that a female respondent could be a mother, grandmother, or other guardian.

**Statistical analyses**

We used bivariate and Chi-square statistics to examine differences in BMI as reported on the initial call and on callback. First, we used Pearson’s Chi-square tests to examine whether demographic characteristics differed between respondents who reported measured height/weight and those who reported an estimated, guessed, or otherwise unmeasured height or weight. Then, among those who reported unmeasured height or weight at initial interview, we examined whether children were reclassified into different BMI status categories after parents measured them at home, using a Stuart-Maxwell test of marginal homogeneity. We used Pearson’s Chi-square tests to determine whether demographic characteristics differed for reclassification. We performed all statistical analyses using Stata® 11.0. No adjustments for survey design were used for our analysis involving a subset of the total sample.

**RESULTS**

**Sample description**

In 2007 and 2008, 5,702 respondents participated in NC CHAMP; 4,828 were respondents with children aged 3–17 years, and their children were evenly divided by sex. More than half of the children (58%) were aged 10–17 years, 70% were non-Hispanic white, 14% were non-Hispanic black, 9% were Hispanic, and 7% were another race/ethnicity. The majority (82%) of respondents were female, with 79% of respondents being the mother of the selected child.

Of the 4,828 respondents who were asked about child height and weight, 4,107 reported height and weight during the initial interview. Of those reporting child height/weight at initial interview, 3,467 (84.4%) reported that both height and weight were measured. The majority of parents reported that height was measured in the doctor’s office (47.2%) or by the parents at home (33.5%), with similar reports for weight (50.7% at the doctor’s office and 35.9% by parents at home). Those who reported an unmeasured, guessed, or estimated height and/or weight (n=638) were flagged for height/weight callback. An additional 721 reporting neither height nor weight at initial call were also flagged for callback, but were not included because this study focused on changes between initial and callback reports. Of those flagged for height/weight callback, 509 (79.8%) ultimately participated and provided updated measures of their child’s height and/or weight: 85 provided updated weight, 226 provided updated height, and 198 provided updates to both height and weight measures. The Figure presents a schematic of sample sizes for reporting of child’s height and weight during initial interview, those identified for height/weight callback, and those who participated in height/weight callback.

**Parents reporting measured vs. unmeasured height and weight**

There were significant differences by demographics in whether the initially reported height and weight were measured or unmeasured (Table 1). Parents of younger children (aged 3–9 years) and non-Hispanic white or Hispanic children, compared with parents of black children or children of other race/ethnicity, were more likely to report measured height and weight. Female caregivers were more likely than male caregivers to report measured weight but not height. There were no differences in reports of measured vs. unmeasured height and weight based on the sex of the child.

**Changes in BMI status based on unmeasured vs. measured height and weight**

Based on initial parental reports of height and weight, 5.7% of children were classified as underweight, 50.3% were classified as healthy weight, 19.1% were considered overweight, and 25.0% were obese. When comparing initial unmeasured reports with measured
Figure. Schematic of reaching 509 subjects aged 3–17 years for whom information was provided to allow BMI calculation based on unmeasured and measured data: NC CHAMP surveys, 2007 and 2008

- Children aged 3–17 years \( n = 4,828 \)
- Did not report height or weight at initial call \( n = 721 \)
- Reported both height and weight \( n = 4,107 \)
  - Reported height and weight as measured \( n = 3,467 \)
  - Reported unmeasured height and weight \( n = 259 \)
  - Reported unmeasured height \( n = 106 \)
  - Reported unmeasured weight \( n = 275 \)
- Eligible for callback \( n = 638 \)
  - Updated height \( n = 226 \)
  - Updated weight \( n = 85 \)
  - Updated height and weight \( n = 198 \)
- With height and weight allowing BMI calculation at both initial call and callback \( n = 509 \)

BMI = body mass index
NC CHAMP = North Carolina Child Health Assessment and Monitoring Program
callback reports, most children (66.9%) who were originally classified as obese remained classified as obese, with 13.4% of those originally classified as obese reclassified as overweight and 19.7% reclassified as healthy weight (Table 2). More than half (57.7%) of overweight children remained classified as overweight. Overweight children were equally likely to be reclassified as having a higher BMI status as they were a lower BMI status, with 21.7% subsequently reclassified as obese and 19.6% reclassified as healthy weight following callback. The great majority of healthy weight children (89.5%) at initial report remained categorized as healthy weight. Most children (72.4%) originally classified as underweight were subsequently categorized as healthy weight on callback.

There were no significant differences in reclassification by race/ethnicity or sex of caretaker who served as the reporter (Table 3). However, younger children were significantly more likely to be reclassified on callback, with 28% of children younger than 10 years of age reclassified into a lower weight category, compared with only 6% of children aged 10 years and older. For children aged 10 years and older, when the child told the parent his/her height or weight, he/she was significantly more likely to remain in the same weight category than if the parent had guessed the child’s measurements.

On average, both height and weight were underreported when comparing measurements collected at callback and guessing at initial interview. The largest difference was in children younger than 10 years of age, whose parents reported height as 5.4 cm higher.

Table 2. Weight status of children aged 3–17 years at the time of callback, based on weight status from initial unmeasured height and weight reports: NC CHAMP surveys, 2007 and 2008 (n=509)*

<table>
<thead>
<tr>
<th>Initial category</th>
<th>Obese</th>
<th>Overweight</th>
<th>Healthy weight</th>
<th>Underweight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obese (n=127)</td>
<td>66.9</td>
<td>13.4</td>
<td>19.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Overweight (n=97)</td>
<td>21.7</td>
<td>57.7</td>
<td>19.6</td>
<td>1.0</td>
</tr>
<tr>
<td>Healthy weight (n=256)</td>
<td>0.8</td>
<td>7.4</td>
<td>89.5</td>
<td>2.3</td>
</tr>
<tr>
<td>Underweight (n=29)</td>
<td>6.9</td>
<td>0.0</td>
<td>72.4</td>
<td>20.7</td>
</tr>
</tbody>
</table>

*p < 0.001; Stuart-Maxwell test of marginal homogeneity
NC CHAMP = North Carolina Child Health Assessment and Monitoring Program

BMI = body mass index

Table 1. Percentage of respondents to the 2007 and 2008 NC CHAMP surveys who reported measured vs. unmeasured height, weight, and BMI, by selected child and parent characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Measured height (n=4,207)</th>
<th>Measured weight (n=4,569)</th>
<th>Measured BMI (n=4,107)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent</td>
<td>P-value*</td>
<td>Percent</td>
</tr>
<tr>
<td>Child age (in years)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3–9</td>
<td>88.2</td>
<td>0.002</td>
<td>93.4</td>
</tr>
<tr>
<td>10–17</td>
<td>84.7</td>
<td></td>
<td>88.8</td>
</tr>
<tr>
<td>Child sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>86.3</td>
<td>0.551</td>
<td>91.1</td>
</tr>
<tr>
<td>Female</td>
<td>85.7</td>
<td></td>
<td>90.4</td>
</tr>
<tr>
<td>Child race/ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>87.0</td>
<td>0.008</td>
<td>91.5</td>
</tr>
<tr>
<td>Black</td>
<td>81.9</td>
<td></td>
<td>86.8</td>
</tr>
<tr>
<td>Hispanic</td>
<td>85.5</td>
<td></td>
<td>91.6</td>
</tr>
<tr>
<td>Other</td>
<td>84.1</td>
<td></td>
<td>89.6</td>
</tr>
<tr>
<td>Respondent sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>86.4</td>
<td>0.158</td>
<td>91.5</td>
</tr>
<tr>
<td>Male</td>
<td>84.4</td>
<td></td>
<td>87.5</td>
</tr>
</tbody>
</table>

*p-values from Chi-square tests of differences in reporting a measured value by demographic categories
NC CHAMP = North Carolina Child Health Assessment and Monitoring Program
BMI = body mass index
on average, during callback, which resulted in a BMI percentile that was 7.2 points lower upon callback. There were no significant differences by race/ethnicity or child’s sex.

### Effect of callback on overall prevalence of overweight and obesity

Finally, we examined the effect on overall estimates of obesity prevalence of including a callback requesting measured height and weight. Due to expected differences in reporting by age, we examined children younger than 10 years of age and children aged 10 years and older separately. Within each age category, overall estimates of the prevalence of obesity were similar whether using the initially collected data or the callback data, which included updated information for parents who reported that the initial weight was not measured. Specifically, including the callback changed the estimated prevalence of obesity among those younger than 10 years of age from 28.2% to 26.8%, and from 17.2% to 17.7% among those aged 10 years and older (data not shown).

### DISCUSSION

In summary, our study demonstrated that when parents who report an unmeasured height or weight for their child are asked to subsequently provide a home-measured value, most children remain in the same BMI status category, especially healthy weight children. Parental guessing correctly categorizes children three-quarters of the time, and more than 80% of the time when collapsing overweight and obese. The greatest difference was seen in those initially reported as underweight, who, much of the time, are subsequently categorized as healthy weight. This finding is consistent with previous studies showing largely accurate weight status classification based on parental and adolescent reports.4,10

However, when parents provided an unmeasured
height or weight value (e.g., by guessing), young children were more likely to be reclassified to a lower BMI status category following parental measurement. The largest difference was seen among children younger than 10 years of age, for whom the underreporting of height, specifically, leads to an overestimation of obesity. There were no significant differences in BMI recategorization by race, sex of the child, or sex of the reporter.

One important finding was that when the reported height and weight were not based on measured values, but the parent indicated his/her child provided the values, weight classification was largely unchanged when parents subsequently reported a measured value. This finding demonstrates that children older than 10 years of age may be able to provide reports that are accurate enough for appropriate broad weight classification.

Adult research shows that height is generally overreported while weight is underreported. Although we were unable to compare our data with clinically measured values, parents in our study generally underreported height, which contrasted adult findings. However, this underreporting of height was much greater among children younger than 10 years of age as compared with older children and adolescents. Importantly, underreporting of height is amplified when calculating BMI, because height is squared in the denominator, leading to an overestimation of obesity prevalence. This underreporting is demonstrated in our finding that young children are frequently reclassified into a lower weight category, in contrast with adults whose overreporting of height contributes to underestimations of obesity prevalence. The reason for this underreporting is likely due to height being an ever-changing value among growing children.

Overall, our findings demonstrate that using parent-reported height and weight values, even when identified as unmeasured, may provide reasonable estimates of population-level obesity prevalence when combined with a complete sample of parents who report measuring their child. Measured height and weight are clearly accurate enough for population-based categorization. When measured height and weight are not feasible in survey research, it may be possible to obtain additional information that can minimize the effects of misreporting. Identifying the source of the data can flag children who may be more likely to be incorrectly categorized—particularly young children whose height is reported as unmeasured and those initially identified as underweight. Based on previous studies and our findings from children who told parents their height or weight, older children may be able to provide height and weight information that is accurate enough for population-based categorization. Systematically asking the source of height and weight information may help to tease apart the more accurate from the less accurate reporters.

Limitations

There were several important limitations to our study. The most important was that we relied on parental report of whether the child’s height and weight were measured. We were also not able to compare parent-reported values with the gold standard of clinically measured values. However, we were able to use a large sample to assess changes when parents indicated the value had been measured, compared with a previous unmeasured report. Additionally, NC CHAMP is based on landline telephones only, meaning the study subjects may not accurately reflect the demographics of the population.

CONCLUSION

Although most parents report that they know their child’s height/weight based on a recently measured value, a substantial percentage of parents provide a guess that is not based on their recollection of a measured value. Gathering information about the source of the data may help to improve the use of parent-reported height and weight data in surveys where clinical measurement is not possible. The two specific pieces of information that are most important are (1) identifying that height was measured among young children and (2) identifying if the child told the parent his/her height and weight. This information about the source of data may help improve the use of parental reports in childhood obesity research.

This study was determined to be exempt from Institutional Review Board review by the University of North Carolina under federal regulation 45 C.F.R. §46.101(b), due to the use of secondary, de-identified data.

REFERENCES

Enforcement of Ohio’s Smoke Free Workplace Law Through the Lens of Public Health Practice

ABSTRACT

Objectives. Little is known about whether public health (PH) enforcement of Ohio’s 2007 Smoke Free Workplace Law (SFWPL) is associated with department (agency) characteristics, practice, or state reimbursement to local PH agencies for enforcement. We used mixed methods to determine practice patterns, perceptions, and opinions among the PH workforce involved in enforcement to identify agency and workforce associations.

Methods. Focus groups and phone interviews (n=13) provided comments and identified issues in developing an online survey targeting PH workers through e-mail recruitment (433 addresses).

Results. A total of 171 PH workers responded to the survey. Of Ohio’s 88 counties, 81 (43% rural and 57% urban) were represented. More urban than rural agencies agreed that SFWPL enforcement was worth the effort and cost (80% vs. 61%, p=0.021). The State Attorney General’s collection of large outstanding fines was perceived as unreliable. An estimated 77% of agencies lose money on enforcement annually; 18% broke even, 56% attributed a financial loss to uncollected fines, and 63% occasionally or never fully recovered fines. About half of agency leaders (49%) felt that state reimbursements were inadequate to cover inspection costs. Rural agencies (59%) indicated they would be more likely than urban agencies (40%) to drop enforcement if reimbursements ended (p=0.0070). Prioritization of SFWPL vs. routine code enforcement differed between rural and urban agencies.

Conclusions. These findings demonstrate the importance of increasing state health department financial support of local enforcement activities and improving collection of fines for noncompliance. Otherwise, many PH agencies, especially rural ones, will opt out, thereby increasing the state’s burden to enforce SFWPL and challenging widespread public support for the law.
In November 2006, 58% of Ohio voters approved the Smoke Free Workplace Act, making Ohio one of 36 states to pass legislation regarding indoor tobacco exposure in workplaces and the 12th state to protect all citizens from secondhand tobacco smoke exposure in public places and most workplaces.\(^1\)\(^-\)\(^4\) Implemented on May 3, 2007, the Smoke Free Workplace Law (SFWPL) limits tobacco use in about 280,000 places of employment and public places in Ohio. Private residences, family-owned businesses without non-family employees, certain areas of nursing homes, outdoor patios, and some retail tobacco stores were exempt.\(^4\) In 2007, 23.1% of Ohioans were current smokers, which was a significantly higher percentage than for the U.S. population as a whole (19.8%).\(^5\)

State and local public health (PH) agencies were charged with SFWPL enforcement. Local PH departments (agencies) choosing to enforce SFWPL could be reimbursed $125 by the Ohio Department of Health (ODH) for each completed investigation that had all required notifications filed within 50 calendar days of an initial issuance. Punitive fines to violators ranged from a warning letter to a $100, $500, $1,000, or $2,500 fine for the fifth and subsequent violations.\(^6\)\(^,\)\(^7\) Inspectors could double fines for intentional violations and assess daily fines for continuing violations. Outstanding obligations could be turned over to the State Attorney General’s (AG’s) office for collection.\(^8\)

Upon implementation, several PH agencies opted out, requiring ODH to enforce the law. By July 2009, 41 agencies had opted out, leaving enforcement in 24 of Ohio’s 88 counties to ODH.\(^9\) Further rule changes allowed agencies to keep 90% of the paid fines to cover enforcement costs. Additionally, administrative hearings for violators were assumed by state offices.

Nonetheless, the actual cost of enforcement, which varies by jurisdiction, is unknown but continues to drive PH agencies to opt out, thereby increasing the burden on ODH.\(^10\) Beyond costs, how an agency enforces ordinances can vary depending on the clarity of legislation and associated rules, professional training and expertise, differing views on prioritization and risk, differences in levels of authority, ineffective strategies, political pressures, population size served, and available staff and time for enforcement.\(^11\)\(^-\)\(^14\) Prioritization and enforcement practices may be greatly influenced by decreasing funding and increased public expectation.\(^15\) Moreover, little was known about how these factors influenced PH practice of SFWPL enforcement across Ohio’s 88 counties and whether variation in practice is associated with agency characteristics. Knowledge about these variations may provide best practices for agencies to follow or areas in need of action.

Therefore, we used qualitative and quantitative direct assessment of the PH workforce to provide information on the barriers, incentives, practice patterns, fiscal pressures, and opinions on SFWPL enforcement. Furthermore, we examined whether the agency census designations, as rural or urban, and supervisory levels, as administration or direct enforcement staff, may be associated with differences in PH practice and opinions regarding SFWPL.

**METHODS**

Phase one involved identifying informants through focus groups and phone interviews. Focus groups were attended by either executive (administrative) or direct enforcement workers. Focus group responses were recorded in notes, with audio recordings transcribed by two investigators (David Bruckman and Aiswarya Chandran Pillai). Key informant interviews (administrators only) used only written notes. Session questions were open-ended, and some questions were based on Resnick et al.’s study\(^15\) and on suggestions within our PH practice-based research network.\(^16\) Attendees were asked whether their agency enforced SFWPL, how they would describe the results of the law, their opinions on the online enforcement registration system, and how well the online system was integrated into their practice. Attendees were asked about the public reaction if the law was repealed; their experiences in speaking with business owners about the law; workplace issues; barriers to enforcement at the business, agency, and political levels; and the apparent effectiveness and effect of the law on businesses. The session ended by asking about perceived differences in how enforcement is prioritized across administrative levels in their agency. Comments from written materials were subjectively coded into key words and issues, and then grouped into domains to develop questions for an online survey.

Phase two involved developing the online survey targeting PH professionals to collect their opinions and descriptions of workplace issues regarding enforcement. Recruitment relied upon refining publicly available e-mail listings from state agency websites to create a contact list. Invitations were e-mailed to executives and any PH staff believed to be involved in tobacco cessation education or enforcement. E-mail addresses were used in the initial recruitment wave. Invitations in state PH and professional association newsletters recruited additional respondents in a second wave. All participants giving informed consent were offered a $10 gift card in compensation.
Survey analysis plan
Voluntary survey responses included agency identification, level of administrative or direct enforcement capacity, and personal characteristics (e.g., gender and smoking history). We used five-level scales of agreement (1 = strongly agree, 2 = agree, 3 = neither agree nor disagree, 4 = disagree, and 5 = strongly agree) and scales of frequency (1 = always, 2 = usually, 3 = half the time, 4 = occasionally, and 5 = never). Each question allowed respondents to answer “not applicable” or “skip/refused.” We used SurveyMonkey® for survey administration and SAS® for analysis. We classified respondents as being from urban or rural agencies based on U.S. Census classifications of Ohio counties. In general, communities with fewer than 50,000 in population were considered rural. We categorized self-reported job level as “administration” or “non-administration,” ranking medical directors and project supervisors into the former category and all others into the latter category. We used nominal Chi-square tests of association to test job class, regions, and other factors against survey responses. This article reflects all data beyond preliminary results.

RESULTS: PHASE ONE
In October and November 2010, 13 people (informants) were interviewed in person or by phone, providing the following insights: Ohio PH agencies used registered sanitarians, environmental health supervisors, health educators or project specialists, and contracted inspectors for direct enforcement. In Ohio, registered sanitarians are certified professionals who routinely perform licensing or permitting and inspections of food vendors, pools, schools, and nursing homes. Most sanitarians performed SFWPL enforcement. Educators covered health promotion events and enforcement but left inspections and fines to sanitarians. In general, most informants preferred client education to assessing fines. Some administrators preferred to use non-sanitarians for enforcement because they felt businesses were more likely to work closely with sanitarians that were not identified with SFWPL enforcement.

Their greatest challenge to enforcement was in adhering to the 50-day filing window, second to explaining legal details with frustrated bar and restaurant owners. ODH was seen as responsive to local issues by providing online resources that clarified legal details.

Informants categorized businesses into three groups. First, businesses disinterested in maintaining a smoke-free workplace generally involved veterans’ halls, lodges, and adult entertainment sites. Several direct enforcement officers stated that these business owners “considered fines as a cost of doing business.” These businesses would delay entry of inspectors to hide evidence. The second group consistently tried to adhere to regulations, but indoor smoking occasionally occurred among tourists or during crowded seasonal events. The third group was characterized as businesses with adjacent public nonsmoking and private smoking areas. These businesses usually involved group homes and assisted-living facilities.

Nearly all informants noted safety as a priority. Rare threats to personal safety spurred practice change. Informants worked in pairs when inspecting veterans’ halls, lodges, and adult private clubs. Informants felt that they could rely on local law enforcement for support, but promptness varied. Most felt that workplaces and restaurants adapted within the year after enactment, with most restaurants having adapted well to the law. All informants acknowledged widespread public acceptance of the law from smokers and nonsmokers.

Informants uniformly perceived that collection of large fines by the State AG’s office was unreliable, placing financial pressure on agency budgets. Administrative informants felt the PH benefits were worth the cost of enforcement, while many sanitary informants believed food and business inspections were more important priorities. We perceived these differences as areas for further study.

After subjective coding and refinement of transcripts and notes, we categorized responses into the following domains:

- Public perception of the law
- Business response to the law
- Workforce issues, including inspector safety
- Prioritization of SFWPL vs. other code enforcement
- Online enforcement administrative Web-based application
- State-level support for local enforcement
- Enforcement administration
- Fees and local health department finances
- Benefits vs. cost and effort at the agency level

RESULTS: ONLINE SURVEY
We developed the online survey from the aforementioned domains and identified 482 e-mail addresses across 128 jurisdictions. Of those e-mail addresses, 49 initially bounced and 433 remained.

The survey was open for 30 days, from January to February 2010, during which 183 people visited the
survey site (42% e-mail response) and 171 (93%) completed the survey. About two-thirds of the respondents (61%) were male and 56% self-identified as administrators. Conversely, most non-administrators were registered sanitarians, representing 28% of all consenting respondents. Current tobacco use was rare (6%, data not shown), far lower than the concurrent state prevalence (20%) (Table 1).  

Ohio was well represented by region, county, and population. Almost half of the respondents (47%) were from southwest Ohio and Appalachia, regions comprising 50% of Ohio’s 88 counties (Table 2). More than one-third of respondents were from 28 rural counties (data not shown). Table 2 presents data on the 81 jurisdictions represented. Almost two-thirds of Ohio’s 128 PH agencies and 88 counties were represented, reflecting 9.48 million residents, or 82% of Ohio’s population. Thirty-five agencies (43%) were considered rural jurisdictions. Thirty-six jurisdictions (45%) represented had at least two respondents.

Enforcement
When surveyed, 64 jurisdictions (79%) indicated they currently enforced SFWPL. Fourteen jurisdictions (17%) enforced in the past but ceded responsibility to ODH. Three jurisdictions (4%) never enforced the law and relied solely on ODH for enforcement (Table 2).

Public perception and business response
Table 3 presents the survey’s 40 questions by domain and shows the percentage responding under the agreement/disagreement or frequency scales. Eighty percent of respondents strongly agreed/agreed that their local citizens would regret any weakening or repeal of the current law. A majority of respondents (58%) felt that the law helped reduce the prevalence of smoking within their jurisdiction. However, most respondents (41%) were unsure whether the smoke-free law was a greater deterrent to smoking than was a $1 tax increase on cigarettes.

Respondents in rural counties were consistent with regard to public responses to smoking. Rural respondents were more likely than their urban counterparts to agree that residents withhold complaints even when smoking is present (56% vs. 34%, \( p=0.0012 \), degree of freedom \( df=2 \)), and that residents tolerate smoking and rarely file complaints about workplace smoking (37% vs. 12%, \( p=0.0024 \), \( df=2 \)) (data not shown).

Most respondents (74%) were clearly against weakening the law to allow businesses to create indoor smoking sections (Table 3). More than three-quarters and two-thirds of respondents felt that business among restaurants and bars, respectively, had either increased or stayed unchanged since the act was passed (data not shown).

Workforce issues, inspector safety, and prioritization
Nearly all respondents (95%) stated that they always respond to complaints, regardless of location. As heard in focus groups, three-quarters of respondents stated that most enforcement time was spent on about 10% of businesses (Table 3). More administrators than non-administrators felt it to be true (82% vs. 63%, \( p=0.054 \), \( df=2 \), data not shown). Seventy percent of respondents indicated that inspections were made routinely after agency business hours if these hours corresponded to the reported time of violation (Table 3).

Inspector safety was considered a priority by 81% of respondents. Seventy percent stated that direct enforcers generally work alone. However, only about half (55%) of respondents felt that law enforcement only arrived promptly when called for assistance. This finding signals a potential discordance between safety and PH workforce in how SFWPL enforcement

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Table 1. Profile of respondents \((n=171)^{a}\) to a survey on SFWPL enforcement: Ohio, January–February 2010

<table>
<thead>
<tr>
<th>Demographic characteristic</th>
<th>N (percent)^{b}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (( n=160 ))</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>98 (61)</td>
</tr>
<tr>
<td>Female</td>
<td>62 (39)</td>
</tr>
<tr>
<td>Job class (( n=169 ))</td>
<td></td>
</tr>
<tr>
<td>Administrator (supervisor and higher)</td>
<td>95 (56)</td>
</tr>
<tr>
<td>Non-administrator</td>
<td>74 (44)</td>
</tr>
<tr>
<td>Job class (specific) (( n=169 ))</td>
<td></td>
</tr>
<tr>
<td>Directors, commissioners, board members</td>
<td>56 (33)</td>
</tr>
<tr>
<td>Supervisors and policy/project coordinators</td>
<td>39 (23)</td>
</tr>
<tr>
<td>Registered sanitarians</td>
<td>48 (28)</td>
</tr>
<tr>
<td>Nurses, health educators, inspectors, specialists</td>
<td>17 (10)</td>
</tr>
<tr>
<td>Other staff</td>
<td>9 (5)</td>
</tr>
<tr>
<td>Tobacco use (( n=156 ))</td>
<td></td>
</tr>
<tr>
<td>Ever</td>
<td>59 (38)</td>
</tr>
<tr>
<td>Never</td>
<td>97 (62)</td>
</tr>
<tr>
<td>Respondents by region (( n=168 ))</td>
<td></td>
</tr>
<tr>
<td>Appalachia</td>
<td>36 (22)</td>
</tr>
<tr>
<td>Central</td>
<td>27 (16)</td>
</tr>
<tr>
<td>Northeast</td>
<td>51 (30)</td>
</tr>
<tr>
<td>Northwest</td>
<td>14 (8)</td>
</tr>
<tr>
<td>Southwest</td>
<td>40 (24)</td>
</tr>
<tr>
<td>Respondents by census type (( n=170 ))</td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>59 (35)</td>
</tr>
<tr>
<td>Urban</td>
<td>111 (65)</td>
</tr>
</tbody>
</table>

^{a}Not all respondents provided answers to each question.
^{b}Not all percentages total 100 due to rounding.

SFWPL = Smoke Free Workplace Law
is perceived. Responses did not differ by respondent gender, job class, or census type (Table 3).

We saw subtle differences in prioritization by job class and agency census. Seventy-one percent of all respondents agreed that SFWPL enforcement was a priority at their agency, differing significantly by census (agree: 49% rural vs. 80% urban; disagree: 34% rural vs. 6% urban; \(p<0.0001\); \(df=2\), data not shown), but not by job class. Half of all respondents (49%) felt that enforcement was as important as food and other workplace safety code enforcement (Table 3); this response varied across respondents, with 29% of rural respondents vs. 60% of urban agencies agreeing (\(p=0.001\); \(df=2\), data not shown).

**Online enforcement documentation**

Online enforcement documentation using the ODH online tracking tool was considered useful by 77% of respondents, and more favorably among urban (80%) than rural (68%) respondents (\(p=0.018\); \(df=2\), data not shown). Six jurisdictions (19%) developed their own application or software tools for enforcement to track investigations or generate form letters (Table 3).

Regarding state support, two-thirds of respondents (66%) obtained timely and adequate assistance from ODH enforcement staff (Table 3). Administrators felt more favorably toward ODH. Perceived timeliness of support also differed by job class (76% of administrators vs. 51% of non-administrators, \(p=0.020\); \(df=2\), data not shown) and adequacy of assistance (79% of administrators vs. 56% of non-administrators, \(p=0.032\); \(df=2\), data not shown).

**Fees and finances**

In general, most agencies indicated they were losing money on enforcement. Nearly two-thirds (60%) of respondents felt that the State AG’s office had not done a good job of getting local businesses to pay outstanding fines, consistent across job and agency census levels.

Moreover, questions on enforcement administration reflected the poor recovery of funds. In Table 4, we relied on the highest-ranking administrator per
Table 3. Results of a survey on SFWPL enforcement with questions categorized by domain (n=171 respondents): Ohio, January–February 2010

<table>
<thead>
<tr>
<th>Domain and question</th>
<th>Strongly agree or agree Percent</th>
<th>Neither agree nor disagree Percent</th>
<th>Disagree or strongly disagree Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public perception</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In my jurisdiction, fewer people smoke because of the Smoke Free Workplace Act.</td>
<td>58</td>
<td>19</td>
<td>23</td>
</tr>
<tr>
<td>The Act caused more people to quit smoking than has the $1 per cigarette pack tax increase.</td>
<td>21</td>
<td>41</td>
<td>38</td>
</tr>
<tr>
<td>Citizens in my jurisdiction tend not to file complaints even when smoking is present.</td>
<td>41</td>
<td>16</td>
<td>43</td>
</tr>
<tr>
<td>People in my jurisdiction tolerate smoking and rarely file complaints about workplace smoking.</td>
<td>20</td>
<td>21</td>
<td>59</td>
</tr>
<tr>
<td>The public in my jurisdiction would miss smoke-free businesses if the Act was repealed or weakened.</td>
<td>80</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Business response</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restaurants, bars, and taverns should be allowed to create smoking sections.</td>
<td>13</td>
<td>13</td>
<td>74</td>
</tr>
<tr>
<td>Since the Act went into effect, most bars in my agency’s jurisdiction have expanded food service.</td>
<td>11</td>
<td>44</td>
<td>45</td>
</tr>
<tr>
<td>Most restaurants in my jurisdiction are doing more business since the Act started.</td>
<td>27</td>
<td>55</td>
<td>18</td>
</tr>
<tr>
<td>Most bars in my jurisdiction are doing more business since the Act started.</td>
<td>10</td>
<td>57</td>
<td>33</td>
</tr>
<tr>
<td>If the Act was repealed, most restaurants would again allow smoking.</td>
<td>53</td>
<td>15</td>
<td>32</td>
</tr>
<tr>
<td>Workforce issues, including safety</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When enforcing the Act (responding to a complaint), our inspectors generally work alone and not in pairs.</td>
<td>70</td>
<td>8</td>
<td>22</td>
</tr>
<tr>
<td>Local police/sheriff officers respond quickly when called to support inspections or enforcement.</td>
<td>55</td>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td>Inspector safety is the most important issue in the Smoke Free Workplace Act enforcement.</td>
<td>81</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>I (my staff) always inspect the site in question after a complaint is filed.</td>
<td>95</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>I (my staff) will inspect businesses after 6 p.m. or on weekends to match the time when the complainant saw the violation occur.</td>
<td>70</td>
<td>3</td>
<td>27</td>
</tr>
<tr>
<td>I (my staff) will not hesitate to inspect Veterans of Foreign Wars, American Legion, Eagles, and Moose halls if a complaint is filed there.</td>
<td>95</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Of the time spent on enforcement of the Act, 80% to 90% of our effort is spent on 10% or less of eligible businesses.</td>
<td>75</td>
<td>16</td>
<td>9</td>
</tr>
<tr>
<td>Prioritization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoke-free enforcement is a public health priority at our agency.</td>
<td>71</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>Smoke-free enforcement is as important as food and workplace safety enforcement.</td>
<td>49</td>
<td>18</td>
<td>33</td>
</tr>
<tr>
<td>Enforcement administration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agencies should hire contracted inspectors, not sanitarians, to enforce the Act.</td>
<td>23</td>
<td>37</td>
<td>40</td>
</tr>
<tr>
<td>Outstanding violations should be collected by a collection agency and not by the State Attorney General’s office.</td>
<td>31</td>
<td>45</td>
<td>24</td>
</tr>
<tr>
<td>Online enforcement administrative Web-based application</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I (my staff) routinely meet the ODH contract obligations for enforcement.</td>
<td>95</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>The ODH online tracking tool has been useful in our enforcement reporting.</td>
<td>77</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
<td>We have created our own programs or templates for enforcement and/or tracking cases.</td>
<td>19</td>
<td>13</td>
<td>68</td>
</tr>
<tr>
<td>State support</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I (my staff) get timely support from ODH when enforcement issues arise.</td>
<td>66</td>
<td>8</td>
<td>26</td>
</tr>
<tr>
<td>I (my staff) get adequate support from ODH when enforcement issues arise.</td>
<td>70</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>I (my staff) get timely support from the State Attorney General’s office to collect outstanding fines.</td>
<td>37</td>
<td>1</td>
<td>62</td>
</tr>
<tr>
<td>I (my staff) get adequate support from the State Attorney General’s office to collect outstanding fines.</td>
<td>34</td>
<td>4</td>
<td>62</td>
</tr>
<tr>
<td>The State Attorney General’s office has done a good job in getting our local businesses to pay outstanding fines.</td>
<td>13</td>
<td>27</td>
<td>60</td>
</tr>
</tbody>
</table>

continued on p. 60
enforcing agency \((n=64)\) for responses. Only 26\% of enforcing jurisdictions indicated they always or usually have violations paid in full, with 63\% occasionally or never fully recovering fines. One-third (33\%) of enforcing jurisdictions felt that the enforcement reimbursements provided by ODH were adequate to cover inspection costs, while nearly half (49\%) of agency leaders felt they were inadequate.

Only 5\% of enforcing jurisdictions made money in enforcement and education, with 18\% potentially breaking even, and 77\% losing money each year (Table 4). Uncollected fines were attributed to 56\% of all jurisdictions losing money each year. Of those enforcing jurisdictions losing money, 40\% were rural and 60\% were urban; two-thirds of them directly attributed the loss to uncollected fines (data not shown). Nearly one-third (31\%) of consenting respondents felt that outstanding violations should be collected by an external collections agency rather than through the State AG’s office (Table 3).

Regarding benefit vs. cost and effort, 74\% of respondents consistently felt that benefits of the law outweighed costs, with another 64\% agreeing that enforcement was worth the cost and effort (Table 3). Administrators and urban county respondents (80\% for both) were more likely than non-administrators and rural county respondents (66\% and 61\%, respectively) to agree that the benefits outweighed the cost \((p=0.0165 \text{ for administrators/non-administrators, } p=0.021 \text{ for urban/rural, each } \text{df}=2, \text{ data not shown}). More urban (74\%) than rural (42\%) respondents agreed that enforcement was worth the effort and cost to the agency \((p=0.0012, \text{ df}=2, \text{ data not shown}). Overall, one in four respondents (26\%) felt that the law was too cumbersome to effectively enforce (Table 3).

Only 30\% of respondents agreed that their agency would continue enforcement if state enforcement reimbursements stopped, while almost half (46\%) of respondents indicated they would discontinue enforcement (Table 3). Rural county respondents (59\%) were more likely than urban respondents (40\%) to discontinue enforcement if state reimbursements ended \((p=0.0070, \text{ df}=2, \text{ data not shown})\) or if AG collection activities ended \((p=0.0054, \text{ df}=2, \text{ data not shown}).

DISCUSSION

To our knowledge, this study is the first of its kind on PH workforce issues related to statewide legislation to prevent indoor workplace exposure to tobacco smoke that inquired whether agencies are losing money due to enforcement and education, and to what extent uncollected fines are attributing to the loss. This study also provides qualitative evidence that most of the 64 enforcing PH agencies in the study, both rural and urban, lose money as a result of enforcement of
Ohio’s SFWPL, primarily due to uncollected fines. One health department reported $248,000 in outstanding fines.30 Statewide, more than $1.8 million remains uncollected.30

These findings reveal that ending state enforcement reimbursement may hamper progress in improving the long-term health of residents and may remove important systems-based prevention of tobacco smoke exposure. This finding is especially true among rural counties, where greater public tolerance for smoking was reported, consistent with tobacco use in Ohio Appalachia (31.5%) exceeding non-Appalachian Ohio counties (26.1%) between 1999 and 2003, and national levels (23.2% during 2000–2002).5,31–33 In addition, workers in rural, smaller agencies appear to favor routine inspection activities over SFWPL enforcement.

Our data reveal an impression among enforcement personnel that local restaurants and bars did generally as well or better since the law went into effect. This finding is supported by other research showing favorable changes in restaurants years after a smoking ban.34 Recent studies using sales tax receipts data from 2003 through 2010 showed that the SFWPL did not have an overall negative economic effect on Ohio restaurants and bars.30,35,36

In May 2012, the Ohio Supreme Court unanimously upheld the constitutionality of the smoke-free law, as well as enforcement by PH entities.37,38 This decision cleared the way for the state to pursue a backlog of uncollected fines.30 To expedite collection, the State AG’s office could turn collection over to a private entity.7 Such an option seems prudent, as businesses may be more inclined to pay a collections agency than the state.

Based on our study findings, we suggest increasing state reimbursement for local enforcement. We suggest appending additional charges and interest to outstanding fines managed by the State AG’s office, and linking renewal of state liquor licenses contingent on payment of all fines levied under Ohio’s SFWPL. At this time, liquor permit renewals are contingent on delay or failure of filing payment of sales or withholding taxes, penalties, and interest due.39

Limitations and strengths
This study had several limitations. For one, as a convenience survey, the results are not fully generalizable to all PH workers in Ohio. Second, the low response rate may have biased inferences. Third, the compressed timeline of the Robert Wood Johnson Quick Strike posed logistical challenges. We had only six weeks between the notice of the award to the funding expiration to set up phase one groups and key informant interviews. Fourth, while we carefully transcribed and coded informant comments, we did not employ software or content methods to extract domains. E-mail lists from PH websites were also incomplete, incorrect, out of date, or missing. Nearly half (66 of 128) of jurisdictions used generic e-mail addresses, thereby limiting direct recruitment of ideal respondents and lowering the response rate. Fifth, statewide lists of registered sanitarians were not publicly available.

The study did benefit from several strengths, however, including its mixed-methods design, use of direct

### Table 4. Survey results regarding enforcement administration of the Ohio SFWPL

<table>
<thead>
<tr>
<th>Question</th>
<th>Always/usually Percentb</th>
<th>Half of the time Percentb</th>
<th>Occasionally/never Percentb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violations are paid fully and in time.</td>
<td>26</td>
<td>12</td>
<td>63</td>
</tr>
<tr>
<td>The inspection fees provided by ODH are adequate to cover our inspection costs.</td>
<td>33</td>
<td>18</td>
<td>49</td>
</tr>
<tr>
<td>Our agency makes money each year on Smoke Free Workplace Act enforcement/education.</td>
<td>5</td>
<td>18</td>
<td>77</td>
</tr>
<tr>
<td>Our agency loses money each year because fines go uncollected.</td>
<td>56</td>
<td>24</td>
<td>20</td>
</tr>
</tbody>
</table>

*Percentages may not total 100 due to rounding.

**Notes:**

- Fees and fine collection as percentage of jurisdictions enforcing the SFWPL, using the highest-ranking respondent per jurisdiction. Adequate data were provided by 45 of 64 enforcing jurisdictions.
- SFWPL = Smoke Free Workplace Law
- ODH = Ohio Department of Health
e-mail for recruitment, and the wide response of agencies, both rural and urban, that extended across 82% of Ohio’s population. We also benefited from an insightful practice-based research team whose members varied widely in applied and academic interests.

CONCLUSIONS

This study attempted to determine and recognize differences in perceptions of Ohio’s SFWPL among the PH workforce and potential impacts on performance. Despite widespread approval of the law among PH officials, differences existed in these perceptions across jurisdiction type (i.e., rural/urban-suburban) and administration levels. These differences manifest in prioritization of indoor SFWPL enforcement compared with food, workplace, and other safety code enforcement, and in the perceived benefits to the cost and effort of enforcement. Overall, three of every four PH agencies that enforce this law lose money, primarily due to unrecovered funds from violators amounting to more than $1.8 million.

Therefore, state fiscal support is critical to continue stable, statewide enforcement by local PH agencies. Loss of state financial support and an ineffective fine collection process will likely cause many PH agencies to opt out of direct enforcement. If they do, it will increase the state’s burden to enforce such a law and will challenge widespread public support for the current law. We anticipate a recent Ohio Supreme Court decision in favor of PH activities to enforce this law to improve the recovery of outstanding collections and reduce these pressures on local agencies.37,38

More research will be needed to track opt-out frequencies, recovery of outstanding fines, and changes in code prioritization among enforcing PH agencies, and to compare the incidence of adverse health outcomes among similar occupational occupations between states that do and do not have similar statewide legislation. Associations between per capita PH expenditures across agency jurisdictions may provide useful insights into changes observed.

Preliminary results of this study were presented as slide presentations at the Ohio Public Health Association Public Policy Institute in Columbus, Ohio, in March 2011; at the Public Health Systems Research Keeneland Conference in Lexington, Kentucky, in April 2011; and at the Ohio Combined Public Health Conference in Columbus, Ohio, in May 2011; and as a poster presentation at the 2011 Annual Conference of the American Public Health Association in Washington, D.C., in October 2011.

The Ohio Research Association for Public Health Improvement is supported by a Robert Wood Johnson Quick Strike Research Fund Grant, coordinated by the University of Arkansas Medical School College of Public Health: RWJF ID# 66151 Practice-Based Research Network in Public Health. The Prevention Research Center for Healthy Neighborhoods at Case Western Reserve University (CWRU) is supported by the Centers for Disease Control and Prevention (CDC) through CDC cooperative agreement #U48DP-001930. All research protocols were approved by the CWRU Institutional Review Board, protocol approvals #20100925 (dated October 12, 2010) and #20110102 (dated January 28, 2011).

The findings, conclusions, and comments in this article are those of the authors and do not necessarily represent the official position of CDC.

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Enforcement of Ohio’s Smoke Free Workplace Law


One of the most important challenges facing public health agencies is how best to regulate health-care industry practices that carry public health implications. A crucial question, however, is the extent to which the U.S. Constitution imposes limits on the regulatory powers of public health, when the industry conduct in question involves what the law considers speech. The following article discusses the implications of a recent U.S. Supreme Court decision for public health policy and practice.

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Department of Health Policy, Washington, DC

SORRELL V. IMS HEALTH INC.: DATA MINING OF PHARMACY RECORDS AND DRUG MARKETING AS FREE SPEECH

Lara Cartwright-Smith, JD, MPH
Nancy Lopez, JD, MPH

This installment of Law and the Public’s Health reviews the U.S. Supreme Court decision in Sorrell v. IMS Health Inc. and considers its implications for public health policy and practice. In Sorrell, the Court struck down Vermont’s Prescription Confidentiality Law, which prohibited pharmacies from disclosing—and pharmaceutical companies from using—physician-prescribing data for marketing purposes without physician consent. Sorrell changes the standard by which the Supreme Court has evaluated such state regulatory restrictions under the First Amendment during the past three decades. In this respect, Sorrell is consistent with perhaps the most famous First Amendment case involving corporate free speech in years, Citizens United v. Federal Election Commission, which extended free speech rights to corporations. Sorrell involves marketing rather than political speech, but it carries important implications for government efforts to curb the use of health information for commercial purposes.

BACKGROUND

Regulation of commercial speech

Sorrell involved a particular category of speech known as “commercial speech.” The Supreme Court has narrowly defined commercial speech as speech that does “no more than propose a commercial transaction.” Prior to 1976, Supreme Court precedent allowed states unlimited discretion to restrict commercial speech. In 1976, the Supreme Court modified its position in Virginia State Board of Pharmacy v. Virginia Citizens Consumer Council, holding that commercial speech should be afforded some First Amendment protection. The Court emphasized that commercial speech has social value and that the government cannot suppress such speech merely because of concerns regarding misleading information or the misuse of information.

The evolution of the Court’s commercial speech protection standard continued with its 1980 decision in Central Hudson Gas v. Public Service Commission of New York, establishing a four-prong test to measure the legality of commercial speech regulation. Under the first prong, the Court must determine whether the speech accurately informs the public about a lawful activity, as illegal or misleading statements are not protected. Second, if the speech is deemed protected, the courts must assess whether government has a substantial interest in regulating the speech in question. Third, courts must determine whether the regulation in question directly advances the government’s asserted interest and is not ineffective or too remote from that interest. Fourth, the Court must determine if the regulation in question directly advances the government’s asserted interest and is not ineffective or too remote from that interest.

The Vermont law

When processing prescriptions, pharmacies collect prescriber-identifying information as required by law. These laws also permit pharmacies to sell this information to “data miners” who, in turn, produce reports on prescriber behaviors (de-identified with respect to patients but identifying the prescribing physician) and lease these reports to pharmaceutical manufacturers. Manufacturers then employ “detailers” (commonly
known as pharmaceutical sales representatives or, among physicians, as “drug reps”) who use the reports to strategically market and promote their drugs to physicians.

Concerned about the effects of this detailing process, Vermont passed the Prescription Confidentiality Law in 2007. The purpose of the law was to “advance the state’s interest in protecting the public health of Vermonters, protecting the privacy of prescribers and prescribing information, and to ensure costs are contained” in the health-care system. The law prohibited pharmacies and similar entities from selling or disclosing prescriber-identifying information for marketing purposes absent the prescriber’s consent. The law further prohibited pharmaceutical manufacturers and marketers from using prescriber-identifiable information for sales marketing and promotion practices. The law did not ban all disclosures; it prohibited disclosures for marketing purposes without physician consent while permitting the distribution and use of prescriber-identifying information for other purposes, such as research.

Data miners, as well as brand-name drug companies, challenged the law’s constitutionality on free speech grounds. In separate cases, the same commercial interests had challenged similar laws enacted by Maine and New Hampshire. The U.S. Court of Appeals for the First Circuit, whose jurisdiction includes both New Hampshire and Maine, examined the laws of these states and concluded that the laws regulated economic conduct (i.e., actual marketing practices), not commercial speech. The court further held that even if such laws were considered laws reaching commercial speech, they satisfied the Central Hudson test. By contrast, the U.S. Court of Appeals for the Second Circuit, which has jurisdiction over Vermont, reversed a trial court ruling upholding the Vermont law. The Second Circuit concluded that the law did involve commercial speech (not just conduct) and that the state’s asserted physician privacy interest was too speculative. Therefore, the court held that the statute unconstitutionally burdened the pharmaceutical marketers and data miners’ speech. In the face of this split in the circuits, the U.S. Supreme Court granted Vermont’s appeal.

THE SUPREME COURT DECISION

By a 6–3 decision, the Supreme Court affirmed the Second Circuit decision. Writing for the majority and joined by Chief Justice Roberts and Justices Scalia, Thomas, Alito, and Sotomayor, Justice Kennedy concluded that the Vermont statute violated the First Amendment Free Speech Clause. In ruling for the companies, the majority rejected Vermont’s argument that conduct (not speech) was involved and that, therefore, a less demanding standard similar to that used for state regulation of economic activity was appropriate. Instead, siding with IMS Health, the majority concluded that the statute imposed a content- and speaker-based burden on protected speech, thereby restricting both who can communicate and what may be communicated; thus, it should be subject to heightened judicial scrutiny.

The Court rejected the state’s assertion that the statute’s restrictions were necessary to advance a “substantial government interest” in protecting physician privacy and reducing health-care costs. The majority concluded that the information was not in fact completely private, and indeed could be used for nonmarketing purposes by a variety of audiences (e.g., researchers). As a result, the state’s purported justification failed; therefore, the statute “imposes more than an incidental burden on protected expression.” Although the Court found the state’s interests to be proper, it found that the law advanced the state’s law in an impermissible way. In the majority’s view, even a substantial state interest cannot justify the censorship of speech involving reliable and truthful information out of “fear that people will make bad decisions if given truthful information.” It was this effort to curb speech involving accurate information that led to the law’s downfall. In light of this decision, the Maine and New Hampshire laws were likewise overturned because of the Sorrell ruling. (The First Circuit’s decision regarding the Maine law was vacated and remanded for further consideration in light of Sorrell. In New Hampshire, the District Court reinstated its 2007 opinion invalidating the New Hampshire law.)

Justice Breyer, joined by Justices Ginsburg and Kagan, filed a dissenting opinion. In their view, Vermont’s law regulated commercial activity rather than speech and, thus, imposed no significant burden on free speech. The dissent argued that just because the statute implements a speaker-based ban does not change the fact that the law is aimed at a commercial activity, not at speech; therefore, no heightened scrutiny is necessary. Arguing that the majority’s opinion was inconsistent with precedent, Justice Breyer further expressed concern that the majority had substituted its judgment for that of state legislators and that its action would open a “Pandora’s box of First Amendment challenges to ordinary regulatory practices.”
IMPLICATIONS FOR PUBLIC HEALTH POLICY AND PRACTICE

The creation and use of health information are fundamental tools of health reform efforts that aim to improve the quality and cost-effectiveness of health care. Federal and state governments will seek to regulate the use of the information that is created under their reform efforts, particularly information that can be applied to advance commercial interests. The lesson of Sorrell is that government cannot stop commercial interests from using legal, accurate, and available information to advance their interests through speech. Of course, government could bar the creation or disclosure of identifiable information regarding healthcare providers, just as it has restricted the disclosure of individually identifiable patient information under the Health Insurance Portability and Accountability Act (HIPAA) Privacy Rule. The majority opinion in Sorrell does not in any way affect the power of government to create vital health information, nor does it affect government’s power to use information. However, by classifying commercial practices as speech rather than conduct, the decision makes clear that the courts will closely scrutinize efforts to censor the use of information, once created, by commercial interests.

As with marketing restrictions for pharmacy data, various state and federal laws regulate the use and disclosure of health information contained in medical records or insurance records that is indisputably truthful and potentially useful to other parties (e.g., health insurers, life insurers, employers, retailers of medical equipment, and lobbyists). State laws requiring disclosures for quality measurement or reporting of communicable diseases may restrict the use of that information for marketing purposes while allowing various entities to access the data for public health surveillance, oversight, research, and other noncommercial purposes. State disease registries may authorize the collection of information for public health and research purposes but prohibit commercial uses. In the past, such limitations would be considered part of a state’s legitimate regulatory objectives, particularly where the information in question is created only because of a government mandate. The Sorrell decision carries implications for these laws in cases in which a commercial interest seeks to buy the data and use them for marketing reasons, treating such restrictions as subject to heightened First Amendment scrutiny, rather than the lower standard of scrutiny typically applied to laws regulating economic conduct.

Of course, an important underlying question is whether government can prohibit the commercial sale or lease of public health information altogether. Sorrell does not address this question, but one could easily anticipate enormous resistance to a law barring the commodification of accurate health-care information, and there are important reasons why such information should be available in the marketplace. The immediate lesson of Sorrell is that the goal of high-quality, cost-effective health care cannot be achieved through efforts to ban marketing practices. Instead, achieving this goal will depend on the degree to which providers are educated about and the health-care system supports and rewards appropriate health-care practice. In this context, initiatives to engage health-care providers, consumers, and payers regarding the use of medical resources become even more vital to the national goal of health reform.

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The National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention (CDC) has redesigned its website to provide better access to more information about the data NCHS produces, how to obtain and use the information, and ways that users can work and interact with NCHS. A new study compares the health of male veterans with men who have not served in the military. NCHS releases an extensive set of cohort fertility tables for 1960–2009. And a recent survey reveals that during the past 10 years, the percentage of Americans with two or more major chronic conditions has increased.

NEW NCHS WEBSITE

The new NCHS website (www.cdc.gov/nchs) has been redesigned with the user in mind. It offers more direct and easier access to NCHS data resources and the information needed to understand and utilize those resources. Among the new features are portals for information on children, adolescents, and older Americans, as well as services targeted toward librarians, researchers, and survey participants under the “NCHS for You!” section.

Another new feature is “Inside NCHS.” This section, which is essentially a quarterly e-newsletter, goes beyond the numbers to provide insights into NCHS’s programs, the collaborations NCHS initiates and maintains, the NCHS staff involved in the major projects, and the issues that the organization faces. Each issue will feature articles that discuss the stories behind noteworthy reports, the processes by which the data are collected, what the experts have to say, and the challenges that had to be overcome to get information to stakeholders. There will also be interviews with staff, information on staff achievements and awards, and updates on changes in key positions. Inside NCHS will also provide a forum to inform users about important issues, such as new challenges in ensuring confidentiality, maintaining survey response rates, or other critical aspects of the systems NCHS maintains. Inside NCHS also provides the opportunity for user feedback, including topics and reports of interest or how to improve existing products or create new ones.

All of the NCHS data access tools are available through the website. For example, FastStats provides quick access to statistics on topics of public health importance, including diseases and conditions, injuries, life stages and populations, and health care and insurance. Health Data Interactive presents tables with national health statistics for infants, children, adolescents, adults, and older adults. Tables can be customized by age, gender, race/ethnicity, and geographic location to explore different trends and patterns. VitalStats is a collection of vital statistics products including tables, data files, and reports that allow users to access and examine vital statistics and population data interactively.

Focusing on data for community assessment, planning, and public health action, the Health Indicators Warehouse (HIW) is a user-friendly source for national, state, and community health indicators. The HIW, which is maintained by NCHS, is a collaboration of many agencies and offices within the Department of Health and Human Services (HHS). It was designed to meet the needs of multiple population health initiatives, to harmonize the indicators used in the various initiatives, and to link indicators with evidence-based interventions. The HIW serves as the data hub for the HHS Community Health Data Initiative, a flagship HHS open-government initiative to release data, encourage innovative application development, and catalyze change to improve community health. The website also provides information on all of the public-use data products from NCHS and information on how to use the Research Data Center, which manages access to files restricted due to confidentiality requirements.

In the data access section of the website, information is provided about the data linkage program of NCHS and how to access the files that have been linked to improve their analytical potential. NCHS has developed a record linkage program designed to maximize the scientific value of NCHS’s population-based surveys. Linked data files enable researchers to examine the factors that influence disability, chronic disease, health-care utilization, morbidity, and mortality. NCHS is currently linking various NCHS surveys with air monitoring data from the Environmental Protection Agency, death certificate records from the National Death Index, enrollment and claims data from the Centers for Medicare & Medicaid Services, and Retirement, Survivor, and Disability Insurance and Supplemental Security Income benefit data from the Social Security Administration.

As in previous versions of the NCHS website, the most recent data releases and reports are highlighted. Users can search all published reports by topic and also obtain information on upcoming reports and estimated
release dates. There are pages that describe each of the data systems in increasingly detailed fashion. Users can sign up for listservs from each of the major programs to track developments that may be of interest. Many additional resources and links to other sources of information and services round out the content of the NCHS website.

**VETERANS’ HEALTH STATUS**

Using data from the National Health Interview Survey (NHIS), a recent NCHS report, “The Health of Male Veterans and Non-veterans Aged 25–64: United States, 2007–2010,” presents key findings comparing the health of veterans with men of the same age who have not served in the military. In general, the study found that veterans did not enjoy as favorable of a health status as non-veterans, with most of the differences in health appearing for veterans aged 35 years and older.

On a general health measure, veterans were more likely than non-veterans to report fair or poor health. Among men aged 25–64 years, 16% of veterans vs. 10% of non-veterans reported being in fair or poor health. Veterans were more likely than non-veterans to report having two or more chronic conditions. Veterans aged 45–64 years were significantly more likely than non-veterans to report experiencing two or more chronic conditions (19% vs. 13% for men aged 45–54 years, and 31% vs. 25% for men aged 55–64 years). Veterans reported serious psychological distress and experienced work limitations more often than non-veterans. However, veterans were more likely than non-veterans to have health insurance coverage.

The NHIS is a large-scale, general-purpose health survey conducted through personal, in-home interviews with a sample of the nation’s civilian, noninstitutionalized population. The report is available on the NCHS website.

**COHORT FERTILITY TABLES RELEASED**

NCHS has just released online an extensive set of tables presenting detailed fertility data for cohorts of women as they pass through their childbearing years. The tables include central birth rates, cumulative birth rates, birth distributions, and birth probabilities. The tables present revised cohort fertility tables for all women for 1960–2000, new cohort fertility tables for all women for 2001–2009, and new cohort fertility tables for white and black women for 1960–2009 based on the mother’s race. The cohort fertility tables also provide the percentage of childless women. The tables will be periodically updated with new data for subsequent years. In addition, cohort fertility measures for other racial and Hispanic-origin groups may be added in the future. The data in these tables are from the National Vital Statistics System, where data on births and deaths in the United States are reported to NCHS from state vital statistics offices.

**MULTIPLE CHRONIC CONDITIONS ON THE RISE**

A new report, “Multiple Chronic Conditions Among Adults Aged 45 and Over: Trends Over the Past 10 Years,” presents an analysis of findings from the NHIS. The report shows that among adults aged 45 years and older, the percentage of people with two or more chronic conditions has increased during the past decade. The study examined the prevalence of nine major chronic conditions: hypertension, heart disease, diabetes, cancer, stroke, chronic bronchitis, emphysema, current asthma, and kidney disease in 1999–2000 and in 2009–2010. During that 10-year period, the percentage of adults aged 45–64 years and 65 years and older with two or more of nine selected chronic conditions increased for both men and women. All racial/ethnic groups examined showed an increase, but there were differences by race/ethnicity.

Between 1999–2000 and 2009–2010, the percentage of adults aged 45–64 years with two or more chronic conditions increased 20% for non-Hispanic black, 35% for non-Hispanic white, and 31% for Hispanic adults. For those aged 65 years and older, the percentage increased 18% for non-Hispanic black, 22% for non-Hispanic white, and 32% for Hispanic adults. In both time periods, the prevalence of two or more chronic conditions was higher among non-Hispanic black adults than among adults in other racial/ethnic groups. Looking at income differentials, in both 1999–2000 and 2009–2010, the prevalence of two or more chronic conditions for adults aged 45–64 years decreased with rising family income, and was more than twice as high among those living in poverty as among those at ≥400% of the federal poverty level. Among those aged 65 years and older, the income differential was less pronounced.

From 1999–2000 to 2009–2010, the percentage of adults with two or more chronic conditions increased for men and women in both age groups (45–64 years of age and 65 years of age and older). In 2009–2010, 21% of adults aged 45–64 years and 45% of adults aged 65 years and older had been diagnosed with two or more chronic conditions. The percentage of adults aged 65 years and older with both hypertension and diabetes increased from 9% to 15%, the percentage with hypertension and heart disease increased from...
18% to 21%, and the percentage with hypertension and cancer increased from 8% to 11%. These disease combinations were the most commonly reported. The percentage of adults aged 45–64 years with two or more of the nine selected chronic conditions who did not receive or delayed obtaining needed medical care due to cost increased from 17% to 23%, and the percentage who did not receive needed prescription drugs due to cost increased from 14% to 22%.

NCHS Dataline was prepared by Sandra S. Smith, MPH, Communications Consultant at the National Center for Health Statistics, Centers for Disease Control and Prevention.

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