

# The Public Health Nutrition workforce and its future challenges: the US experience

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## Abstract

*Objectives:* To describe the US public health nutrition workforce and its future social, biological and fiscal challenges.

*Design:* Literature review primarily for the four workforce surveys conducted since 1985 by the Association of State and Territorial Public Health Nutrition Directors.

*Setting:* The United States.

*Subjects:* Nutrition personnel working in governmental health agencies. The 1985 and 1987 subjects were personnel in full-time budgeted positions employed in governmental health agencies providing predominantly population-based services. In 1994 and 1999 subjects were both full-time and part-time, employed in or funded by governmental health agencies, and provided both direct-care and population-based services.

*Results:* The workforce primarily focuses on direct-care services for pregnant and breast-feeding women, infants and children. The US Department of Agriculture funds 81.7% of full-time equivalent positions, primarily through the WIC Program (Special Supplemental Nutrition Program for Women, Infants, and Children). Of those personnel working in WIC, 45% have at least 10 years of experience compared to over 65% of the non-WIC workforce. Continuing education needs of the WIC and non-WIC workforces differ. The workforce is increasingly more racially/ethnically diverse and with 18.2% speaking Spanish as a second language.

*Conclusions:* The future workforce will need to focus on increasing its diversity and cultural competence, and likely will need to address retirement within leadership positions. Little is known about the workforce's capacity to address the needs of the elderly, emergency preparedness and behavioural interventions. Fiscal challenges will require evidence-based practice demonstrating both costs and impact. Little is known about the broader public health nutrition workforce beyond governmental health agencies.

**Keywords**  
Public health nutrition  
Workforce  
United States

Who constitutes the public health nutrition workforce and the environments in which they function impact how they practice. Myriad issues affect how public health nutrition personnel in the United States practise today. As part of the workforce charged with 'assuring the conditions in which people can be healthy'<sup>(1)</sup>, public health nutrition personnel must be proactive in addressing nutrition-related health promotion and disease prevention. They accomplish this through both population-based and direct health care services. The present paper identifies some of the social, biological and fiscal challenges facing the US public health nutrition workforce today, and describes and raises questions about this workforce and its capacity to support essential public health nutrition services.

## Public health challenges for public health nutrition practice in the US

Since 1950, the US population has changed significantly. From 1900 to 1950, the ratio of non-white races to the whole population decreased from approximately 1 out of 8 to 1 out of 10. By 2000, however, the ratio increased to 1 out of 4. Furthermore, although from 1970 to 2000 the white and the black populations increased in number, other populations also increased so that by 2000 their proportion equalled that of the black population. The Hispanic population more than doubled in size from 1980 to 2000<sup>(2)</sup>. Unfortunately, there are health disparities or differences in health status associated with race/ethnicity

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and other demographic and socio-economic characteristics<sup>(3)</sup>. Because of this, one goal of *Healthy People 2010*, the 10-year national health objectives, is to eliminate health disparities<sup>(3)</sup>. The public health workforce will remain challenged by the population's racial/ethnic diversity: from 2000 to 2050 the non-white only/non-Hispanic population is projected to increase from 30.6% to 49.9% of the overall population<sup>(4)</sup>.

A related and important challenge is immigrant health. Individuals from other countries may have lower incomes, have greater incidence of children with fair or poor health, and be less likely to be insured<sup>(5,6)</sup>. In 2002, one out of every three (11.2 million out of 33.5 million) foreign-born persons did not have health insurance and had more than twice the risk of being uninsured compared to native-born persons. Furthermore, 43% of foreign-born non-citizens were uninsured compared to 18% of naturalised citizens<sup>(6)</sup>. These populations also have health disparities, which public health nutrition must address.

As a whole, the US population is ageing. In 1900, half of the population was younger than 22.9 years. This compares to 1950 and 2000 when half was younger than 30.2 and 35.3 years, respectively. From 1900 to 2000, the overall population doubled in size, while the population 65 years or older increased from 3.1 million to 12.3 million in 1950, and to 35.0 million in 2000<sup>(2)</sup>. From 2000 to 2050, those 65 and older are projected to increase from 12.4% to 20.7% of the population<sup>(7)</sup>. Practice to promote healthy ageing and quality of life will be important for public health nutrition personnel.

The lessons learned from natural disasters, such as Hurricane Katrina and bioterrorism, point to the need for a workforce that can respond quickly and appropriately to emergencies. This includes institution of emergency food systems and long-range planning to reduce vulnerability of the food supply and promotion of sustainable food systems, especially for those who are most vulnerable. Concern for the food system extends beyond acute disruptions, because while the US food system has global reach and is considered one of the safest in the world, it is also extremely complex and with significant agribusiness consolidation from farm to table<sup>(8)</sup>. Corporate decisions about the food supply, and disruption or problems at any point of the food system, whether due to intentional or unintentional contamination or to extreme weather, can all have far-reaching dramatic fiscal and qualitative impacts on communities' access to food. Emergency preparedness competence in general<sup>(9)</sup> and specific for food systems will be important, as will be an understanding and appreciation for the relationship of these food systems to health.

The nutrition-related health risks of human behaviours, including eating and physical activity, are changing the way we think of chronic diseases. Approximately 32% of adults were overweight or obese in 2003–2004 compared to only 15% in 1978–1980. Similarly, 36% compared to

only 12% of children were overweight<sup>(10)</sup>. This dramatic increase in rates, particularly among the young<sup>(11,12)</sup>, poses one of the country's most serious health threats. While genetics plays a role in obesity, more important are the roles of an obesigenic environment and both sedentary and eating behaviours, including how infants are fed. For example, a number of studies have shown correlations between rapid early infant weight gain and children's later weight<sup>(13–16)</sup>, although how this relates to differences in formula- and breast-feeding is unclear. Rising overweight and obesity also have a striking impact on the rates of what were once termed 'adult' diseases. Children who become overweight are at increased risk of co-morbidities, including diabetes, hypertension and heart disease<sup>(17,18)</sup>. The number of children and adolescents with type 2 diabetes, once thought of as 'adult-onset' diabetes, is rising<sup>(10)</sup> and it is perhaps naïve to think that these same children will not become adolescents or young adults with serious heart disease.

The US health care system is increasingly costly, too, now constituting 16% of the gross national product<sup>(19)</sup>. The health care system's technological capacity to support and extend life is dramatic, although this capacity is not without costs. Moreover, the health care system is faced with increasing treatment needs associated with an overweight/obese and ageing population. This means that increasingly some population groups are without access to primary health care services or a 'medical home', and providers must demonstrate the benefits and costs of their services, measured through cost–benefit, cost–effectiveness, or cost–utility analyses<sup>(20)</sup>. The need for public health nutrition practitioners to demonstrate and use evidence-based practice is paramount, because there are competing entities for the limited available health care dollar<sup>(21–23)</sup>. A related challenge is how to best demonstrate and measure the benefits of nutrition-related services and programmes not only as reductions of morbidity and mortality but also as satisfaction with quality of life<sup>(21)</sup>.

Income and education disparities also impact health, with those who are the poorest and least educated being at most risk<sup>(3)</sup>. For example, children especially are vulnerable to food insecurity. Nearly 17% of households with children and 18% of children overall experienced household food insecurity in 2005. Moreover, over 30% of households headed by a single woman with children were food-insecure, compared to 10.8% of married-couple households with children<sup>(24)</sup>. A number of studies have shown that children in food-insecure households have poorer health-related quality of life<sup>(25,26)</sup> and that there are differences in risk of food insecurity by income, household status, race/ethnicity and geographic location<sup>(25,27)</sup>. Access to food as both household and community food security is likely to decrease<sup>(24,28,29)</sup>. Therefore, public health nutrition personnel will remain challenged with the needs of economically vulnerable populations who need access to safe, culturally

acceptable foods that are acquired in socially acceptable ways to comprise a healthy diet<sup>(30,31)</sup>. For example, while in 2005 about two-thirds of the US food-insecure households employed coping strategies to address their hunger, some of these coping strategies included participating in food assistance programmes and using emergency food from community food pantries, community kitchens, homeless shelters, and garbage dumpsters<sup>(24,32)</sup>. Various population groups may not consider some or all of these coping strategies as socially acceptable.

The fiscal demands of the US food assistance programmes also impact public health nutrition practice. Eligibility requirements for some programmes are based on income (e.g. Food Stamps and School Breakfast and Lunch Programs), while others are based on income and nutritional risk (e.g. Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)). As health care costs have increased in the USA, so have food assistance programme costs. As food and administrative costs associated with nutrition education and programme delivery and management increase, demands to document efficacious and efficient programmes will increase.

Finally, advances in science and technology have changed the way we think about the relationship of genetics and environment to disease incidence and progression and the way we communicate with both the public and other practitioners. Practitioners will need to be poised to deal with the public health implications of genetics research and of increasingly sophisticated information technology that may have its own disparities in access<sup>(33,34)</sup>. For example, the digital divide, referring to those with and without access to information and communication technologies, will need to be addressed. Estimates are that one-third of Americans lack Internet access and that there are disparities in using home computers to access health information associated with race, income and education<sup>(35–38)</sup>. Nutrition personnel will have to maintain a delicate balance of utilising and incorporating new technologies and more direct interpersonal interventions.

### **What is the public health nutrition workforce in the USA?**

Public health nutrition personnel primarily work in primary and secondary prevention, across the life cycle and at all intervention levels, from those of individuals or small groups to organisations, communities and policies/systems<sup>(39)</sup>. They work in a variety of governmental and non-profit and for-profit sectors, all of which are responsible for supporting the public's health<sup>(3,40)</sup>. Their work is funded by tax-generated public dollars, private corporate and agency dollars, and voluntary contributions or donations. Those who work in governmental health agencies are responsible for the core public health functions

(assessment, policy development and assurance), which are described by ten essential public health services<sup>(41)</sup> and sixteen essential public health nutrition services<sup>(42,43)</sup>.

The wide range of personnel who promote the public's nutrition-related health is not unique to public health nutrition personnel. Indeed, the 2005 study of the public health workforce conducted by the US Department of Health and Human Services concluded that it is 'very diverse...', found in many settings and providing a wide range of services<sup>(44)</sup>. Therefore, it is difficult to identify, describe, and enumerate the public health workforce overall or the public health nutrition workforce specifically.

Historically, US public health nutrition personnel worked as consultants to other providers, such as physicians and nurses, but over time their work changed to include both direct nutrition services and population-based services<sup>(45)</sup>. A focus on personal health care services increased dramatically with implementation of WIC in 1974, when nutrition personnel were hired to provide nutrition education, supplemental food and referrals for income-eligible women, infants and children up to age 5 who were at nutritional risk<sup>(45)</sup>. There is no uniformly adopted terminology for personnel who work at the population/systems-level or at the individual or small group levels. However, the Public Health/Community Nutrition Practice Group of the American Dietetic Association defined a 'public health nutritionist' as one with graduate-level public health preparation and a 'community nutritionist/dietitian' as one with a baccalaureate degree, both with dietetic registration credentialing<sup>(46)</sup>. Dodds and Kaufman<sup>(47)</sup> further reserved the term 'public health' in position titles for those with population/system-focused responsibilities. The upcoming revision of *Personnel in Public Health Nutrition* maintains this distinction (JM Dodds, personal communication).

### **Who is the US public health nutrition workforce?**

The public health nutrition workforce includes both those who work in governmental health agencies and those who work in other areas or locations, such as health care delivery systems, employers/businesses, the media, academia and communities<sup>(40)</sup>. Although very little is known about this overall public health nutrition workforce, considerably more is known about the workforce employed in or funded by governmental health agencies. This is because since 1985 the Association of State and Territorial Public Health Nutrition Directors (ASTPHND) has conducted periodic workforce surveys<sup>(48–53)</sup>. Prior to 1994, these workforce studies were conducted by surveying state nutrition directors to describe full-time budgeted nutrition personnel employed in their respective governmental health agencies. Personnel described in these studies provided predominantly population-based services and not one-on-one diet counselling<sup>(48–51)</sup>.

Beginning in 1994<sup>(52)</sup> and with the subsequent 1999–2000 survey<sup>(53)</sup>, personnel were surveyed directly. They included both full-time and part-time nutrition personnel, who were employed in governmental health agencies or funded by governmental health agencies in for-profit and non-profit agencies. Personnel functioned at both population-based and direct-care nutrition service levels. Therefore, because the various surveys were administered differently, direct and conclusive comparisons of results are inappropriate, particularly for results from the 1985 and 1987 surveys compared to the 1994 and 1999–2000 surveys. However, differences noted can suggest ways to describe how the workforce has changed and are our best indicator of ‘who’ constitutes the US public health nutrition workforce. More recently, the ASTPHND collected data to enumerate and describe the 2006–2007 public health nutrition workforce and used the same criteria for selecting personnel as the 1994 and 1999–2000 surveys. Direct comparisons may be more appropriate once these data are available.

According to the 1999–2000 workforce survey in which forty-nine states, the District of Columbia and three territories participated<sup>(53)</sup>, there were 10 904 nutrition positions that were predominantly in local official health agencies (47.9%), full-time (80.6%) and in budgeted positions (95.5%). Most also worked in direct-care positions (69.0%) in contrast to the 30.4% who classified their position as population/system-focused.

In contrast, the 1994 workforce numbered only 7550<sup>(52)</sup>. This number, however, is an important under-estimation, because it did not include personnel from California, which constituted about 24% of the 1999–2000 workforce. Acknowledging this discrepancy, the more recent workforce seemed to have a greater proportion of personnel working in budgeted positions (95.5% *v.* 93.7%), full-time (80.6% *v.* 77.9%) and in non-profit and for-profit agencies (29.1% *v.* 28.3%)<sup>(52,53)</sup>. Based on position classification, the more recent workforce also had more personnel with direct-care service responsibilities (69.4% *v.* 65.6%) and fewer with population/system-focused responsibilities (30.4% *v.* 34.4%)<sup>(52,53)</sup>.

The important role of public health nutrition personnel in delivering direct nutrition services is documented by the nearly 80% whose primary practice area in 1999–2000 was assurance of services: approximately 65% spent 75–100% of their time in direct client services. Women, infants and children were the primary clients of these personnel. A much smaller percentage of the workforce (almost 10%) was most engaged in management and administration<sup>(53)</sup>.

The WIC Program's impact on how the public health nutrition workforce functions is suggested by these data. WIC is a categorical grant delivered similarly across states for services with individuals and small groups. This is in contrast to other block grants, such as the Maternal and Child Health and Preventive Services Block Grants, which may impact larger groups, communities, policies and systems. The 1985 workforce survey excluded personnel delivering one-on-one diet counselling<sup>(48)</sup>, while the 1987 survey excluded those who spent more than 40% of their time in direct-care services<sup>(50)</sup>. In 1994, personnel delivering direct nutrition services were included in the workforce surveys<sup>(52)</sup>, and in 1999–2000 the workforce was described overall and as those working in WIC and in programmes other than WIC<sup>(53)</sup>.

WIC's impact is in large part due to its significant funding of the workforce. In 1985 and 1987, WIC funded 62% and 55% of budgeted full-time equivalent (FTE) positions, respectively<sup>(48,50)</sup>. In 1994 it funded 78% FTE<sup>(52)</sup> and by 1999–2000 it funded 81.7% FTE<sup>(53)</sup>. Although federal funding has been the primary means of funding public health nutrition personnel, ranging from approximately 76% in 1985 to 87% in 1999–2000, proportional funding of WIC has increased, while that of other federal funding sources, such as the Maternal and Child Health Block Grant and the Preventive Services Block Grant, has remained flat or decreased<sup>(48,50,52,53)</sup> (Table 1).

This significant level of WIC funding impacts not only how public health nutrition personnel function but also with whom. Block grants allow states to plan, implement and evaluate programmes designed to address state-specific priorities and needs. Therefore, they allow more

**Table 1** Full-time equivalents per funding source – a comparison of 1994 and 1999–2000\*

	1999–2000		1994	
	FTE	Percentage	FTE	Percentage
US Department of Agriculture	8189.22	82.3	5345.46	82.7
US Department of Health and Human Services	470.73	4.7	423.49	6.6
State	420.16	4.2	331.54	5.1
Local	256.87	2.6	143.42	2.2
Other	186.27	1.9	211.33	3.3
US Department of Education	19.67	0.2	9.20	0.1
Not specified	408.58	4.1	0.00	0.0
Total	9951.5	100.0	6464.44	100

FTE, full-time equivalent.

\*Includes vacant positions. Idaho did not participate in the 2000 survey; California did not participate in the 1994 survey.

From Houghton *et al.*<sup>(37)</sup>.

state flexibility on how programmes are delivered and for what population groups. For example, the Maternal and Child Health Block Grant is intended to promote the health, safety and well-being of all women, infants, children, adolescents and their families, including fathers and children with special health care needs<sup>(54)</sup>. In contrast, WIC's target population is low-income women, infants and children up to age 5 who are at nutritional risk<sup>(55)</sup>. Therefore, while WIC's workforce funding is important and significant, it targets a more narrow population than some federal, state and local funding sources.

The public health nutrition workforce also is very experienced and there are differences among those who work in WIC *v.* other programmes/areas. Approximately 45% of the 1999–2000 WIC workforce had at least 10 years of nutrition/dietetics experience and over 30% had at least 10 years of public health nutrition experience, specifically. The non-WIC workforce was even more experienced with over 65% having at least 10 years of nutrition/dietetics experience and almost 40% having at least 10 years of public health nutrition experience<sup>(53)</sup>.

Historically, public health academic preparation has been a concern. In 1987, 30% of state directors estimated that at least 60% of those engaged primarily in population-based work had a graduate degree with public health coursework<sup>(48)</sup>. In 1994, only 26.5% had a Master's degree and only 7% had a Master's in public health nutrition<sup>(52)</sup>. By 1999–2000, 12% and 28% of the WIC and non-WIC workforces, respectively, had Master's degrees in nutrition or dietetics. Similarly only 4% and 14%, respectively, had Master's degrees in public health or community nutrition<sup>(53)</sup>. These findings pose important questions. Do these differences reflect differences in the required academic preparation of WIC personnel compared to others? Do they reflect differences in recruitment and retention?

Both the 1994 and 1999–2000 surveys assessed self-perceived continuing education needs. Personnel were provided lists of continuing education topics and were asked to identify their top training needs. During both survey administrations, the top training need was nutrition for children with special health care needs, followed by infant and child (or infant and preschool) nutrition, prenatal nutrition and breast-feeding. In 1994, the lowest ranked training needs were home-based health care, nutrition and health promotion for the elderly, and coalition building and developing partnerships<sup>(52)</sup>. WIC's influence is once again noted, because by 1999–2000 while nutrition for children with special health care needs remained the top training need of both the WIC and non-WIC workforces, only three other of the top ten training needs were the same, namely nutrition counselling, supplemental and alternative dietary therapies, and use of information technology, including computers. The other top needs of the non-WIC workforce were adult health promotion, senior nutrition, data management and monitoring, fund raising and grant writing, and programme planning and evaluation<sup>(53)</sup>. These are continuing education topics that are perhaps more consistent with the demands of population-focused practice compared to direct nutrition services (Table 2).

The workforce's diversity is suggested by its racial/ethnic make-up and primary and secondary languages spoken. Most of both the WIC and non-WIC workforces in 1999–2000 were white (65.3% and 81.6%, respectively) and non-Hispanic/Latino (49.0% and 65.9%, respectively), although a significant number chose not to answer these questions<sup>(53)</sup>. As noted in the 1999–2000 final report, limited comparisons can be made with the overall US and WIC populations, because of differences in how individuals were asked to describe their racial/ethnic backgrounds. However, it appears that while the

**Table 2** Perceived training needs – top ten choices identified by the WIC and non-WIC 1999–2000 workforce

Topic	WIC		Non-WIC	
	Rank	Percentage	Rank	Percentage
Nutrition for children with special health care needs	1	30	1	15
Breast-feeding	2	28		
Infant and preschool nutrition	3	24		
Prenatal nutrition	4	18		
Nutrition counselling, behaviour change, client education	5	17	3	13
High-risk clients, including HIV and addiction	6	12		
Childhood nutrition	7	10		
Eating disorders	8	9		
Supplemental and alternative dietary therapies	9	9	2	14
Use of current IT, including computers	10	8	5	11
Adult health promotion, chronic disease, healthy ageing			4	12
Senior, geriatric nutrition			9	8
Data management, surveillance, monitoring systems			8	9
Fund raising, proposals and grant writing			7	10
Programme planning and evaluation			10	8
No response or missing		15		15
Total responses		10 309		955

WIC, Special Supplemental Nutrition Program for Women, Infants, and Children; IT, information technology. From Haughton *et al.*<sup>(37)</sup>.

**Table 3** Diversity of the US population, 1999–2000 public health nutrition workforce, and WIC participants

Race	US population 2000 (%)	Public health nutrition workforce 2000 (%)	WIC workforce 2000 (%)	WIC participants 2001 (%)
One race reported	97.6	85.1	84.2	–
American Indian/Alaskan Native	0.9	0.8	0.8	1.5
Asian	3.6	6.3	6.5	3.2*
Black or African-American	12.3	10.9	11.3	22.9 Non-Hispanic
Hawaiian/Pacific Islander	0.1	0.3	0.3	Not reported
White	75.4	66.7	65.3	39.2 Non-Hispanic
Other race	5.5	†	†	
Two or more races	2.4	0.5	0.5	Not collected
No response race	Not shown	14.4	15.2	0.8
Ethnicity				
Latino/Hispanic	12.5	19.4	20.8	32.3

WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

\*Includes Pacific Islanders.

†Question did not include 'other race' response choice.

From Haughton *et al.*<sup>(37)</sup>.

WIC workforce compared with the non-WIC workforce was more ethnically and racially diverse, its diversity was still more limited than the WIC population served. Of note is that while over 80% (83.3%) of the 1999–2000 workforce spoke English as its primary language, 18.2% spoke Spanish as a second language compared to only 6.0% in 1994<sup>(52,53)</sup> (Table 3).

### Relationship of the public health nutrition workforce to public health challenges

What we know about the US public health nutrition workforce is based on surveys administered from 1985 to 2000. The environment in which these personnel practice undoubtedly has changed since these data were collected. Though data from the 2006–2007 survey are not yet available, it is possible to speculate on how today's workforce may be different and to pose questions about how it will need to change to respond to future challenges.

Increasing population diversity reflected as race, ethnicity, languages spoken and age will require the workforce to be culturally competent as it engages and works collaboratively with families, communities and target populations to identify and sensitively address priorities and needs. One approach is for the workforce to mirror the population with which it works by becoming more diverse, especially racially and ethnically. Data from previous surveys suggest a workforce that is becoming more diverse, though still less diverse than the overall US population. While public health nutrition personnel who speak Spanish as a second language and who are of Hispanic/Latino ethnicity are increasing, gaps between the workforce and population remain. This reinforces the importance of recruitment and retention of a diverse workforce and, in addition, an overall workforce that is culturally competent in working with citizen and immigrant populations who differ from the

workforce not only by race/ethnicity but also by income, education and other parameters. Cultural competence was not identified in either the 1994 or 1999–2000 survey as a top training need. It is unclear whether this is because the workforce was adequately and appropriately trained or if the workforce had other competing training needs of higher self-perceived priority.

Ageing of the population and workforce is another aspect of diversity requiring attention. The high proportion of the workforce funded by WIC leads to a focus on women, infants and young children. However, especially for non-WIC personnel there is an increased need for training in serving elderly clients and their communities, which is a reflection of the impact of ageing 'baby boomers' and technological advances in health care. This was suggested by the 1999–2000 training needs identified by the non-WIC workforce, where two of the top ten needs were adult health promotion and senior nutrition<sup>(53)</sup>. With further increases in an elderly population, these training needs will likely become even more important. Another impact of the ageing population and changes in family dynamics is 'grandparent caregivers', who, according to the 2000 US Census, were approximately 2.4 million elderly individuals with primary responsibility for their grandchildren<sup>(56)</sup>. Black and American Indian/Alaskan Native grandparents were the racial groups most likely to be these caregivers. This has significance for the WIC workforce and for others whose work focuses on infants and children, because they may have the opportunity to impact not only the primary target population, but also parents and other extended family members, including older grandparents.

An ageing population also suggests an ageing workforce. A key concern throughout the health care field, including public health, is workforce 'greying'. Nursing has tracked trends and predicted shortages<sup>(57)</sup> due to insufficient numbers of nurses entering the field to replace those retiring<sup>(58)</sup>. While similar age-tracking for

the public health nutrition workforce has not been performed, its increasing years of experience suggest that it, too, may be faced with shortages. Moreover, within the WIC workforce recruitment and retention are concerns due to salaries, benefits, workloads and shortages of nutritionists and dietitians<sup>(59–61)</sup>. As a result, leadership capacity is unclear, especially if a significant proportion of the workforce is indeed ageing and recruitment and retention remain problematic.

Emergency preparedness competence of the workforce is an emerging challenge<sup>(62)</sup>, yet how well-equipped it is to address emergencies overall or specific for food safety and food systems is unknown. Although 'health/food safety' was a training need option in the 1999–2000 survey, it was not selected as a priority<sup>(53)</sup>. Also of note is the small proportion of the workforce with formal public health training. This training would include population-based approaches required in emergencies and systems approaches that consider the food system in general and its relationship to food access and nutrition-related health. Because emergency preparedness competencies are relatively new and the workforce has extensive experience, even those trained in public health may lack this preparation. The 1999–2000 survey also did not specifically request information on training needs related to food system approaches to promote sustainability, access and nutrition-related health. All these raise questions regarding the workforce's competence related to food systems in general and in emergencies.

Obesity likely will remain the major public health challenge of the 21st century. The prevalence of obesity and chronic disease is linked to behavioural determinants of health, which raises questions about the capacity of personnel to develop, implement and evaluate appropriate interventions that target each level of the social–ecological model<sup>(63,64)</sup>. Programmes have recognised the importance of targeting health behaviours. WIC, for example, has adopted a behavioural approach to service delivery through Revitalizing Quality Nutrition Services<sup>(65)</sup> and implemented Value Enhanced Nutrition Assessment techniques to conduct participant-focused nutrition assessments<sup>(66)</sup>. The public health nutrition workforce must be prepared to help children and families adopt more healthful eating and physical activity patterns and to collaborate with organisations and communities to create healthful environments and policies to promote healthy weight and to reduce overweight. They will also need to deal with severe health complications of overweight/obesity in a strikingly younger population. The degree to which the overall workforce is trained in or uses appropriate educational, behavioural, environmental, organisational and policy interventions that are culturally competent to address these challenges is unclear.

Intense competition for health care dollars amplifies the need for evidence-based practice that demonstrates impact. The selection of 'data management' and 'programme planning and evaluation' as training priorities identified

by the 1999–2000 non-WIC workforce<sup>(53)</sup> suggests that staff recognise this need. However, there is limited research on evidence-based public health nutrition practice and the degree to which this research informs practice in the field is unknown<sup>(60)</sup>. How well prepared personnel are to incorporate performance management into programmes at the agency or organisation level is also unknown<sup>(67)</sup>.

Rising health care costs may impact the overall workforce's composition and compensation. Programmes must demonstrate not only nutrition-related health impact but also the appropriate inputs, including personnel, required for that level of impact. To reduce personnel costs, some programmes may contract or hire part-time personnel, thereby limiting employee benefit costs, such as health insurance. They also may hire personnel with differing or lower levels of academic and experiential preparation. There is some anecdotal evidence that some US states have moved to 'broad banding', in which a large number of pay grades are consolidated into a few 'broad bands'<sup>(68)</sup>. Salary ranges may have as much as a 50–60% difference between the minimum and the maximum salaries, making it difficult to interpret salary ranges. Implications for recruitment, retention, composition and quality of personnel are unknown for the workforce.

Finally, how personnel will respond to the challenges of disparities in income, education, access to food and technological advances is unclear. Although offered as a training need option in the 1999–2000 survey, 'hunger and food security' was not selected as a priority, while 'use of information technology' was selected among the top ten priorities<sup>(53)</sup>. Our understanding of the current workforce is primarily based on self-report of how personnel practice and perceive their training needs. It does not include demonstration of the degree to which they are trained in and use health informatics, are prepared to address implications of genetics research on public health practice, or address disparities in access among their target populations.

## Conclusion

As the health care and public health fields adjust to the changing environments in which they work, the public health nutrition workforce must be proactive and prepared to adapt as well. The US public health nutrition workforce has changed historically, moving from more population-based approaches to individual approaches and small-group approaches, in part because of changes in funding sources. It is also a mature workforce that has differing capacities and needs related to WIC and other programmes and services. Because the ASTPHND and federal agencies, including the US Department of Health and Human Services, Maternal and Child Health Bureau and the US Department of Agriculture, Food and Nutrition Service,

have recognised the importance of workforce monitoring, much is known, at least in terms of those employed or contracted by official health agencies. This provides not only historical perspective but also the ability to project about how the workforce needs to prepare for future challenges and to plan accordingly. Unfortunately, there is a dearth of knowledge about the broader public health nutrition workforce or that described by the Institute of Medicine as those employed in governmental health agencies, health care delivery systems, employers/businesses, the media, academia and communities<sup>(40)</sup>. Even less is known about how they work collaboratively and systematically to promote the public's nutrition-related health. This is an important direction for future public health nutrition workforce infrastructure research<sup>(69)</sup>, because it is this broader system that is responsible for assuring conditions for nutrition-related public health. A future challenge is to understand this broader workforce and how it will respond to future public health challenges.

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