



## The health of Americans 1

# Prevention of chronic disease in the 21st century: elimination of the leading preventable causes of premature death and disability in the USA

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With non-communicable conditions accounting for nearly two-thirds of deaths worldwide, the emergence of chronic diseases as the predominant challenge to global health is undisputed. In the USA, chronic diseases are the main causes of poor health, disability, and death, and account for most of health-care expenditures. The chronic disease burden in the USA largely results from a short list of risk factors—including tobacco use, poor diet and physical inactivity (both strongly associated with obesity), excessive alcohol consumption, uncontrolled high blood pressure, and hyperlipidaemia—that can be effectively addressed for individuals and populations. Increases in the burden of chronic diseases are attributable to incidence and prevalence of leading chronic conditions and risk factors (which occur individually and in combination), and population demographics, including ageing and health disparities. To effectively and equitably address the chronic disease burden, public health and health-care systems need to deploy integrated approaches that bundle strategies and interventions, address many risk factors and conditions simultaneously, create population-wide changes, help the population subgroups most affected, and rely on implementation by many sectors, including public–private partnerships and involvement from all stakeholders. To help to meet the chronic disease burden, the US Centers for Disease Control and Prevention (CDC) uses four cross-cutting strategies: (1) epidemiology and surveillance to monitor trends and inform programmes; (2) environmental approaches that promote health and support healthy behaviours; (3) health system interventions to improve the effective use of clinical and other preventive services; and (4) community resources linked to clinical services that sustain improved management of chronic conditions. Establishment of community conditions to support healthy behaviours and promote effective management of chronic conditions will deliver healthier students to schools, healthier workers to employers and businesses, and a healthier population to the health-care system. Collectively, these four strategies will prevent the occurrence of chronic diseases, foster early detection and slow disease progression in people with chronic conditions, reduce complications, support an improved quality of life, and reduce demand on the health-care system. Of crucial importance, with strengthened collaboration between the public health and health-care sectors, the health-care system better uses prevention and early detection services, and population health is improved and sustained by solidifying collaborations between communities and health-care providers. This collaborative approach will improve health equity by building communities that promote health rather than disease, have more accessible and direct care, and focus the health-care system on improving population health.

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### Introduction

The emergence of chronic diseases as the predominant challenge to global health is undisputed.<sup>1–4</sup> In its 2010 report on the global status of the challenges presented by chronic diseases, WHO noted that non-communicable conditions—including cardiovascular diseases, diabetes, cancers, and chronic respiratory diseases—accounted for nearly two-thirds of deaths worldwide.<sup>5</sup>

The updated Global Burden of Disease Study, 2010 provides further documentation of the continued shift from communicable to non-communicable diseases, and from premature death to years lived with disability.<sup>4</sup> Related research indicates the scope of the problem and key risk factors that cause the global trends, including high blood pressure, tobacco smoking and second-hand smoke exposure, high body-mass index (BMI), physical inactivity, alcohol use, and diets low in fruits and vegetables and high in sodium and saturated fats (eg, artificial trans fats).<sup>4,6,7</sup>

In the USA, chronic diseases are the main cause of poor health, disability, and death, and account for most of health-care expenditures.<sup>8–11</sup> Around half (50.9%) of adults in the USA have at least one chronic condition and 26% have two or more conditions.<sup>12</sup> In 2011, 13.1% of the population had a disability, including 46.3% of those in people aged 75 years and older.<sup>13</sup> In 2011, ten of the 15 leading causes of death in the USA were chronic conditions, including seven in the top ten (diseases of the heart, malignant neoplasms, chronic lower respiratory diseases, cerebrovascular diseases, Alzheimer's disease, diabetes, and the combination of nephritis, nephrotic syndrome, and nephrosis).<sup>8</sup>

The Institute of Medicine reported that the USA is less healthy in key areas—including obesity, diabetes, heart disease, chronic lung disease, and disability—compared with 16 high-income or peer countries.<sup>14–16</sup> The provision of care for people with chronic illnesses is very costly; in 2010, total spending for the Medicare population (largely

**Key messages**

- Non-communicable diseases (eg, cardiovascular diseases, diabetes, cancers, and chronic respiratory diseases) account for most deaths globally, and are the main drivers of morbidity, disability, and health-care costs in the USA.
- Much of the chronic disease burden results from a small number of key risk factors that include high blood pressure, tobacco smoking and second-hand smoke exposure, high BMI, physical inactivity, alcohol use, and diets low in fruits and vegetables and high in sodium and saturated fats. Most adults in the USA have more than one risk factor.
- All of these risk factors can be effectively addressed at both the individual and population levels; work at both levels is essential. To address the challenge of chronic diseases needs a sustained cross-sectoral policy and programme focus on high-value prevention targets at the individual (clinical) and population levels.
- Reduction to the chronic disease burden needs coordinated and mutually-reinforcing actions: epidemiology and surveillance to monitor trends and track progress, policy and environmental approaches to promote health and support healthy behaviours, health-care interventions to improve the effective delivery and use of preventive and other high-value clinical services, and links between community programmes and clinical services to improve and sustain the management of chronic conditions.
- Establishment of community conditions to support behaviours that lead to a healthy life and promote effective management of chronic conditions will deliver healthier students to schools, healthier workers to employers and businesses, and a healthier population to the health-care system.

people  $\geq 65$  years) was more than US\$300 billion, with almost all (93%) spending in support of people with two or more chronic conditions.<sup>11</sup> Similarly, lost productivity from chronic diseases, other chronic conditions, and risk factors is associated with enormous costs both for those remaining in the workforce and for those who prematurely leave because of a disability.<sup>17</sup>

US national health priorities include prevention of the development and early detection of chronic diseases, slowing disease progression, mitigating complications to optimise quality of life, and a decrease in the demand on the health-care system.<sup>18–20</sup> In this review, we assess the burden of chronic diseases in the USA, and describe the USA's public health practice-focused approach that is used by CDC's National Center for Chronic Disease Prevention and Health Promotion to reduce the preventable burden of chronic diseases.

**The chronic disease burden in the USA**

In the USA, the burden of chronic disease is not distributed equitably. People with lower educations or

incomes, of specific races or ethnic backgrounds, and in specific geographical locations, among other factors, are disproportionately affected by chronic diseases, often as a result of social disadvantages and vulnerability.<sup>21</sup> For example, stroke death rates are highest in the south-eastern states; smoking prevalence is highest in some American Indian tribes, particularly in the northern Plains; cardiovascular disease death rates are highest in African-Americans; and obesity rates are highest in those with low education or low income.<sup>22</sup> Although public health and health-care systems do not directly address many determinants of health such as poverty or education, which have a great effect on population health, both systems can work to mitigate the adverse health consequences of these social and economic structures of society, change the context within which chronic disease occurs, and target interventions to reach people with the greatest burden of disease.<sup>23</sup>

The chronic disease burden in the USA largely results from a short list of prevalent risk factors—including tobacco use, poor diet and physical inactivity (both strongly associated with obesity), alcohol consumption, uncontrolled high blood pressure, and hyperlipidaemia<sup>24,25</sup>—which, along with access to medical care, are inequitably distributed. These risk factors, conditions, and resultant chronic diseases can be effectively addressed at both the individual and population levels through policy and environmental approaches to change the context within which health behaviours occur, through early detection and better management within the health-care system to improve outcomes, and through community programmes linked to the health-care system to slow disease progression, mitigate complications, and avert adverse outcomes. For people with or at high risk for chronic conditions, community-deployed, evidence-based, disease self-management regimens can help to improve quality of life and reduce the number of health-care visits needed to maintain good health.<sup>26,27</sup> Combined whole-population and individual approaches, including targeted resources and support for population subgroups with the greatest burden, can reduce the prevalence of chronic disease and narrow health disparities.<sup>28</sup>

The burden of chronic disease in the USA is attributable to at least three key factors: the persistent high prevalence of risk factors, including lifestyle and other behaviours;<sup>29,30</sup> social and environmental factors that promote or adversely affect health; and an increase in life expectancy leading to greater numbers of older people with one or more chronic conditions<sup>11</sup> and related disabilities. Large numbers and high rates of chronic disease create substantial challenges and costs for the public health and health-care systems. The public health system often focuses on acute problems such as control of infectious disease outbreaks, whereas health-care providers focus on the delivery of care. Neither system prioritises sustained, long-term investments in health promotion and disease prevention.

High-burden chronic conditions—such as diabetes, hypercholesterolaemia, hypertension, and obesity—can be addressed through a range of community-based and clinically-based prevention strategies that deal with root causes of chronic conditions (eg, social conditions and physical environments) and manage the existing burden. These prevention strategies create community conditions that support health, such as community water fluoridation and smoke-free air laws, and strengthen links between community settings and health-care systems to ensure that patients and caregivers have the means to better manage their health outside the clinical setting.<sup>31</sup> The existing burden of chronic conditions underscores the urgent need to intensify upstream policy and environmental approaches to prevent chronic diseases by reducing tobacco use, improving nutrition, increasing physical activity, and strengthening community programmes linked to clinical settings.

Public health surveillance data provide essential information to guide these strategies by measuring the burden of chronic diseases (ie, downstream indicators), informing priority-setting for interventions, and monitoring progress for the whole population and across population subgroups.<sup>32,33</sup> Key risk factors and indicators of the epidemiology and burden of chronic diseases are monitored in surveillance and data systems that are maintained at state and national levels. For example, the Behavioural Risk Factor Surveillance System (BRFSS) measures the prevalence of lifestyle risk factors at the state level.<sup>29</sup> The National Health and Nutrition Examination Survey (NHANES)<sup>34</sup> and the National Health Interview Survey (NHIS)<sup>13</sup> measure the national prevalence of selected chronic conditions and health indicators. These state and national systems also allow monitoring of conditions and risk behaviours by education, income, race or ethnic origin, and other variables to monitor disparities in health status. The National Vital Statistics System (NVSS) measures national cause-specific death rates; state vital records offices register deaths that are then collected and processed nationally to produce national mortality data.<sup>8</sup> Analyses of national survey data<sup>35–38</sup> and, particularly for the population aged 65 years and older, Medicare fee-for-service claims data,<sup>11</sup> produce estimates of expenditures associated with chronic conditions.

Table 1 documents the prevalence and patterns of selected chronic conditions and risk factors between 1999 and 2010. These data are regularly reported in several CDC publications, such as Health, United States, which includes data from the NHIS, NHANES, and other sources.<sup>39–41</sup> These data document the high prevalence of chronic conditions and risk factors and key health disparities in the USA. CDC's annual reports on US death rates, leading causes of death, and other mortality data show the predominant effect of chronic diseases on US mortality patterns.<sup>8</sup> Other data sources extend understanding of the chronic disease challenge. For example, analyses of administrative claims data for

	1999–2000	2005–06	2009–10
Diabetes*	9.0%	10.4%	11.5%
High cholesterol*	25.0%	27.0%	26.7%
Hypertension*	30.0%	30.5%	30.0%
Obesity*	30.5%	34.4%	35.7%
Current cigarette smokers†	23.1%	20.8%	19.3%
Did not meet physical activity guidelines‡	54.7%	No data	49.1%
Binge drinking§	14.9%¶	15.4%	15.8%**

Data from reference 30 unless otherwise stated include estimates of meeting physical activity guidelines for 2011 and current cigarette smokers for 2012.  
 \*Percentage of people 20 years and older.†Percentage of people 18 years and older who were current cigarette smokers (years: 2000, 2005, 2010); for 2012, the prevalence was 18.0% (source: National Health Interview Survey).‡Percentage of people 18 years and older who met neither aerobic activity or muscle-strengthening 2008 federal Physical Activity Guidelines (years 2000 and 2010); for 2011, the prevalence was 47.6% (source: National Health Interview Survey).§Estimates are not age-adjusted. Source: Behavioural Risk Factor Surveillance System (BRFSS).¶Percentage of people 18 years and older who consumed ≥five drinks on ≥one occasion(s) during the past month (1999 only).||Percentage of men 18 years and older who consumed ≥five drinks and women who consumed ≥four drinks on ≥one occasion(s) during the past 30 days (2006 only).\*\*Percentage of men 18 years and older who consumed ≥five drinks and women who consumed ≥four drinks on ≥one occasion(s) during the past 30 days (2009 only).

**Table 1: Age-adjusted percentage of adult population with selected chronic disease risk factors and conditions in the USA, 1999–2012<sup>30</sup>**

health-care services provided to Medicare beneficiaries, a population predominantly older than 65 years,<sup>11</sup> show that only 32% have no or one chronic condition, 32% have two to three chronic conditions, 23% have four to five, and 14% have six or more. The most common triad of conditions is hypertension, hypercholesterolaemia, and ischaemic heart disease, which is present in 33.7% of the population aged 65 years or older. People with many concurrent chronic conditions use health services, such as emergency department visits and re-admissions to hospitals, at a disproportionately high level. In 2006, an estimated 84% of total US health-care expenditures were accounted for by the 50% of the non-institutionalised population with one or more chronic conditions.<sup>35</sup>

Public health and health-care efforts have contributed to substantial improvements in the prevalence of some chronic diseases, conditions, and risk factors. For example, self-reported cigarette smoking among adults decreased from 42% in 1965, to 18% in 2011,<sup>30,39,40</sup> and adults aged 20 years and older with a diagnosis of hypertension but uncontrolled (defined as having an average systolic blood pressure of ≥140 mm Hg, or an average diastolic blood pressure of ≥90 mm Hg), decreased from 77% in 1988–94 to 56% in 2009–10.<sup>30</sup> Coronary heart disease death rates have sharply reduced since the 1960s, from a peak in 1968 of 482.6 deaths per 100 000 population to a preliminary 2011 rate of 109.0 deaths per 100 000 population.<sup>8,42</sup>

Substantial challenges remain to sustain and accelerate this progress. Cardiovascular disease continues to be the main cause of death. Tobacco use is still among the leading



preventable causes of death, accounting for 480 000 deaths every year (about one in every five) in the USA.<sup>43</sup> For high-income North America, the top-ranked risk factors in 2010 were tobacco smoking (including second-hand smoke exposure), high BMI, alcohol use, high blood pressure, and high fasting plasma glucose,<sup>46</sup> many of which can be prevented or controlled with effective community and clinical interventions that are often available but underused.<sup>44-47</sup> Trends for some risk factors—mostly obesity and some of its downstream consequences—have increased. For example, in 1985, no state had an obesity prevalence greater than 14%, but by 2010, every state had a prevalence of 20% or more;<sup>48,49</sup> between 1988-94 and 2007-10, the proportion of adults aged 20 years and older with diabetes increased from 9.1% to 11.4%.<sup>30</sup>

Finally, important gaps in policies and environments that support or enable healthy lifestyles pose an additional challenge. For example, less than half (48.9%) of the total US population is protected from second-hand tobacco smoke by comprehensive smoke-free air laws that cover all workplaces, restaurants, and bars.<sup>50</sup> Access to nutritious foods (eg, through full-service groceries and farmers' markets) and safe places for physical activity (eg, playgrounds, hiking trails, and bike paths) are suboptimal in many areas.<sup>51,52</sup> Pricing of tobacco products, alcohol, and high-calorie low-nutrition foods and beverages is not commensurate with costs of the health consequences associated with their use.<sup>53</sup>

### Addressing the chronic disease burden

To effectively and equitably address the chronic disease burden, collaborations between health-care systems and

public health are needed to bundle strategies and interventions, address combinations of risk factors and conditions, create population-wide changes, help the most affected population subgroups, and to ensure implementation of measures by many sectors, including public-private partnerships with involvement from all stakeholders. The magnitude of the chronic disease challenge in the USA requires a sustained policy and programme focus on high-value prevention targets that draw upon strengthened links between public health and clinical care. Historically, major improvements in population health were achieved through collaborations with other sectors (eg, investments in water and sewage systems, and policies and regulations establishing housing and transportation safety standards).<sup>54</sup>

Multicomponent population strategies, which include many sectors and address many risks or diseases, have potential to improve the effectiveness, efficiency, and cost-effectiveness of public health action. Examples include the successful action against tobacco use through policy interventions in health care, taxation, and finance, at indoor and outdoor public places, among businesses and employers, and in the media. Such interventions work together to change norms regarding tobacco use. Similar multicomponent approaches could be used to address obesity (eg, menu labelling laws, pricing strategies, and voluntary changes in portion sizes) and other risk factors. Policies and programmes that increase the availability of affordable healthy foods and beverages, and foster safe places for regular physical activity, have the potential to reduce obesity and improve several health outcomes, including arthritis, diabetes, cancer, and cardiovascular disease. Health system interventions, such as the widespread implementation of health information technologies and team-based care, could address many risks and diseases. To improve health outcomes, public health uses a population health perspective to identify key targets for the health-care system to increase demand for preventive services, expand the population served, and reach underserved populations.

These prevention and control approaches to reduce the US chronic disease burden are organised into four domains described by CDC, which address combinations of risk factors and diseases: (1) epidemiology and surveillance to monitor trends and track progress; (2) environmental approaches to promote health, and support and reinforce healthy behaviours; (3) health system interventions to improve the effective delivery and use of clinical and other preventive services; and (4) community programmes linked to clinical services, to improve and sustain management of chronic conditions. The four domains have mutually reinforcing effects, which are shown in the US Department of Health and Human Services (HHS) initiative called Million Hearts (table 2). Million Hearts aims to prevent 1 million heart attacks and strokes between 2012 and 2017 by empowering Americans to make heart-healthy lifestyle choices and by

Strategies and interventions	
Enhanced surveillance	To monitor: behaviours and environments such as sodium consumption and sodium in the food supply, smoking prevalence, and the proportion of the population protected from second-hand smoke exposure; and use of blood pressure control medications and the proportion of people with hypertension who have their blood pressure under control
Environmental approaches	Provide support for communities to: reduce the amount of sodium in the food supply, including in prepared foods served in schools, work sites, health-care settings, and institutions; increase access to affordable fruits and vegetables and opportunities for safe physical activity; and decrease exposure to secondhand smoke in public and work places and multiunit housing and promote cessation from tobacco use
Health systems interventions	Increase appropriate aspirin use, blood pressure control, and cholesterol management by: strengthening the reporting of outcomes, providing feedback and techniques to physicians on performance; and implementation of team-based approaches to manage high blood pressure, including physicians, pharmacists, nurses, and allied health professionals
Community-clinical links	Support patient efforts to manage their conditions by providing self-management education and methods in structured lifestyle programmes, such as the National Diabetes Prevention Program, that are linked to supportive community environments

\* The Department of Health and Human Services (HHS) Million Hearts initiative aims to prevent 1 million heart attacks and strokes between 2012 and 2017.

**Table 2: Four domains of chronic disease prevention activities for preventing heart attacks and strokes from the Million Hearts Initiative\***

improving care for people needing treatment.<sup>44,55</sup> Million Hearts uses all four domains to address and improve heart health at many levels, in many settings, and in collaboration with many sectors.

Public health epidemiology and surveillance provides essential data and information to define and prioritise public health problems, identify populations most affected, inform solutions, and monitor progress.<sup>32</sup> The first domain includes the collection, analysis, and dissemination of data, and completion of assessments to inform, prioritise, deliver, and monitor programmes and population health. Epidemiology and surveillance data are essential to inform continuing chronic disease prevention and control efforts, to document successes, identify gaps and disparities, and provide critical information to advance policy.

In the present period of governmental restrictions, public health surveillance data can be augmented by creative use of data from other systems, including health-care, and novel uses of new techniques. Health information technology has potential to increase the efficiency and timeliness of future public health surveillance. For example, new US Meaningful Use standards (an aspect of the American Reinvestment and Recovery Act of 2009, these standards are incentive programmes for health-care providers and hospitals to incorporate the use of certified electronic record technology to improve patient care) will accelerate reporting to state cancer registries, which will expand understanding of timeliness of care, effective treatments, and disparities in cancer outcomes.<sup>56</sup> Work in progress—eg, the use of health systems and other data to conduct surveillance of BMI<sup>57,58</sup>—will improve obesity surveillance by increasing the timeliness and availability of locally relevant information about obesity in children and adults, and across population subgroups. Some key risk behaviours (eg, diet, including sodium intake, physical activity, and alcohol use) are poorly captured in the public health and health-care systems. Strengthening of behavioural surveillance data is an ongoing need.<sup>23</sup>

The second domain shows how improvements to population health can be achieved through community prevention efforts that promote healthy behaviours and reduce chronic disease. These efforts include policies that change the context (eg, smoke-free air laws that protect non-smokers from second-hand tobacco smoke, and bans on artificial trans fats that eliminate a cardiotoxin from the food supply), and environmental approaches that make healthy choices easier, more convenient, affordable, and safe (eg, community design and zoning standards that improve street connectivity, and transportation alternatives to encourage walking and cycling). Tobacco control has new, context-changing policies. In 2009, the Family Smoking Prevention and Tobacco Control Act (Public Law Number 111–31) granted the US Food and Drug Administration new authority to regulate tobacco products. In 2009, flavoured cigarettes were banned to help to combat smoking in young people. Policies and environmental approaches are often implemented by

non-health sectors, such as businesses, employers, transportation, parks and recreation departments, and planning and economic development agencies, and generally have a broad and sustained effect because of their jurisdiction-wide application (at the national, state, or local levels).

Since the mid-1970s, health promotion approaches that incorporate these types of policy and environmental improvements have generally been more effective than other approaches to promote healthy behaviours.<sup>59</sup> Complex system modelling, completed at CDC, suggests that in the long term, these approaches might save more lives at a lower cost than alternative interventions.<sup>60</sup> However, despite investments in community health in the USA,<sup>61</sup> public health spending by governments at all levels constituted only about 3% of total health spending in 2010.<sup>62</sup> The Patient Protection and Affordable Care Act of 2010 created the Prevention and Public Health Fund and the National Prevention Council to accelerate progress in public health and cross-sectoral multi-component interventions.

Several community and state efforts have addressed, or are addressing, policy, environmental, programmatic, and infrastructure investments for chronic disease issues including nutrition, physical activity, obesity, tobacco use, diabetes, hypertension, cardiovascular disease, and other high priorities.<sup>61,63,64</sup> Together, these efforts will provide substantial new evidence to drive improvements in community and state level programmes and policies to promote health.

System enhancements to achieve a goal affect all elements of an organisation, including the organisational culture. For health-care systems, such enhancements might focus on an increase in screening for tobacco use or improvements in control of high blood pressure to effectively advance disease prevention goals. Optimisation of the health-care systems to more effectively deliver preventive services has the potential to accelerate progress in reducing the chronic disease burden. CDC's third domain approaches increase the effective delivery of clinical and other preventive services to prevent, detect early, and mitigate chronic diseases. Although health-care interventions typically have a smaller overall population effect than community interventions that include policy and environmental changes,<sup>23,65</sup> elements of the health-care system can be powerful drivers of population health improvements. Interventions that increase access to and build demand for quality preventive services, such as the National Breast and Cervical Cancer Early Detection Program,<sup>66</sup> address population health inequities and reduce health disparities. Improvements in health care have contributed to reductions in the burden of cardiovascular disease, the main cause of death and the main driver of health disparities in the USA.<sup>67</sup>

Health-care reform developments in the USA, including the Affordable Care Act and Meaningful Use regulations, provide important opportunities for additional population

health improvements. These developments include expanded population coverage, requirements for coverage of effective clinical preventive services, changes in how care is organised and paid for, enhanced involvement of a broad range of health professionals in delivery of care, increased deployment and the use of health information technology and associated methods (eg, reminders and clinical decision support), and increased measurement and reporting of successes and shortfalls.<sup>68-72</sup> Governmental public health and community health organisations can improve the use of the health-care system by defining highly effective services and priorities (eg, as in the Million Hearts initiative), by undertaking surveillance of high priority health outcomes, by assuring that the hardest to reach populations receive the clinical care they need (although this problem will not be wholly addressed by increases in insurance coverage without addressing other access barriers), and by educational and other efforts to more fully engage the public in their own health care.

The fourth domain emphasises approaches that reduce the chronic disease burden by helping people with or at high risk of chronic diseases to better manage their conditions, thereby improving quality of life, and reducing the need for care. Improved links between community and clinical settings offer community delivery of proven programmes, which clinicians might refer a patient to, with third-party payments to the community organisation and lay provider. Programmes such as The Chronic Disease Self-Management Program<sup>26,73</sup> and the National Diabetes Prevention Program<sup>45</sup> offer substantial savings over clinician-delivered models and are cost effective.

Such programmes address cardiovascular disease, diabetes, arthritis, falls in elderly people, and other risks and conditions, by delivering structured lifestyle interventions over periods ranging from weeks to months, in accordance with standard protocols and customised to a community. These programmes provide people with chronic diseases the knowledge and skills necessary to effectively manage their condition. Effective patient self-management improves quality of life, averts disease progression and complications, and reduces the number of emergency department visits.<sup>73</sup> New health-care models, such as Accountable Care Organizations, can bring an alternative focus not only on provision of excellent care to people already being reached,<sup>74</sup> but also to ensure that the whole population receiving care from an organisation is appropriately and cost-effectively served.

The four domains capture strategies that simultaneously address many conditions and risk factors by improvements to the common factors that underlie so many poor health behaviours—tobacco use, poor diet, lack of physical activity—and by strengthening opportunities and supports for engagement in healthy behaviours. For example, diabetes is a large contributor to cardiovascular disease and obesity is a major risk factor for diabetes. Tobacco use, poor diet, physical inactivity, and alcohol misuse are all causally related to cardiovascular disease and cancer.

Establishment of the community conditions to support behaviours that lead to healthy life and promote effective management of chronic conditions will deliver healthier students to schools, healthier workers to employers and businesses, and a healthier population to the health-care system. Community environments that support and reinforce healthy behaviours could substantially reduce burdens on the health-care system. As cost pressures on the health-care system intensify, the importance of environmental approaches, health system interventions, community-clinical links, and collaborations between public health and clinical medicine become crucial.

### Conclusions and future directions

Chronic diseases and non-communicable conditions are common, costly, and debilitating. With effective community and clinical strategies, they can often be prevented, or their onset delayed and duration shortened substantially. As the US population continues to age and many low-income and middle-income countries undergo similar demographic transitions, the adverse effects of chronic diseases on population health, economic growth and development, and the world's workforce will continue to grow. Substantial progress has been made in the USA, including substantial reductions in cardiovascular disease mortality and the incidence of and mortality from the leading cancers (lung, colorectal, breast); however, the prevalence of other chronic diseases and conditions, such as diabetes and obesity, continues to increase, threatening to off-set the gains. Additionally, chronic diseases and their key risk factors tend to co-occur, leading to complex interactions across diseases, risk factors, and treatments. Interventions that address them cannot be discrete and targeted, but need to address many conditions, take a multicomponent approach, and include several sectors to create environments that support and reinforce health and healthy behaviours.<sup>28</sup>

The framework in this review describes the prevention and control of chronic diseases in the USA through interventions that work at many levels, include many sectors, and are deployed in many settings to address an ageing, diverse population with many chronic diseases, conditions, and risk factors. Strengthened collaborations between the public health and health-care sectors are crucial to the intervention framework. With this approach, public health delivers a healthier population to the health-care system; the health-care system better uses prevention and early detection services to increase the quality and utility of the patient's encounter; and population health is improved and sustained by collaborations between communities and health-care providers. This approach will improve health equity by building communities that promote health rather than disease, bring more accessible and direct care into communities, and focus the health-care system on improving population health.

Many of these approaches are being implemented in the USA, either as pilot projects or with a restricted rollout, but



none has been fully deployed nationally. As the US health care undergoes further transformations with implementation of the Affordable Care Act, and as fiscal challenges continue, opportunities and needs to further improve the health status of Americans will become clearer. We need to increase our attentiveness to data, be even more vigilant with surveillance systems, and use comprehensive approaches that can be scaled up to reach the entire population, with a focus on people with the poorest health status. To reduce the chronic disease burden in the USA will require work across several sectors, including health care, to ensure that community environments promote and sustain behaviours that contribute most to health.

#### Contributors

All authors contributed equally in conceptualising the review, the writing, and revising of the manuscript.

#### Declaration of interests

We declare no competing interests.

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