Community Preventive Services Task Force

Diabetes Management: Interventions Engaging Community Health Workers

Community Preventive Services Task Force
Finding and Rationale Statement
Ratified April 2017

Table of Contents

Community Preventive Services Task Force (CPSTF) Finding and Rationale Statement

Intervention Definition

Community health workers (including promotores de salud, community health representatives, community health advisors, and others) are trained frontline public health workers who serve as a bridge between underserved communities and healthcare systems. They are from, or have an unusually close understanding of, the community served. Community health workers may address a broad range of health issues, or provide a wide range of services for patients with a specific health issue. Community health workers often receive on-the-job training and work without professional titles. Organizations may hire paid community health workers or recruit volunteers to act in this role.

Interventions engaging community health workers for diabetes management aim to improve diabetes care and self-management behaviors among patients through education, coaching, or social support to improve diabetes testing and monitoring, medication adherence, diet, physical activity, or weight management.

Community health workers deliver services and program content through one-on-one interactions or group sessions. Intervention activities take place in patients' homes, or community or clinical settings. Community health workers may work alone or as part of an intervention team comprised of clinicians, counselors, or other health professionals (e.g., nutritionist, exercise physiologists).

Community health workers (CHWs) engage in one or more of the following models of care (HRSA 2007):

- Screening and health education—CHWs deliver individual or group education on diabetes self-management, provide adherence support for medications, and monitor patients' blood pressure as recommended by the American Diabetes Association.
- Outreach, enrollment, and information—CHWs reach out to individuals and families who are eligible for medical services, help them apply for these services, and provide them with proactive follow-up and monitoring, such as appointment reminders and home visits.
- Member of a care delivery team—CHWs partner with the patient, their primary care provider, and other health professionals to improve coordination of diabetes care, education, and support.
- Patient navigation—CHWs help individuals and families navigate complex medical service systems and processes to improve their access to care.
- Community organization—CHWs facilitate self-directed change and community development by serving as liaisons between the community and healthcare systems.

CPSTF Finding (April 2017)

The Community Preventive Services Task Force (CPSTF) recommends interventions engaging community health workers for diabetes management based on strong evidence of effectiveness in improving glycemic and lipid control among participants with diabetes and reducing their healthcare use. Economic evidence indicates that interventions engaging community health workers for diabetes management are cost-effective.

Interventions engaging community health workers for diabetes management are typically implemented in underserved communities and can improve health, reduce health disparities, and enhance health equity.

Rationale

Basis of Finding

The CPSTF recommendation is based on evidence from a systematic review of 44 studies (search period through May 2015).

Included studies evaluated interventions that engaged CHWs as health education providers (38 studies); outreach, enrollment, and information agents (14 studies); members of care delivery teams (27 studies); patient navigators (9 studies); or community organizers (1 study).

Overall findings demonstrated that interventions engaging CHWs improved glycemic control (A1c, proportion at goal) and fasting blood glucose, and reduced healthcare use among participants with diabetes (Table 1).

Table 1. Outcomes Related to Glycemic Control and Healthcare Use

Outcome Measure	Results[a] by Study Design
Change in mean A1c	**Greatest suitability of study design**[b] (28 studies): Median decrease of 0.45% (IQI: -0.76 to -0.27) **Least suitable study design**[c] (8 studies): Median decrease of 0.54% (IQI: -1.2 to -0.22) **Combined study design** (36 studies): Median decrease of 0.49% (IQI: -0.76 to -0.27; median intervention duration: 12 months)
Proportion at goal A1c (A1c < 7.0%)	**Greatest suitability of study design** (5 studies): Median increase of 9.9% (range: 5.1 to 16.0) **Least suitable study design** (2 studies): Increases of 3.0% (non-significant) and 4.7% (non-significant) **Combined study design** (7 studies): Median increase of 6.6% (IQI: 3.5 to 13.0; median duration: 12 months)
Change in mean fasting blood glucose	**Greatest suitability of study design** (4 studies): Median decrease of 26.5 mg/dL (range: -41.0 to -4.3) **Least suitable study design** (2 studies): Decreases of 49.8 mg/dL (non-significant) and 28.3 mg/dL (p<0.001) **Combined study design** (6 studies): Median decrease of 29.5 mg/dL (IQI: -43.2 to -17.2; median duration: 12 months)

Outcome Measure	Results[a] by Study Design
Healthcare use	**Greatest suitability of study design** (3 studies) • Emergency department visits decreased by 26 percentage points (p<0.05; 1 study) • The rate of emergency department visits in the intervention group was 44% less than the rate of visits in the control group (95% CI: -67% to -4%; 1 study) • The rate of hospitalizations in the intervention group was 5% less than the rate of hospitalizations in the control group (95% CI: -45% to 66%; 1 study) • Emergency department visits decreased by 0.18 visits (p=0.02) and days in the hospital increased by 0.45 days (p=0.02; 1 study) **Least suitable study design** (1 study) There were non-significant improvements or decreases across all outcomes (i.e., outpatient visits, emergency department visits, hospitalizations, hospital days)

[a] Results shown in table were those reported at the end of each intervention
[b] Includes the following study designs: group and individual RCT, other design with concurrent comparison, before-and-after with comparison group
[c] Includes the following study design: before-and-after without comparison group
IQI = interquartile interval
A1c = glycated hemoglobin

Four studies reported results that could not be aggregated with those presented in the table. One study reported a mean decrease of 1.85% in A1c among participants whose baseline A1c was 9% or higher (p<0.001). Three studies that measured the proportion of participants who reached their A1c goal at different cutoffs showed favorable increases.

Studies evaluated intervention effectiveness using blood pressure control (24 studies), lipid control (18 studies), and weight-related outcomes (15 studies). Improvements were seen for lipid control; results were mixed for blood pressure control and weight-related outcomes (Table 2).

Table 2. Cardiovascular Disease Risk Factors and Weight-related Outcomes

Outcome Measure	Results[a] by Study Design
Change in mean systolic blood pressure (SBP)	**Greatest suitability of study design**[b] (15 studies): Median increase of 1.4 mmHg (IQI: -3.0 to 5.0) **Least suitable study design**[c] (7 studies): Median decrease of 2.3 mmHg (IQI: -9.0 to -1.0) **Combined study design** (22 studies): Median decrease of 0.5 mmHg (IQI: -4.7 to 4.1; median duration: 12 months)
Change in mean diastolic blood pressure (DBP)	**Greatest suitability of study design** (12 studies): Median increase of 0.58 mmHg (range: -3.2 to 1.9) **Least suitable study design** (6 studies): Median decrease of 1.9 mmHg (IQI: -4.3 to -0.92) **Combined study design** (18 studies): Median decrease of 0.74 mmHg (IQI: -3.3 to 1.4; median duration: 12 months)
Change in mean total cholesterol	**Greatest suitability of study design** (8 studies): Median decrease of 6.9 mg/dL (IQI: -24.8 to -2.2) **Least suitable study design** (4 studies): Median decrease of 10.7 mg/dL (range: -38.6 to -8.0) **Combined study design** (12 studies): Median decrease of 8.9 mg/dL (IQI: -24.5 to -3.5; median duration: 12 months)
Change in mean low density lipoprotein (LDL) cholesterol	**Greatest suitability of study design** (11 studies): Median decrease of 5.8 mg/dL (IQI: -9.9 to 6.0) **Least suitable study design** (3 studies): Median decrease of 10.5 mg/dL (range: -12.9 to -6.9) **Combined study design** (14 studies): Median decrease of 6.9 mg/dL (IQI: -10.7 to 0.70; median duration: 12 months)

Outcome Measure	Results[a] by Study Design
Change in mean high density lipoprotein (HDL) cholesterol	**Greatest suitability of study design** (7 studies): Median increase of 0.8 mg/dL (IQI: -3.1 to 5.6) **Least suitable study design** (2 studies): Increases of 1.1 mg/dL (p=0.22) and 2.4 mg/dL (p=0.09) **Combined study design** (9 studies): Median increase of 1.1 mg/dL (IQI: -1.3 to 4.0; median duration: 18 months)
Change in mean triglycerides	**Greatest suitability of study design** (6 studies): Median decrease of 11.6 mg/dL (IQI: -15.0 to 1.1) **Least suitable study design** (3 studies): Median decrease of 17.5 mg/dL (range: -38.0 to 0) **Combined study design** (9 studies): Median decrease of 12.6 mg/dL (IQI: -16.3 to -2.0; median duration: 18 months)
Change in mean BMI	**Greatest suitability of study design** (10 studies): Median decrease of 0.20 kg/m^2 (IQI: -0.88 to 0.23) **Least suitable study design** (7 studies): Median increase of 0.10 kg/m^2 (IQI: -0.60 to 0.40) **Combined study design** (17 studies): Median decrease of 0.20 kg/m2 (IQI: -0.70 to 0.26; median duration: 6 months)
Change in mean weight	**Greatest suitability of study design** (6 studies): Median decrease of 1.5 lbs (IQI: -7.3 to 5.2) **Least suitable study design** (4 studies): Median increase of 1.8 lbs (range: -5.4 to 4.0) **Combined study design** (10 studies): Median increase of 1.1 lbs (IQI: -5.7 to 3.6; median duration: 15 months)

[a] Results shown in table were those reported at the end of each intervention

[b] Includes the following study designs: group and individual RCT, other design with concurrent comparison, before-and-after with comparison group

[c] Includes the following study design: before-and-after without comparison group

IQI = interquartile interval

Evidence measuring health behavior outcomes (15 studies) was largely self-reported. Increases in physical activity and improvements in nutrition were seen across studies (Table 3).

Table 3. Health Behavior Change Outcomes

Outcome Measure	Results[a] by Study Design
Physical activity outcomes	**Greatest suitability of study design**[b] (10 studies; median duration: 12 months) • Statistically significant improvements (1 study) • Non-significant improvements (5 studies) • No improvements (3 studies) • Non-significant decrease (1 study) **Least suitable study design**[c] (5 studies; median duration: 3 months) • Statistically significant improvements (2 studies) • Non-significant improvements (2 studies) • No improvement (1 study)
Nutrition outcomes	**Greatest suitability of study** (8 studies; median duration: 12 months) • Statistically significant improvements (1 study) • Non-significant improvements (5 studies) • No improvement (2 studies) **Least suitable study design** (4 studies; median duration: 3 months) • Statistically significant improvements (1 study) • Non-significant improvements (3 studies)

[a] Results shown in table were those reported at the end of each intervention

[b] Includes the following study designs: group and individual RCT, other design with concurrent comparison, before-and-after with comparison group

[c] Includes the following study design: before-and-after without comparison group

In 17 studies, CHWs participated as a member of a formal team-based care (TBC) intervention. The Community Preventive Services Task Force recommends team-based care to control type 2 diabetes [www.thecommunityguide.org/findings/diabetes-management-team-based-care-patients-type-2-diabetes] based on strong evidence of effectiveness. For glycemic control, interventions that applied CHWs to team-based care models were comparable to interventions in which CHWs implemented interventions alone (-0.6% A1c for both strata). The findings were reversed, however, for blood pressure outcomes.

- Systolic blood pressure (SBP)
  - CHW+TBC: -2.6 mmHg (IQI: -5.7 to 1.0 mmHg)
  - CHW alone: 2.2 mmHg (IQI: -4.5 to 4.0 mmHg)
- Diastolic blood pressure (DBP)
  - CHW+TBC: -3.0 mmHg (IQI: -3.4 to -0.2 mmHg)
  - CHW alone: 1.4 mmHg (IQI: -1.0 to 1.8 mmHg)

Only three studies provided evidence on the incremental effectiveness of adding a CHW to a diabetes management intervention. These studies demonstrated that engaging a CHW improved glycemic control (1 study) and blood pressure (2 studies).

Applicability and Generalizability Issues

Included studies were from the United States (39 studies), the United Kingdom (3 studies), and Australia (2 studies). Studies were conducted in urban (21 studies), rural (6 studies), or mixed (3 studies) areas; 14 studies did not report this information. CHWs delivered services in clinics (e.g., primary care settings, Federally Qualified Health Centers; 13 studies), community centers (e.g., YMCA, faith-based organization; 6 studies), homes (3 studies), or multiple settings (22 studies); none of the studies delivered services in work settings. Studies included a median of 4 CHWs (33 studies). There was a median of 101 participants (IQI: 68 to 173; 44 studies, including 2 studies with more than 500 participants).

In the included studies, CHWs served adults ages 18–64 years old (32 studies), older adults ages 65 years and older (1 study), adults 18 years and older (3 studies), or patients of all ages (3 studies); 5 studies did not report this information. Across all studies, participants were mostly female (70%; IQI: 61% to 78%). Results examined by gender were similar, though additional evidence on ways to recruit and retain males would be helpful for future studies. In the included studies, participants had type 2 diabetes (31 studies), type 1 or 2 diabetes (6 studies), or diabetes of unspecified type (7 studies).

CHWs engaged participants using a team based care approach (17 studies), as a member of care delivery team (10 studies), or as the primary implementer (17 studies). In the 27 team studies, the other team member was most often a physician (19 studies), nurse (15 studies), or registered dietitian (12 studies).

The core roles are the duties of individual CHWs that are used to identify their possible responsibilities, qualities, and skills used to engage participants for diabetes management. In this review, CHWs met a median of 3.5 core roles that included providing culturally appropriate information (37 studies), building individual and community capacity (33 studies), coaching (32 studies), and coordinating care or case management (17 studies) (C3 Project).

Intervention duration was less than 6 months (7 studies), 6-12 months (26 studies), or longer than 12 months (11 studies), with a median duration of 12.3 months. CHWs delivered interventions through group sessions (10 studies), one-on-one sessions that were either in-person (9 studies) or by telephone (3 studies), or a combination of both (19 studies); 2 studies did not report how interventions were delivered. Interaction frequency between CHWs and participants occurred weekly (7 studies), bimonthly (5 studies), monthly (5 studies), or varied (8 studies); 19 studies did not report interaction frequency. For studies that reported visit length, the average duration was 120 minutes for group sessions (17 studies) and 60 minutes for one-on-one, in-person interactions (12 studies). The median number of CHW-participant contacts was 12 (IQI: 6 to 24).

Thirty-six studies evaluated programs that enrolled participants from underserved groups as defined by race/ethnicity, education, or annual income. Study populations were all (14 studies) or mostly (2 studies) Hispanic, all African-American (2 studies), all Asian (3 studies), or at least 75% Native Hawaiian or Pacific Islander (2 studies), American Indian (2 studies), or indigenous Australian (2 studies). Most participants had less than a high school education (14 studies) or averaged less than 12 years of education (8 studies), and in 18 studies the majority of participants had annual incomes of $30,000 or less. Findings from these studies suggest CHW interventions targeted to underserved groups are likely to reduce health disparities.

Data Quality Issues

Study designs included individual randomized controlled trials (15 studies), before-and-after designs without comparison groups (13 studies), group randomized controlled trials (5 studies), before-and-after designs with comparison groups (5 studies), other designs with concurrent comparison groups (5 studies), and 1 retrospective cohort study. Common limitations affecting this body of evidence were loss to follow-up, insufficient reporting of sampling methods and intervention descriptions, and self-selection bias.

Other Benefits and Harms

Community health workers are often trained to provide participants with additional health and social support services that extend beyond the aims of the specific diabetes management intervention. This helps establish a bridge between healthcare systems, providers, and the communities they serve.

No potential harms to participants, communities, or CHWs were identified. CHW roles and services should be designed to complement and support ongoing clinical treatment and management.

Economic Efficiency

A systematic review of economic evidence found that interventions engaging community health workers for management of diabetes are cost-effective.

The review included 13 studies (search period through July 2016). Studies were based in the United States (10 studies), the United Kingdom (2 studies), and Australia (1 study). Studies were set in communities, clinics, and diabetes centers, and several included home visits by CHWs. The majority of patients served were from minority or low-income populations. Six of the interventions engaged CHWs within a team-based care approach. All monetary values are reported in 2016 U.S. dollars.

Intervention Cost

The major drivers of intervention cost are the cost of CHW wages, supervision and training of CHWs, and the cost of any additional staff or additional interventions. All 13 studies reported on intervention cost, with a median cost per patient per year of $585 (IQI: $389 to $1,578). No studies provided a reasonably complete estimate of intervention cost that included all the major drivers. The costs most often missing from studies were the costs of training or supervising CHWs.

Healthcare Cost

The major drivers of healthcare cost are costs associated with outpatient and inpatient care, medications, and emergency room visits. The change in patients' healthcare cost due to intervention was reported in four studies, with a median reduction in cost per patient per year of $72 (IQI: $364 decrease to $856 increase). Only one study that reported estimates included all the major drivers. The component most often missing from studies was cost of outpatient visits.

Total Cost

Total cost is measured as the sum of change in healthcare cost due to the intervention and the cost of the intervention. Hence, a negative value indicates that averted healthcare cost exceeds the intervention cost. The median total cost per patient per year was $1,454 (IQI: $504 to $3,504) based on four studies.

Other Cost

While several studies indicated CHW activities included facilitating access to social services, none of the studies measured or reported the incremental cost of social services as a result of the intervention.

Cost-Benefit

No studies provided cost-benefit estimates for CHW interventions.

Cost-effectiveness

The median cost per quality-adjusted life year (QALY) gained was $38,276 (IQI: $14,000 to $61,294; 5 studies). One of the studies found the intervention to be cost-effective for uninsured and publicly insured subgroups and not cost-effective for a commercially insured subgroup. The commercially insured subgroup had a lower baseline A1c and also achieved a smaller reduction in A1c compared to the other subgroups.

Reviewers computed cost per QALY gained for two studies that did not report their own cost-effectiveness outcomes but provided sufficient information for an estimation. Reductions in A1c reported in the two studies were translated to QALY gained using published methods where one percentage point change in A1c = 0.39 QALY with a standard deviation of 0.16 (Valentine et al., 2006). One of the translated estimates showed the intervention was cost-effective at $20,800 per QALY gained while the other translated estimate was not cost-effective at $144,581 per QALY gained. The study that showed the intervention was not cost-effective had a high cost of intervention due to a smaller intervention group size, a smaller reduction of A1c starting from a lower baseline, and no change in short term healthcare cost.

Estimates of cost-effectiveness were reasonably complete in their inclusion of drivers of cost and incorporated appropriate modeling to long term outcomes. Four of the seven studies included all drivers of healthcare cost but either CHW training or CHW supervision were not included in the cost of intervention estimated in most studies. QALY gained due to averted complications were estimated for all seven studies within validated and established diabetes models.

Overall, the weight of evidence indicates interventions engaging community health workers for management of diabetes are cost-effective.

Considerations for Implementation

Linkages between communities, worksites, clinics, and health centers are important in the reimbursement and delivery of CHW services. Rulings by the Centers for Medicare and Medicaid Services provide emerging opportunities for sustainable funding of CHW services. In 2013, the Centers for Medicare and Medicaid Services began allowing states to provide Medicaid reimbursement for preventive services recommended by the U.S. Preventive Services Task Force when “recommended by a physician or other licensed practitioner” and delivered by a broad array of health professionals, including CHWs (CMS 2013). States determine which services are covered, who provides them (including any required education, training, experience, credentialing, certification, or registration), and how providers are reimbursed.

States have faced challenges implementing reimbursement plans that operate in connection with healthcare systems and practitioners. Efforts are being made to address this through referral systems that use bidirectional linkages,

feedback loops that facilitate communication between referring providers and those delivering services, and educational programs that aim to raise awareness about these systems and increase their use.

Multisite healthcare systems may operate by having CHWs associated with each site or by centralizing their CHW services through an organization such as a health department. A health department (i.e., central organization) may provide greater efficiency and coordination when working with smaller systems and clinics. One study by Nelson et al. (2017) reported that centrally organized CHW services improved A1c levels in participants with poor glycemic control. Important considerations for delivery of service are integration of CHWs within the clinic or system and intensity of their engagement with participants.

Previous research has shown a link between reductions in A1c (blood glucose) and clinical outcomes. The United Kingdom Prospective Diabetes Study found that for every one percentage point decrease in A1c, there was a reduction in diabetes-related deaths, all-cause mortality, combined fatal and nonfatal myocardial infarction, and risk of microvascular complications (UKPDS, 1998).

Community health workers are important team members across different healthcare delivery models. They frequently partner with professionals in health, academic, and local communities. They have the flexibility to be members of a team or engage participants as primary implementers of an intervention.

In Community Guide reviews about interventions engaging community health workers, included studies have reported limited information about training standards and CHW credentialing and certification. Many states, however, are establishing laws, regulations, and statutes to guide these processes (ASTHO 2016). Most studies in this review reported that CHWs received “some” training, usually focused on diabetes management education, but there was limited evidence on specific types, methods, and duration of training.

Consideration should be given to the frequency and settings for interactions between CHWs and participants. Interventions commonly combined group sessions with one-on-one in-person interactions (most common) or telephone interventions (second most common). Overall, studies reported improvements in glycemic, lipid, and self-management outcomes, though there was not enough evidence to determine whether mode of delivery had an effect on individual outcomes. Many studies reported on interaction frequency between CHWs and participants (e.g., weekly, bimonthly), but there was not enough data to assess effects on outcomes. CHWs were effective across 4 of the 5 described models of care: screening and health education; outreach, enrollment, and information; member of a care delivery team; and patient navigation. Within all 4 models, improvements were seen for glycemic control though there were minimal effects on blood pressure control. There was limited evidence for the community organizer model.

CHWs are typically matched to the populations they serve and the specific services they deliver. In the included studies, CHWs were frequently matched with populations by location, race or ethnicity, language, or disease status. Favorable effects were reported when CHWs were matched by location, race or ethnicity, or disease status. CHWs most often provided participants with culturally appropriate information and education on diabetes management, helped build individual and community capacity, provided informal counseling, coaching and social support, and facilitated and assisted with care coordination and case management. Interventions were applicable across these core roles. In general, the more core roles met, the more favorable the outcome. While CHWs were most effective in community settings, some also conducted home and clinic visits to ensure participants got the services they needed.

Evidence Gaps

Many of the studies had fewer than 100 participants and were conducted in urban settings. More evidence is needed on effectiveness of large-scale programs (i.e., those with more than 500 participants) and programs conducted in rural settings. Study participants were predominantly female. More evidence is needed on ways to recruit and retain males.

In 31 reporting studies, the median age of participants was 54.6 years, and none of the included studies had adolescents. More evidence is needed on intervention effectiveness among younger and older adult populations. In addition, more research is needed with older adults to understand intervention effects on diabetes-related complications and management of comorbidities.

Included studies had a median intervention duration of 12.3 months. Long-term evaluations are needed to understand effects on glycemic control and weight management over time. Additionally, more information on frequency and duration of CHW–participant interactions would be useful.

More information is needed on reimbursement arrangements including CMS implementation and funding of CHW services through clinic- or community-based providers. Similarly, more research is needed on linkages between communities, worksites, clinics, and health centers and how they distribute and implement diabetes management resources across diverse settings and populations, including underserved groups.

Studies evaluated interventions that most often used models of care focused on culturally appropriate health education and CHWs as members of care delivery teams. More information is needed about interventions that engage CHWs as patient navigators, community organizers, and outreach, enrollment, or information agents. More evidence is needed to understand effective methods for recruiting, training, and supervising CHWs. It also would be helpful to understand the effect of CHWs' experience and educational attainment on diabetes outcomes.

Evidence was mixed for intervention effects on other risk factors for cardiovascular disease (e.g., blood pressure control) and weight control. More comparative studies with increased reporting of cardiovascular risk and weight outcomes are needed. Similarly, evidence assessing medication and pharmacologic management of diabetes and diabetes-related conditions would be useful as many of the included studies did not report on medication adherence and use.

Studies that qualified for the economic review had incomplete reporting and inclusion of important drivers of intervention cost and healthcare cost. In particular, studies did not often include the cost to train or cost to supervise CHWs. Additional economic studies are needed to assess the costs and economic benefits of interventions that engage CHWs in different ways, such as interventions that use CHWs within team-based care or interventions in which CHWs are the primary implementers.

References

ASTHO 2016 Community Health Workers: Orientation for State Health Departments 2016. Available at URL: http://www.astho.org/Community-Health-Workers/CHW-Orientation-Presentation-Slides/

Centers for Medicare & Medicaid Services (CMS). 78 Fed Reg 42160 (July 15, 2013). "a. Diagnostic, Screening, Preventive, and Rehabilitative Services (Preventive Services) (§ 440.130)" (paragraph citation: 78 FR 42226) www.gpo.gov/fdsys/pkg/FR-2013-07-15/pdf/2013-16271.pdf

Community Health Worker Core Consensus (C3) Project. Available at URL: http://chrllc.net/id12.html

Community Health Worker Core Consensus (C3) Project document. Available at URL: https://sph.uth.edu/dotAsset/55d79410-46d3-4988-a0c2-94876da1e08d.pdf

Health Resources Services Administration (HRSA), Bureau of Health Professions. Community health worker national workforce study. U.S. Department of Health and Human Services. Rockville (MD); 2007. Available at URL: https://bhw.hrsa.gov/sites/default/files/bhw/nchwa/projections/communityhealthworkforce.pdf

Nelson K, Taylor L, Silverman J, Kiefer M, Hebert P, Lessler D, et al. Randomized Controlled Trial of a Community Health Worker Self-Management Support Intervention Among Low-Income Adults With Diabetes, Seattle, Washington, 2010–2014. *Prev Chronic Dis* 2017;14:160344. DOI: http://dx.doi.org/10.5888/pcd14.160344

UK Prospective Diabetes Study Group: Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). *Lancet* 352:837–53, 1998.

Valentine W, Palmer A, Nicklasson L, Cobden D, Roze S. Improving life expectancy and decreasing the incidence of complications associated with type 2 diabetes: a modelling study of HbA1c targets. *International Journal of Clinical Practice* 2006;60(9):1138-45.

Disclaimer

The findings and conclusions on this page are those of the Community Preventive Services Task Force and do not necessarily represent those of CDC. CPSTF evidence-based recommendations are not mandates for compliance or spending. Instead, they provide information and options for decision makers and stakeholders to consider when determining which programs, services, and policies best meet the needs, preferences, available resources, and constraints of their constituents.

Document last updated September 7, 2017