HHS Public Access

Author manuscript

Glob Heart. Author manuscript; available in PMC 2020 July 03.

Published in final edited form as:

Glob Heart. 2015 March ; 10(1): 3–11. doi:10.1016/j.gheart.2014.12.013.

Appraising the Evidence for Public Health Policy Components Using the Quality and Impact of Component Evidence Assessment

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Abstract

An essential strategy expected to reduce the global burden of chronic and cardiovascular disease is evidence-based policy. However, it is often unknown what specific components should constitute an evidence-based policy intervention. We have developed an expedient method to appraise and compare the strengths of the evidence bases suggesting that individual components of a policy intervention will contribute to the positive public health impact of that intervention. Using a new definition of "best available evidence," the Quality and Impact of Component (QuIC) Evidence Assessment analyzes dimensions of evidence quality and evidence of public health impact to categorize multiple policy component evidence bases along a continuum of "emerging," "promising impact," "promising quality," and "best." QuIC was recently applied to components from 2 policy interventions to prevent and improve the outcomes of cardiovascular disease: public-access defibrillation and community health workers. Results illustrate QuIC's utility in international policy practice and research.

Most deaths are due to noncommunicable conditions (e.g., chronic disease), which account for 6 in 10 deaths globally [1]. The World Health Organization predicts that cardiovascular disease will be the single leading cause of death in 2015, with an estimated 20 million people dying mainly from heart disease and stroke [2]. An essential strategy to prevent and control public health problems, including chronic and cardiovascular disease, is evidence-based policy [3]. Although evidence-based policy has the potential for an enormous impact on health, translation of evidence on effective public health interventions into evidence-based policy strategies for broad dissemination will require appraisal of existing evidence [4–6].

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The authors report no relationships that could be construed as a conflict of interest.

Rigorous evidence syntheses (i.e., systematic reviews), such as those produced by the United States Clinical and Community Guides to Preventive Services [7] and the Grading of Recommendations, Assessment, Development, and Evaluation system [8], have resulted in many evidence-based guidelines and recommendations. However, because of the length of time required to identify, review, and evaluate evidence (i.e., about 12 months) [9,10], traditional systematic review methods such as these cannot realistically be used to study every policy option, especially when many public health problems are urgent [4]. In 2005, gaps in the traditional evidence base for public health interventions prompted the United States Institute of Medicine to call for action on the basis of the "best available evidence," as opposed to the "best possible evidence" [11]. To increase the discovery, study, and application of effective public health interventions, researchers have developed new frameworks and expedient methods for evaluating the best available evidence [9,12–18]. Several of these approaches now classify interventions along an evidence continuum or in a typology that includes categories such as "emerging," "promising," and "best" [9,13,14,16].

Public health policy interventions can be defined as new or altered courses of action influencing or determining decisions, laws, rules, or regulations governing health or related health behaviors [9]. Rapid evidence assessment methods are especially important for developing policy interventions because windows of time for evidence to influence policy making are short [10,19]. The use of the best available evidence is also necessary because the rigorous designs used to assess clinical interventions are often not feasible or appropriate to assess policy interventions [20]. Furthermore, most public health interventions, including policy interventions, are made up of many components, each with its own evidence base [6]. Brennan et al. [9,21] recently developed an expedient evidence assessment method for policy and environmental interventions to prevent childhood obesity [9,21] in which the policy interventions assessed could have multiple components (i.e., using more than 1 related activity) or be complex (i.e., using multiple approaches that are not inherently distinct) [7]. They noted that the nature of policy would require the capacity to delineate the many moving parts to determine the minimal intervention components required for effectiveness. Brownson et al. [3] have also identified the need to better describe the evidence-based elements within existing and proposed policy to find the "active ingredients."

Indeed, it is too often unknown what specific components should constitute an evidence-based public health policy intervention. To expediently appraise and compare the strengths of multiple evidence bases suggesting that individual components of a public health policy intervention will contribute to the positive public health impact of that intervention, we developed the Quality and Impact of Component (QuIC) Evidence Assessment method. In this report, we 1) describe how QuIC was developed and provide an overview of the method, 2) present results of using QuIC to appraise the evidence for 2 cardiovascular disease–related policy interventions (public-access defibrillation [PAD] and community health workers [CHWs]), and 3) discuss QuIC's utility in international public health policy research and practice, including its strengths and limitations.

METHODS

Our team included 2 public health policy analysts and 4 public health policy research and measurement development experts. Our first step was to select 2 cardiovascular disease–related interventions with evidence of positive (i.e., desired) outcomes, which we also knew had existing state-level policy applications (e.g., laws, including statutes and regulations) in the United States: PAD and CHWs [22,23]. PAD facilitates the use of automated external defibrillators (AEDs) by the public and increases the likelihood of survival after out-of-hospital sudden cardiac arrest [24]. Existing U.S. state PAD policies support state, local, and organizational PAD programs in a state [22]. CHWs are lay health workers who improve the cultural competence and quality of service delivery, especially for minority and vulnerable populations, and have evidence of reducing hypertension [25], among other positive outcomes. Existing U.S. state CHW policies support the CHW workforce practicing in a state [23].

After we selected policy interventions of interest, we defined the best available evidence for public health interventions, including policies, by reviewing definitions from the published research [3,9,12–18,26,27]. Next, we searched for this evidence generally for PAD and CHWs by querying Web resources and consulting with subject-matter experts at the Centers for Disease Control and Prevention (CDC). We found very little evidence about PAD or CHW policy interventions (as defined earlier); most evidence pertained to practices and programs. Using the evidence collected, we identified individual policy components for assessment, where policy components were defined as discrete though sometimes related activities that are part of an existing or recommended policy intervention. For example, we used the American Heart Association's recommended PAD legislative strategies for states, along with other evidence, to identify and describe evidence-based PAD policy components (e.g., targeted AED site placement) [28]. When we examined component-level evidence, we found that although each intervention as a whole (i.e., PAD and CHWs) included experimental or quasi-experimental evidence, the evidence bases for individual components of PAD and CHWs largely did not. For example, experimental evidence shows positive outcomes of CHW programs [25], but many components within these CHW programs (e.g., certification of CHWs) have not been studied experimentally, even though many are recommended in the U.S. as part of state policies and programs [29].

On the basis of this review, we developed a new definition of "best available evidence" for the policy components under study. Similar to existing evidence assessment methods (including the Community Guide), QuIC's best available evidence includes evidence from practice in addition to evidence from research [7,9,12–18]. This includes evidence on "upstream," "midstream," and "downstream" interventions with diverse outcomes at the individual and population levels [3]. However, QuIC's new definition also includes evidence on practice, program, and policy interventions, which are used to infer potential policy impact; evidence for which the effect or association of the component has not been extracted from the effect or association of the broader intervention; and parallel evidence, defined as evidence of positive outcomes from similar strategies used to address other public health issues [27]. For example, evidence showing CHWs' effectiveness at asthma management was considered parallel evidence for CHWs' management of heart disease and stroke.

After defining the best available evidence, we developed the QuIC framework and method. Evidence quality and (evidence of) public health impact were selected from an existing conceptual framework, developed by the CDC, as the 2 key dimensions for assessing the strength of an evidence base for a policy component [16]. After reviewing the published research on these dimensions, we chose 8 criteria to include in the QuIC framework: 4 to assess evidence quality and 4 to assess evidence of public health impact. QuIC's criteria for evidence quality include the following:

- Study type: This criterion was chosen because study type (e.g., design) can indicate rigor and internal validity [17]. For example a quasi-experimental study would have a control or comparison group and/or multiple time points, which increase internal validity [15].
- Source: This criterion was chosen because author credibility can be used as a proxy for evidence quality in decision making [30]. Expert peer review [17] and transparency of methods and sponsorship [31] both increase source credibility. Practice or theory-based evidence: Too much public health evidence is from controlled research that does not fit realities of practice. This criterion was chosen because practice-based evidence takes into account diverse circumstances [32] and because interventions should be grounded in sound theory [6,15].
- Research-based evidence: This criterion was chosen because empirical evidence can produce generalizable results and generalizability is needed to make inferences about effectiveness for a population [33].

QuIC's criteria for evidence of public health impact include the following:

- Health: This criterion was chosen because affecting health status is a long-term intended outcome of public health policy [3]. Heath impact results from both effect size and reach, where reach is defined as the extent that the intervention affects intended population(s) [16].
- Equity: Equity is defined as fairness in the distribution of health and the social determinants of health among people [34,35]. This criterion was chosen because health disparities are responsible for many public health problems, including much of the cardiovascular disease burden [1,2,36]. Equity impact also results from effect size and reach.
- Efficiency: An efficient allocation of resources occurs when maximum output is obtained from a particular combination and quantity of resource inputs [34]. This criterion was chosen because policy makers must maximize effectiveness with diminishing funds [37]. Efficiency impact also results from effect size and reach.
- Transferability: This criterion was chosen to suggest the extent that an intervention can be applied to or adapted for different contexts [16], including different settings and populations [15,38]. Diverse contexts in the supporting evidence base suggest wider applicability and greater potential public health impact.

These 8 criteria are domains in QuIC's evidence quality and evidence of public health impact assessment scales, which were developed to produce an evidence quality score (quality score) and an evidence of public health impact score (impact score) for each component assessed as part of a public health policy intervention. (The scales are provided in the QuIC Handbook, which is available on request.) Scale levels were selected using published research on existing evidence hierarchies and assessment tools, and point designations were assigned to scale levels using the expertise of our team in measurement development. We also developed an evidence strength continuum (i.e., quadrant; see Figures 1 and 2) to simultaneously consider quality and impact scores to determine if a policy component is "emerging," "promising impact," "promising quality," or "best." Descriptions and potential next steps were created for components falling into each of the evidence strength categories (Table 1).

To test usability and reliability of QuIC, it was independently applied to evidence bases for PAD policy components in February and March 2014 and CHW policy components in March and April 2014 by 3 policy analysts. During this phase, the analysts developed additional decision rules and definitions to resolve disagreements. The final rules and definitions were reviewed by the team as a whole and are documented in the QuIC Handbook.

THEORY AND CALCULATION

There are 7 steps in a QuIC Evidence Assessment:

1. Collect evidence and use it to identify discrete components of a policy intervention.
2. Select and train raters.
3. Raters classify the evidence base to each policy component.
4. Raters complete evidence quality assessments.
5. Raters complete evidence of public health impact assessments.
6. Assess interrater reliability and have raters reach consensus.
7. Determine evidence strength categories and next steps.

The following provides a brief overview of each step. For more details, including step-by-step instructions for completing a QuIC assessment, refer to the QuIC Handbook.

Step 1: Collect evidence and use it to identify discrete components of a policy intervention

First, one must select a public health policy intervention with some evidence of efficacy and/or effectiveness. Web resources (e.g., PubMed) and subject-matter experts provide evidence, which is reviewed to identify and define discrete components of the policy intervention for assessment. During this step, highly interrelated policy components are not separated for assessment. For example, requiring publicly accessible AEDs to be registered with emergency medical services and requiring AED users to call 911 are highly related

components that are part of the broader component of PAD coordinated with emergency medical services.

Step 2: Select and train raters

A minimum of 2 raters with some subject-matter knowledge in the area under study are selected to classify evidence in step 3 and to assess evidence quality and evidence of public health impact in steps 4 and 5. Using more than 1 rater provides data to assess interrater reliability and is also expected to improve the validity of assessments. Although raters with only an introductory background to research methods are expected to use QuIC reliably, subject-matter knowledge will help raters better interpret evidence of public health impact. To ensure consistent application of QuIC, raters are trained by reviewing the QuIC Handbook and by classifying and rating a sample of pre-classified and pre-rated evidence.

Step 3: Raters classify the evidence base to each policy component

The raters' first task is to complete an independent review of the policy intervention evidence base and classify relevant evidence to each policy component. The QuIC Handbook instructs raters to classify an item of evidence (e.g., 1 journal article) to a policy component's evidence base if it 1) provides a rationale for why the component will have or contribute to a positive (i.e., desired) outcome and/or 2) uses data analysis to examine outcomes of the component or of an intervention using the component and finds a desired outcome. To reduce redundancy of information, raters ensure that every item adds new data or a new argument (e.g., a new expert's opinion) and does not simply summarize other evidence. If raters find that a component or intervention has evidence of harming human health, the assessment of that component or intervention is terminated, as QuIC is not designed for assessing evidence bases with mixed findings. Overall, an iterative process of collecting evidence, defining the policy components, and classifying the evidence is used.

Step 4: Raters complete evidence quality assessments

The raters next independently assess evidence quality for each component by completing a structured review of the evidence and then applying an evidence quality scale (quality scale) to each component's evidence base as a whole. The quality scale ranges from 0 to 40, with its 4 domains evenly weighted at 10 points each. Step 4 is repeated for each component being assessed so that each receives a quality score out of 40. For the scoring protocol, refer to the QuIC Handbook.

Step 5: Raters complete evidence of public health impact assessments

The raters next independently assess evidence of public health impact for each component by completing a structured review of the evidence and then applying an evidence of public health impact scale (impact scale) to each component's evidence base as a whole. The impact scale ranges from 0 to 40, with its 4 domains evenly weighted at 10 points each. Step 5 is repeated for each component being assessed so that each receives an impact score out of 40. For scoring protocol, refer to the QuIC Handbook.

Step 6: Assess interrater reliability and have raters reach consensus

Interrater reliability remains important to assess because judgments made by humans are prone to measurement error [39]. Interrater reliability is analyzed separately for the quality and impact scales using methods developed by Shrout and Fleiss [39] to calculate an intraclass correlation coefficient with data from raters' independent assessments. Afterward, raters resolve their discrepancies and reach consensus on final scoring.

Step 7: Determine evidence strength categories and next steps

The final quality and impact scores for each component are used to determine a single evidence strength category for each component: emerging, promising impact, promising quality, or best. This is accomplished using a quadrant (see Figures 1 and 2) that includes the two 40-point quality and impact scales as axes; a quality or impact score of 21 or more moves a component into the adjacent quadrant. The final task of a QuIC assessment is to propose next steps for each policy component on the basis of where each fell along the evidence continuum (Table 1).

RESULTS AND DISCUSSION

Table 2 and Figure 1 show scores and categorizations for 7 evidence-based PAD policy components, and Table 3 and Figure 2 show scores and categorizations for 14 evidence-based CHW policy components. Reliability was high in both assessments [40]. Figures 1 and 2 also illustrate that evidence quality and evidence of public health impact are likely interrelated constructs, as suggested by Spencer et al. [16]. The CHW assessment results were published in September 2014 in the Policy Evidence Assessment Report [40], the first in a series of reports developed by the CDC to translate and disseminate results of QuIC assessments. (The CHW Policy Evidence Assessment Report provides a list of the evidence reviewed in the assessments as well as evidence inclusion and exclusion criteria and search terms. This report also includes summaries of the evidence for each policy component assessed as well as the results of reliability assessments for the quality and impact scales. The PAD policy component evidence assessments were completed primarily to help develop QuIC and are not published; however, additional documentation [e.g., reliability analysis results] is available upon request.)

The results of these QuIC applications have international implications. Evidence supporting PAD policy components included studies set in many developed countries (e.g., England, Canada, the United States, Japan, Denmark); thus, results can inform policy development in these and similar countries. In addition, this assessment identified evidence gaps; we found no evidence suggesting PAD's impact on health disparities, which remains important to study given disparities in cardiovascular disease [1,2,36] and sudden cardiac arrest [41]. Although we excluded evidence from low-resource settings during the CHW assessments to ensure a sufficient level of comparability across CHW interventions [40], these QuIC results also have international relevance. Many components of CHW policy to address chronic disease in the United States (e.g., providing CHWs with standard specialty area training) could be adapted and included in the CHW policies of other countries, including those in the developing world, where lay health workers remain a critical strategy and chronic disease a

growing problem [1,2,42]. Furthermore, our results provide parallel evidence for similar CHW policy strategies that are especially relevant for the developing world, including policies for promoting maternal and child health and for preventing the human immunodeficiency virus [42,43].

We found that the main strength of QuIC, compared with existing evidence assessment methods, is its potential to assess many policy component evidence bases, for which evidence might range from emerging to well-established. This strength is due mostly to QuIC's broad definition of "best available evidence." Furthermore, on the basis of the assessments of 7 PAD components with 34 items of evidence and 14 CHW components with 57 items of evidence, QuIC assessments of similar scopes could be completed by 2 part-time policy research staff members in about 2 to 3 months. This time frame could be considered expedient compared with the 12 months typically expected for a systematic review of only 1 component [10]. Moreover, other approaches for assessing evidence often involve convening an expert panel [17], which might not always be practical when attempting to assess a large number of policy options. Finally, although QuIC's formative assessments included only cardiovascular disease–related policy interventions, we expect QuIC to be applicable to a broad range of public health policy topics because QuIC criteria were selected on the basis of published research general to public health policy analysis.

There are several limitations of QuIC. One is that QuIC only assesses evidence of a positive public health impact; as such, it does not combine or compare separate study findings on component or intervention outcomes, as in systematic review and meta-analysis. We do not conduct this analysis for two reasons. First, many interventions will have both successful and unsuccessful applications, depending on context [6]. Aggregating primary study findings could result in QuIC undervaluing components that are part of interventions successful in some settings and for some populations. Nevertheless, if QuIC finds any harm to human health, an assessment is terminated. The second reason that QuIC does not combine or compare separate study findings is that QuIC is intended to be "quick," so that assessments can be completed during the short windows of opportunity for policy change [19]. We surmised that the process of combining and comparing findings would be time consuming and potentially inappropriate, given the heterogeneity of outcomes assessed.

An additional limitation, related to our definition of "best available evidence," is that what works well as a practice or program might not work at the policy level, because many determinants of the policy process can influence outcomes [44,45]. We decided that the potential cost of this limitation did not exceed the value that practice and programmatic evidence could provide in the absence of policy evidence. Another limitation related to our definition of "best available evidence" is that QuIC attributes some part of a desired health effect or association to all the components that constitute an intervention with equal weight. This assumption is necessary because it is unlikely that all the individual components of recent policy interventions have been studied independently. We ultimately address the described limitations by using a mixed approach to present QuIC results in the Policy Evidence Assessment Report, which also includes narrative summary sections in which we can note findings of ineffectiveness, contextual factors affecting policy implementation, the need for component-level experimental study, and other important considerations [40].

A final limitation is that QuIC's reliability has been assessed using only its developers as raters. Therefore, it will be important to test reliability with raters outside of the project team who also represent intended users. Overall, QuIC's limitations are outweighed by its strengths because it offers a method for assessing evidence that would otherwise be overlooked. QuIC can be used to screen a large number of policy options in a relatively short time frame, and its results offer a starting point for detailed and rigorous synthesis (i.e., QuIC is a "systematic preview").

SUMMARY

Evidence-based policy could be expected to significantly improve cardiovascular health in both developed and developing countries. However, assessment of the evidence for public health policy components is needed. QuIC provides an expedient approach for appraising and comparing the strengths of the best available evidence bases for many individual components of existing or proposed public health policy interventions. Its results could help translate a broad base of information for international policy maker audiences and uncover evidence gaps that could inform future policy research and evaluation.

ACKNOWLEDGMENTS

The authors thank the following persons who provided feedback during the development of QuIC: Sarah Ali, Ryan Bell, Farah Chowdhury, Elizabeth Dodson, Diane Dunet, Valerie Edelheit, Samantha Harrykissoon, Sarah Kerch, Michael Kulcsar, Alberta Mirambeau, Deesha Patel, Kim Prewitt, Tara Ramanathan, Nora Shields, Michael Tynan, Daniella Uslan, Marla Vaughan, and Cathy Vogel. Also, the authors thank Ross Brownson, David Callahan, and Deesha Patel for input on drafts of this report.

This project was funded by Centers for Disease Control and Prevention, Division for Heart Disease and Stroke Prevention, contract 11IPA1103219. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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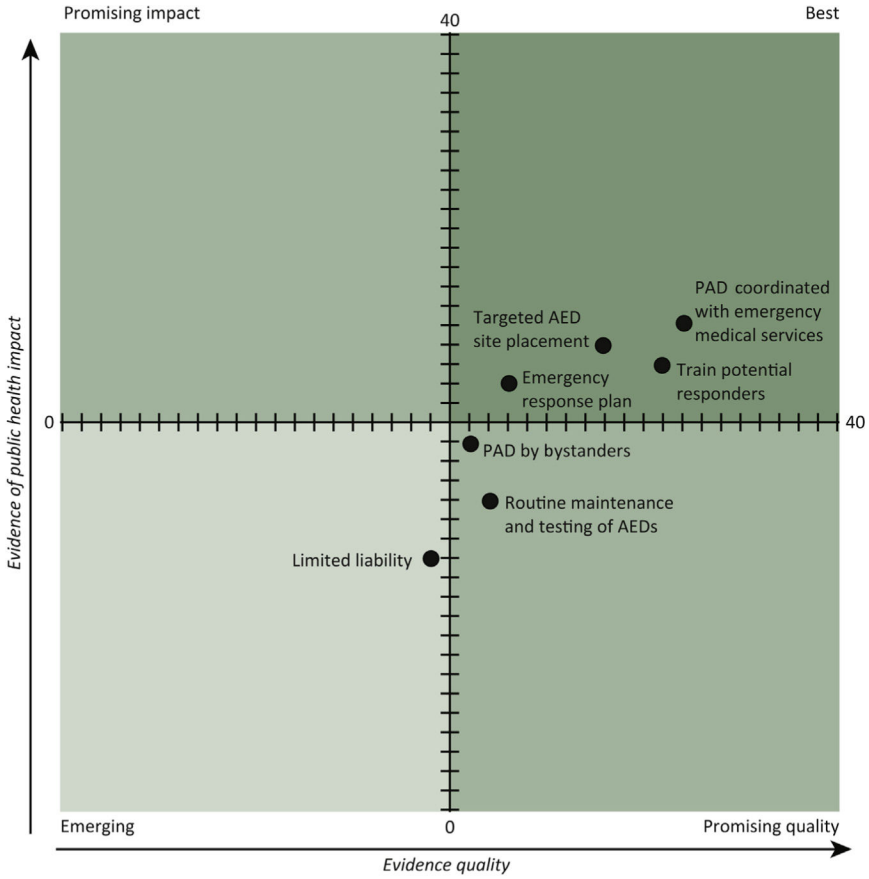

FIGURE 1. Public access defibrillation (PAD) policy component evidence strength categorizations.

Most (4 of 7) of the PAD policy components had the strongest (i.e., “best”) evidence basis. Two PAD policy components fell into the “promising quality” category, and 1 fell into the “emerging” category.

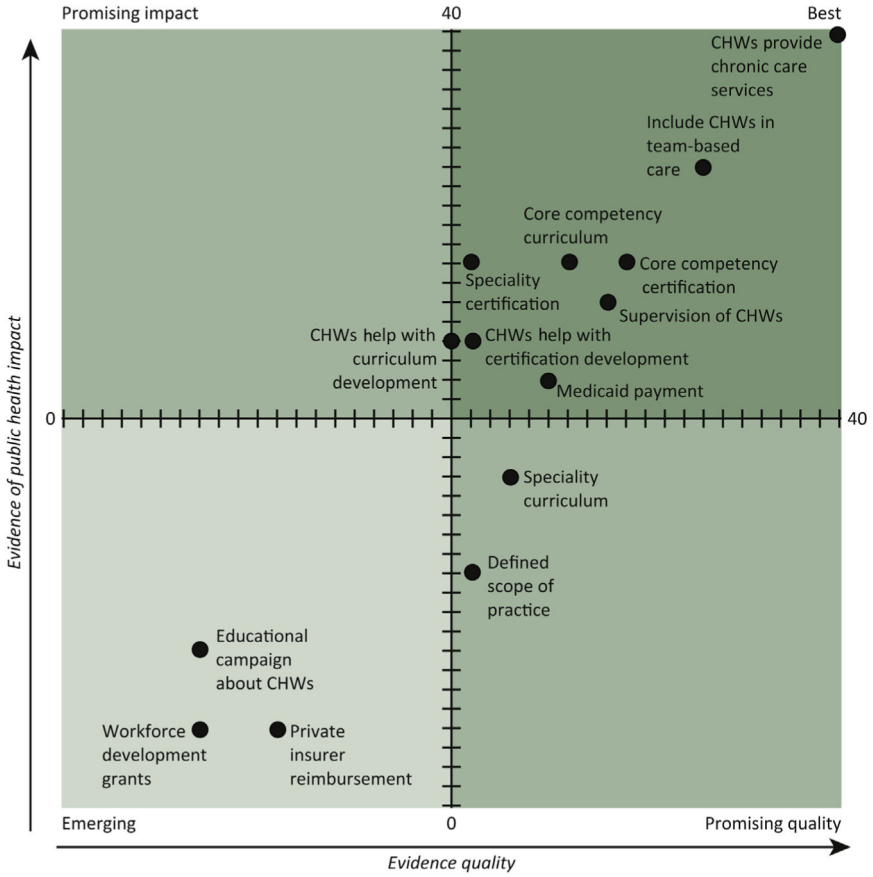

FIGURE 2. Community health worker (CHW) policy component evidence strength categorizations.

Most of the CHW policy components had a strong evidence basis, with 8 falling into the "best" category. Two CHW policy components fell into the "promising quality" category, 1 into the "promising impact" category, and 3 into the "emerging" category.

TABLE 1.

Quality and Impact of Component Evidence Assessment evidence strength category descriptions and next steps

Category	Description	Next steps
Best	In general, these components have been shown by rigorous peer-reviewed evidence, which was derived from practice or theory and research, to improve health across many types of settings. These components typically broaden an intervention's reach and show a larger magnitude of effect. There is also likely evidence of improved equity and/or efficiency.	These components can be considered first when developing new policy or updating existing policy. They might be good candidates for experimental studies to measure their relative contributions to the improved health effect of the policy intervention as a whole or for systematic review.
Promising quality	In general, these components have been shown by rigorous peer-reviewed evidence, which was derived from practice or theory and research, to improve health across a few types of settings. However, these components typically narrow an intervention's reach and show a smaller magnitude of effect. There is also likely no evidence on equity and/or efficiency.	These components can also be considered for inclusion in new or existing policy. They might also be good candidates for experimental studies to measure their relative contributions to the improved health effect of the policy intervention as a whole. Additional evidence should examine their equity and efficiency impacts.
Promising impact	In general, the evidence shows that these components positively affect health across at least a few settings, and there might also be evidence of improved equity and/or efficiency. However, the evidence base is lacking rigorous study types, peer review, and a sufficient amount of evidence from both practice or theory and research.	These components can also be considered for inclusion in new or existing policy. Researchers and evaluators should consider analyzing additional applications of these components to confirm impacts and generate new evidence that improves the overall quality of the evidence base.
Emerging	In general, there is very little or no evidence on the health, equity, and efficiency impacts of these components. The evidence base is also lacking rigorous study types, peer review, and a sufficient amount of evidence from practice or theory and research.	More evidence is needed on the health, equity, and efficiency impacts of these components. Researchers and evaluators should consider analyzing early applications of these components to generate new evidence that improves the overall quality of the evidence base.

TABLE 2.

Quality and Impact of Component Evidence Assessment results for PAD policy components

Policy component	Quality score*	Impact score*	Evidence category†
PAD coordinated with emergency medical services	32	25	Best
PAD with training for potential responders	31	23	Best
PAD with targeted AED site placement in high-density areas, schools, and fitness facilities	28	24	Best
PAD with an emergency response plan	23	22	Best
PAD by untrained bystanders	21	19	Promising quality
PAD with routine maintenance and testing of AEDs	22	16	Promising quality
PAD with limited liability and/or immunity	19	13	Emerging

AED, automatic external defibrillator; PAD, public-access defibrillation.

*Out of 40 possible points.

†"Emerging," "promising impact," "promising quality," or "best."

Glob Heart. Author manuscript; available in PMC 2020 July 03.

TABLE 3.

Quality and Impact of Component Evidence Assessment results for CHW policy components

Policy component	Quality score*	Impact score*	Evidence category†
CHWs providing chronic disease care services	40	40	Best
CHWs included in the team-based care model	33	33	Best
CHWs with core competency certification	29	28	Best
CHWs when supervised by health care professionals	28	26	Best
CHWs trained using standardized core CHW curriculum	26	28	Best
CHWs providing services that are paid for by Medicaid	25	22	Best
CHWs with specialty area certification	21	28	Best
CHWs certified after helping develop their certification requirements	21	24	Best
CHWs trained using a standardized specialty area curriculum	23	17	Promising quality
CHWs with a defined scope of practice	21	12	Promising quality
CHWs trained after helping develop their standardized curriculum	20	24	Promising impact
CHWs providing services that are covered and reimbursed by private insurers	11	4	Emerging
CHW awareness promoted by educational campaign	7	8	Emerging
CHW workforce development supported by grants and incentives	7	4	Emerging

CHW, community health worker.

*Out of 40 possible points.

†"Emerging," "promising impact," "promising quality," or "best."