

# Reducing the Risk of Potentially Preventable Hospitalisations

## A Literature Review of Community-based Approaches

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# Executive summary

## Introduction

Potentially Preventable Hospitalisations (PPHs), sometimes referred to as Ambulatory Care Sensitive Conditions (ACSCs), are those for which hospitalisation is considered potentially avoidable through preventive care and early disease management, usually in an ambulatory setting (South West Sydney Local Health District [SWSLHD], 2014).

Given the increasing burden of PPHs, there is a growing need to find ways to reduce them, particularly in areas of locational disadvantage. There are several initiatives currently underway in the SWSLHD including programs aimed at integrating primary and community care, and projects analysing PPH data such as the analysis of ACSC data being undertaken by the SWSLHD Integrated Care Committee.

The Centre for Health Equity Training Research and Evaluation (CHETRE) was contracted by SWSLHD Population Health to conduct a literature review to develop a current evidence base of community-based interventions that are effective in reducing the number of PPHs, particularly in locationally disadvantaged areas. This report outlines the available evidence and provides recommendations for the development and implementation of community-based interventions that are appropriate for SWSLHD, and can inform future work with SWSLHD Community Health on Integrated Care projects using PPHs as performance indicators.

## Methods

A structured literature review, conducted with a systematic approach, was undertaken to identify Australian and international evidence around effective community-based interventions aimed at reducing potentially preventable hospitalisations. The review aimed to answer the following research questions:

1. What are effective interventions that can be delivered in community settings?
2. Are there any conditions under which interventions are more effective?
3. Are there any differences in intervention effectiveness when interventions are conducted in areas of locational disadvantage?
4. What interventions are most cost effective?

The review focused on the following 5 conditions, relevant to SWSLHD:

- Diabetes (type 1 and 2)
- Asthma
- Heart Failure

- Chronic Obstructive Pulmonary Disease (COPD)
- Urinary Tract Infections (UTI)

A literature search of peer reviewed articles was conducted using Medline, EMBASE and Global Health databases.

## Results

Overall, the review identified 56 papers that were eligible for data extraction. It should be noted that the search strategy failed to identify any relevant literature focused on the prevention of UTI hospitalisations. Table 1 provides an overview of the results.

### Effective interventions

A range of community-based interventions that produced positive results to varying degrees were identified in the literature. These are discussed under the categories of 'mode of delivery' and 'intervention content'.

#### Mode of delivery

**Community Health Worker (CHW)** programs were common in the literature, sometimes focused on a particular ethnic community, disease population, or both. This method was often implemented as an outreach service from clinical services, and CHW programs tended to have an educational focus. Programs that engage CHWs are popular because these representatives can liaise between a medical team and the community, and improve clinical patient outcomes through work outside of the hospital or primary care setting. Most CHW program evidence indicates positive results, even if outcomes are not necessarily clinically relevant.

**Telehealth** programs identified in the literature included mobile-based applications, telephone health coaching or counselling and even television based educational components. Studies reporting on these programs were not numerous, and the findings were mixed in terms of effectiveness.

Considering the conditions of interest can be treated or managed with prescription medications, researchers have studied ways in which **pharmacies** might be integrated into population-level programs and recruitment. There is some limited evidence for effectiveness of this type of intervention. Pharmacies provide a unique opportunity as they are well placed in optimising patient disease self-management.

There were also a number of studies which were delivered **in-home** and in a **school based** context. These studies were particularly effective for asthma control and management.

#### Intervention content

There were a variety of successful interventions that focussed on **education**. Education provided ranged from training on disease mechanics to interactive cooking courses. Unsurprisingly, educational programs report on knowledge gain as a primary outcome measure. While knowledge

gain is important, it is also essential to track clinical health metrics in order to ensure efficacy in preventing hospitalisation.

As diabetes and COPD can be managed with **exercise**, it has been a focus of programs targeting disease management for adults with these conditions. There is some evidence that it is effective, when implemented at the correct time point of illness.

Numerous effective intervention programs are **multifaceted**, comprising a range of strategies. Education is a key component in these multifaceted interventions. Other strategies that have been combined with education in various combinations include support, counselling, coaching, goal setting, environmental assessment, service coordination, referral pathways, exercise, behaviour modification, surveys, and motivational incentives.

## Factors or conditions impacting on effectiveness

A plethora of research shows that there is a higher prevalence of ill health among cultural and linguistic minority groups as compared to majority populations, including in the diseases of interest. As such, it is not surprising that many successful programs attributed outcomes (at least partially) to their adaptation and **sensitivity to the culture(s)** of the targeted group. The two key lessons learnt from the literature suggest that:

- 1) programs should be **culturally-tailored** and
- 2) members of the **community** of interest should be **included** in program **design** and potentially in **implementation** and **evaluation**.

The literature also identified ways and approaches to **program design, recruitment and implementation** to increase the effectiveness of various programs. Contextual issues such as health literacy should be considered when designing a program for those who do not necessarily come from a health or public health background. Approaches such as the utilisation of pharmacies, local media or specialised nurses have shown effectiveness in the recruitment of participants. The involvement of the population of interest is also important, this is particularly important when considering Indigenous populations, where it has been shown that there is great value within Indigenous-led programs.

## Special considerations for areas of locational disadvantage

There were many factors that were particularly relevant to locationally disadvantaged areas among the papers reviewed, providing guidance for development and implementation of interventions to reduce PPH in SWSLHD. Factors that contributed to the success of programs in areas of locational disadvantage included:

- Consideration of **the target population** with particular importance given to the acknowledgment of the local social and physical environments e.g. using family-centred approaches
- **Engaging the local community** in the program design, implementation and evaluation

- Implementing programs in areas with the **highest need** (burden of disease) and selecting venues where largest number of families could be reached
- Incorporating principles of **learning and change** into program

## Cost savings

From the studies that were included in the review, **cost savings** were reported for interventions designed for asthma and diabetes. There is compelling evidence of serious cost savings, especially for certain types of programs. CHW programs and mobile phone-based programs with a case manager resulted in greater cost savings than other types of programs reviewed. These programs had the commonality of a specific, assigned professional following up with patients and providing feedback, encouragement, and assistance in disease management.

**Table 1: Overview of results**

	Diseases that have this type of program (evidence in review)	Reported decrease in rates of PPH	Equity Considerations – Population groups targeted	Measured Cost-effectiveness
<b>Mode of delivery</b>				
<b>Community Health Worker</b>	<ul style="list-style-type: none"> <li>○ Diabetes</li> <li>○ Asthma</li> <li>○ Heart Failure</li> </ul>	Yes	<ul style="list-style-type: none"> <li>○ Racial/ethnic/minority groups</li> <li>○ Low income</li> <li>○ Uninsured</li> </ul>	Yes
<b>Telehealth</b>	<ul style="list-style-type: none"> <li>○ Diabetes</li> <li>○ Heart failure</li> <li>○ COPD</li> </ul>	Yes	<ul style="list-style-type: none"> <li>○ Elderly populations</li> <li>○ Racial/ethnic/minority groups</li> </ul>	Yes
<b>Pharmacy</b>	<ul style="list-style-type: none"> <li>○ Diabetes</li> <li>○ Asthma</li> </ul>	Yes	<ul style="list-style-type: none"> <li>○ Rural populations</li> </ul>	No
<b>Other</b>	<ul style="list-style-type: none"> <li>○ Diabetes</li> <li>○ Asthma</li> <li>○ Heart failure</li> </ul>	Yes	<ul style="list-style-type: none"> <li>○ Racial/ethnic/minority groups</li> <li>○ Age groups</li> <li>○ Education level</li> <li>○ Low income</li> <li>○ Rural</li> <li>○ Public housing tenants</li> </ul>	Yes

Intervention Content				
<b>Education</b>	<ul style="list-style-type: none"> <li>○ Diabetes</li> <li>○ Asthma</li> </ul>	Yes	<ul style="list-style-type: none"> <li>○ Racial/ethnic/minority groups</li> </ul>	No
<b>Exercise</b>	<ul style="list-style-type: none"> <li>○ Diabetes</li> <li>○ COPD</li> </ul>	No	<ul style="list-style-type: none"> <li>○ Racial/ethnic group/minority groups</li> </ul>	No
<b>Multifaceted</b>	<ul style="list-style-type: none"> <li>○ Diabetes</li> <li>○ Asthma</li> <li>○ COPD</li> <li>○ Heart failure</li> </ul>	Yes	<ul style="list-style-type: none"> <li>○ Public housing residents</li> <li>○ Elderly populations</li> <li>○ Rural populations</li> <li>○ Low income</li> <li>○ Racial/ethnic/minority groups</li> </ul>	Yes

Note: If any intervention for any of the diseases listed addressed PPHs, equity or costs, they were listed as 'yes' or described which population groups were targeted. For a more detailed overview of each individual paper, see Appendix 2.

# Introduction

Potentially Preventable Hospitalisations (PPHs), sometimes referred to as Ambulatory Care Sensitive Conditions (ACSCs), are those for which hospitalisation is considered potentially avoidable through preventive care and early disease management, usually in an ambulatory setting (South West Sydney Local Health District [SWSLHD], 2014). There are 22 ACSCs (see Appendix 1) which can be classified into the following groups: vaccine-preventable, where the condition is preventable rather than the hospitalisation; chronic conditions that may be managed in a primary care setting to prevent the condition worsening and requiring hospitalisation; and acute conditions for which the condition may not be preventable, but hospitalisation should not become necessary if people receive timely and adequate access to primary health care (National Health Performance Authority, 2015).

Between 2011 and 2013, approximately 7% of hospitalisations in SWSLHD were potentially preventable. Rates for a number of conditions, including congestive heart failure, asthma, ear nose and throat infections, iron deficiency anaemia, and vaccine preventable diseases, were much higher than the NSW rates, and rates for diabetes complications, influenza and pneumonia, and gangrene were also higher (SWSLHD, 2014). In 2015-2016, urinary tract infections, COPD, heart failure, asthma, and diabetes-related hospitalisations accounted for nearly 40,000 bed days in SWSLHD. This accounts for just under 50% of the total bed days associated with PPH in the LHD. Estimates put the cost of these hospitalisations at over \$44 million per annum (Centre for Epidemiology and Evidence, n.d.).

In SWSLHD there are several areas of locational disadvantage. People living in locationally disadvantaged communities typically have limited access to services and facilities and experience poorer health outcomes. People living in areas of locational disadvantage also experience higher rates of PPHs. In 2013-14, PPHs were two times higher across poorer local areas in major cities (Australian Bureau of Statistics, 2011).

Given the increasing burden of PPHs, there is a growing need to explore strategies to reduce these, particularly in areas of locational disadvantage. There are several initiatives currently underway in the SWSLHD including programs aimed at integrating primary and community care, and projects analysing PPH data such as the analysis of ACSC data being undertaken by the SWSLHD Integrated Care Committee.

The Centre for Health Equity Training, Research, and Evaluation (CHETRE) has been conducting a program of work in locational disadvantage since 1999 aimed at improving the health and wellbeing of people living in such areas, and the capacity of communities in these areas to take actions that will enhance their health and wellbeing. The activities outlined in the program logic for the Locationally Disadvantaged Program align with the priorities of Population Health SWSLHD (Zapart, Silk, Harris-Roxas, and de Leeuw, 2017).

Previous research investigating interventions to reduce avoidable hospitalization (Melbourne Health, 2009; Basu and Brinson, 2008) is outdated and up-to-date evidence is required. The Centre for Health Equity Training Research and Evaluation (CHETRE) was contracted by SWSLHD Population

Health to conduct a literature review to develop a current evidence base of community-based interventions that are effective in reducing the number of PPHs, particularly in locationally disadvantaged areas. This report outlines the available evidence and provides recommendations for the development and implementation of community-based interventions that are appropriate for SWSLHD, and can inform future work with SWSLHD Community Health on Integrated Care projects using PPHs as performance indicators.

# Methods

## Search strategy

A structured literature review, conducted using a systematic approach, was undertaken to identify Australian and international evidence around effective community-based interventions aimed at reducing potentially preventable hospitalisations. The search strategy was developed to answer the following research questions:

1. What are effective interventions that can be delivered in community settings?
2. Are there any conditions under which interventions are more effective?
3. Are there any differences in intervention effectiveness when interventions are conducted in areas of locational disadvantage?
4. What interventions are most cost effective?

In order for the review to be more useful in the SWS context, the decision was made to target five conditions from the ACSC list (Australian Institute of Health and Welfare, 2016) that were identified as having a high burden of disease in the LHD (South Western Sydney Medicare Local and the Planning Unit of SWSLHD, 2014; National Health Performance Authority, 2015). These conditions are listed below. The estimated cost to the LHD of the hospitalisations relating to these conditions are presented in Table 2.

- Diabetes (type 1 and 2)
- Asthma
- Heart Failure
- Chronic Obstructive Pulmonary Disease (COPD)
- Urinary Tract Infections (UTI)

**Table 2. Number, and estimated cost, of hospitalisations in 2015-16 for the five conditions targeted in this review**

<b>Condition</b>	<b>Number of hospitalisations in SWS 2015-2016<sup>#</sup></b>	<b>Cost per hospitalisation (adult)</b>	<b>Estimated total cost to the LHD</b> <i>calculated by CHETRE</i>
<b>Asthma</b>	1375	\$3295*	\$4,530,625
<b>COPD</b>	2235	\$5500 <sup>¥+</sup>	\$12,292,500
<b>Diabetes</b>	1275	\$7656*	\$9,761,400
<b>Heart Failure</b>	1750	\$5600 <sup>¥</sup>	\$9,800,000
<b>UTI</b>	2356	\$3400 <sup>¥</sup>	\$8,010,400
<p>Notes:</p> <ol style="list-style-type: none"> <li>1. Cost data was obtained from different sources and is not unique to South West Sydney or NSW, (see citations)</li> <li>2. Costs for heart failure, UTI &amp; COPD are for admissions without complication, therefore estimates are modest. The costs are also for major metro hospital admissions.</li> </ol>			
<p><sup>#</sup> Centre for Epidemiology and Evidence, n.d.</p> <p>* Bellon, Barton, McCaffrey, Parker and Hutchinson, 2017</p> <p><sup>¥</sup> Australian Institute of Health and Welfare [AIHW], 2015</p> <p><sup>+</sup> Watson, n.d.</p>			

A literature search of peer reviewed articles was conducted using Medline, EMBASE and Global Health databases. The search terms used are displayed in Table 3.

**Table 2: Literature review search terms**

<b>Key Words</b>
<b>1. “preventative health services” OR</b>
<b>2. “community adj4 program*” OR</b>
<b>3. “health adj4 program*”</b>
<b>WITH</b>
<b>4. Each disease (e.g. Asthma)</b>
<i>Key:</i> <i>*accounts for variation in spelling</i> <i>adj4accounts for within four (4) words</i>

Due to the large number of papers found in the initial searches, the decision was made, in consultation with the Population Health Project Contacts, to limit the scope of the review and the type of papers to be included. Documents were included or excluded based on the following criteria:

- Inclusion criteria
  - English language
  - OECD country
  - Delivered in community health/population setting
  - Date range: 2012-2017
- Exclusion criteria
  - Editorials
  - Epidemiological studies
  - Conference proceedings
  - Sample has less than 50% with disease type
  - Primary prevention

Specific priority was given to studies which had an equity focus (especially disadvantaged areas and/or populations) and those that had been evaluated. Duplicate documents were removed across

all disease types. Figure 1 outlines the process of exclusion for the literature review. The screening process was undertaken by two research officers.

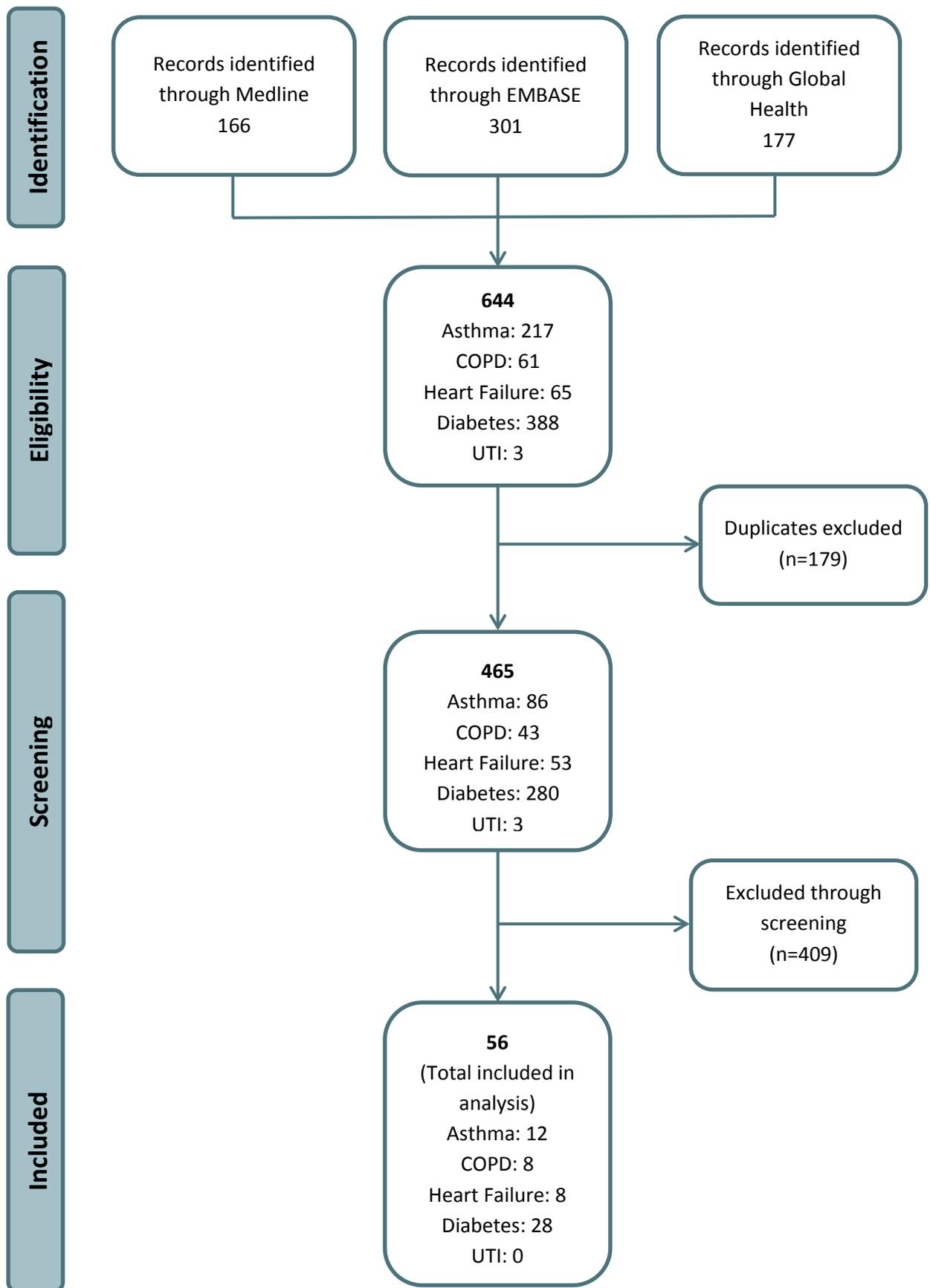
Identified sources were summarised in a data extraction table by disease type (see Appendix 2). Overall, 56 documents were included in the literature review. The search criteria failed to provide any literature for effective community-based UTI interventions.

## Assumptions

An important assumption that was integrated into the process of identifying and reviewing literature was that improved disease management would result in a reduction in Emergency Department (ED) visits and hospitalisations. Thus, studies which did not directly link patient outcomes to hospitalisations were included in the review. This assumption helped identify programs that might be appropriate for implementation within a community-based environment by public health professionals as opposed to clinical setting by providers.

There was no data available with regards to the characteristics of the people presenting for the selected conditions. Therefore, the review was also conducted with the assumption that the people, for whom potentially preventable hospitalisations are being reduced in SWSLHD, reflect the overarching demographics of the area. For instance, SWSLHD has a large number of communities with low socio-economic status (SWSLHD, 2014) and a high proportion of persons born overseas (35.8% compared to the NSW average of 25.7%) (ABS, 2013).

Figure 1: Flowchart of the search strategy



# Results

For the purposes of this review, findings are organised under the following main headings:

- Effective interventions
- Factors or conditions impacting on effectiveness
- Special considerations for areas of locational disadvantage
- Cost savings

When necessary, any variability in outcomes based on disease type is explained. It should be noted that many interventions might be categorised and or discussed under more than one heading.

## Effective Interventions

A range of community-based interventions that produced positive results to varying degrees were identified in the literature. These are discussed under the categories of 'Mode of delivery' and 'Intervention content'.

### Mode of delivery

#### Community Health Worker

Community Health Worker (CHW) programs were common in the literature, sometimes focused on a particular ethnic community, disease population, or both. This method was often implemented as an outreach service from clinical services, and CHW programs tended to have an educational focus. Programs that engage CHWs are popular because these representatives can liaise between a medical team and the community, and improve clinical patient outcomes through work outside of the hospital or primary care setting. Most CHW program evidence indicates positive results, even if outcomes are not necessarily clinically relevant.

A variety of programs, across the diseases that were the focus of this review, used CHWs who were members of the targeted community. In this role, CHWs identify gaps where the clinical setting falls short. In particular, CHWs engage patients in discussions on a range of topics ranging from barriers and facilitators to self-management and lifestyle changes (Cadzow et al, 2014), and are more likely to be valued and trusted because they belong to the same community as the program participants.

The "Neighbourhood Health Talker" program, which trained community members as CHWs to engage in conversations with neighbours on living well with diabetes, did not report clinical outcomes but instead noted an increase in diabetes-related knowledge and increased confidence among the intervention participants (Cadzow et al, 2014).

Programs that included CHWs from the targeted communities yielded clinically significant outcomes as well. In a particularly vulnerable community (Mexican uninsured), a culturally tailored CHW

diabetes education program achieved significant HbA1c reductions from baseline to 12 months (Prezio et al 2013). Community Health Ambassadors in Project H.I.G.H. (Helping Individuals Get Healthy) were an essential part of the intervention, undergoing training prior to program implementation and meeting individuals with type 2 diabetes in their homes to discuss and educate on the social, behavioural, and emotional risk factors associated with the disease. This evaluation captured compelling clinical results: 89% of those who received an at home glucose monitor had improved glucose levels. The program was successful in motivating community members to take better care of their health (Suther et al., 2016).

Similarly, an asthma CHW program that utilised a community health educator model recruited layperson educators from the community who had cultural and communal connections with the study participants (Channing, 2012). The researchers had identified a gap between primary care providers and families and proposed the community health educator as the solution. This method of delivery was very effective in building trust and the health educators were well placed to understand common barriers to disease management. This method also provided valuable local employment. Participants in the study experienced a 72% reduction in ED visit, 65% decrease in asthma attacks and 40% decrease in the number of asthma symptom days during their enrolment in the program. Another asthma program that utilised CHW's to provide home environmental assessments, comprehensive asthma education, trigger reduction strategies, and social and clinical referrals also showed positive benefits (Peretz et al. 2012). After 12 months hospitalisations and ED visits decreased by more than 50% and caregiver confidence in controlling their child's asthma increased to nearly 100%.

Evaluation of a Canadian-based peer support program with goals of assisting in navigation of the health system, and type 2 diabetes management, showed that while there were small positive changes in self-management behaviours among participants as compared to controls, this did not significantly influence cardiovascular risk. It was suggested that this was likely because participants already had well controlled diabetes, good diabetes knowledge, practiced diabetes control and good self-management. This highlights the need for programs to be designed to reach the portion of the population most in need or at risk for hospitalisation or other disease-related complications (Riddell et al 2016). A U.S.-based, peer-led educational intervention was successful in significantly increasing diabetes knowledge and empowerment (Davis et al, 2016).

There were also studies that reported positive impacts of CHW programs but did not specify that the CHW was a member of the target community. Two separate studies of an evidence-based CHW asthma home visit program found that a combination of home visits (focused on education, support and service coordination), follow up phone calls, and provision of asthma-friendly environmental controls had a positive effect on asthma outcomes for children and had a positive impact on caretakers' asthma-related quality of life (Campbell et al, 2015; Martin, 2016). The intervention group also experienced a reduction in urgent health care utilisation (1.3 fewer visits over 12 months), and cost savings (discussed later). Another study by Rau-Murthy et al. (2017) described an asthma education-based intervention which had impacts on health service utilisation. Patients who received the asthma education program via 'Asthma Educators' reported better controlled asthma, increased asthma knowledge and decreased ED and hospital admissions.

## Telehealth

Telehealth programs identified in the literature included mobile-based applications, telephone health coaching or counselling and even television based educational components. Studies reporting on these programs were not numerous, and the findings are mixed.

In a mobile-based intervention for people with diabetes, participants shared information related to their diet, exercise, mood and glucose tests on a weekly basis with a case manager. The case manager sent personalized texts with encouraging words, reminder and diet/exercise tips. More than 33% of participants improved their HbA1c values (Taylor & Siddiqui, 2016). In the case of this program, researchers argued that it was the (CHW-like) case manager, as opposed to the fact that the program was mobile-based, that contributed to its success.

One study assessed the impact of a telephone health coaching program, that targeted people with heart failure, coronary heart disease, diabetes, or COPD (all of whom also had other conditions) on emergency hospital admissions (Steventon et al 2013). It was expected the program would lead to a reduction in admissions, but this was not the case with emergency hospital admissions and outpatient attendance increasing more quickly in the intervention group. However, the study only looked at number of admissions not condition for which admission occurred, so it is not known whether the increase in admissions applied to all of the conditions. A review of community based approaches to controlling asthma found that telephone counselling has resulted in decreases in hospitalisations in three studies (Clark et al., 2012;).

Shah et al. (2015) studied the impact of a high-intensity telemedicine program in older people living in seniors living centres. Study participants had a variety of conditions including asthma, diabetes, and heart problems (and or other comorbidities). There was a significant decrease in the rate of ED use by intervention participants over the 12 month period compared to no changes in ED use in the control group. Again, this study did not look at the type of admission. A study of another telemedicine program (Veenstra et al. 2015) found that a home based TV educational program along with telemedicine resulted in a decrease in unplanned admissions for heart failure. There were also changes in blood pressure (decreased independent of medication), improvements in quality of life and disease knowledge remained high throughout the follow-up period.

## Pharmacy

Considering the conditions of interest can be treated or managed with prescription medications, researchers have studied ways in which pharmacies might be integrated into population-level programs. There is some limited evidence for effectiveness of this type of intervention. A very small pharmacy-based health coaching service for people with diabetes (Chang et al, 2014) was not long enough to document long-term outcomes, but the personalized coaching resulted in all four participants reaching their respective dietary and physical activity goals. Engagement of a pharmacist in the health care team has been shown to provide benefits in terms of asthma outcomes and health service utilisation (Labre et al, 2012).

The potential of pharmacy based interventions has also been investigated. One study by Elaro et al. (2014) evaluated the 'PACE' (Practitioner Asthma Communication and Education) framework that

was adapted to the Australian Pharmacy context and evaluated. Training was delivered to pharmacists and focused on communication skills and asthma related practices. The study found that the intervention had high levels of satisfaction (from participants); it increased confidence and resulted in changes to pharmacists' behaviours including an increase in checks for written asthma-self management plans and reviewing inhaler technique more frequently. This study demonstrated the opportunity for pharmacists to play an important role in optimising disease self-management. Other studies have employed pharmacies as the point at which to recruit participants into programs (Parker et al. 2017).

## In-home

A study by Bucher & Thompson (2012) described a community-based home visit asthma education program. The intervention was implemented in a predominately public housing neighbourhood and was focused on families with children with asthma under the age of 18. The study showed an increase in knowledge (although not statistically significant) and a reduction in asthma-related ED visits and hospitalisations.

In addition, some of the effective community health worker programs described above have been delivered in the home (Campbell et al, 2015; Channing, 2012; Suther et al., 2016).

## School-based programs

School-based programs are especially popular for targeting children with asthma. This method is primarily used to deliver self-management education, and allows for large numbers of families to be reached. School based programs show particular promise for achieving sustainable improvements in asthma control (Clark, 2012).

There were a number of studies which focused on the importance of bystander CPR in the community. A study by Berger (2017) described a school based CPR training intervention. The study found that lay person CPR saves lives (Berger, 2017). CPR training can decrease mortality but it is unknown whether it will impact on hospitalisations.

## Intervention Content

Effective interventions ranged from ones that had a single focus such as education or exercise, to ones that were multifaceted.

### Education

There were a variety of successful interventions that focussed on education. Education provided ranged from training on disease mechanics to interactive cooking courses. Unsurprisingly, educational programs report on knowledge gain as a primary outcome measure. While knowledge gain is important, it is also essential to track clinical health metrics in order to ensure efficacy in preventing hospitalisation.

“Cooking Well with Diabetes,” a training program designed to teach practical cooking skills and build on self-management knowledge, increased short-term knowledge but did not have a measurable or

significant impact on self-reported H1Ac indicators (Bielamowicz, Pope, & Rice, 2013). Participants (90%+ of whom were Black or Latino) in a theory-guided, culturally sensitive, health empowerment-focused, community-based health promotion education program, tailored to adults with type 2 diabetes, reported lower levels of BMI, diastolic blood pressure and physical stress as compared to controls (Tucker et al, 2014). These findings indicate the importance of adapting programs for target audiences as well as using best practices (i.e. theory-driven approaches) for instruction.

A review of public health interventions for asthma (Labre et al 2012) found that the most effective interventions aimed at reducing ED visits and hospitalisations were asthma education programs focused on self-management. The review also found that provider education programs offered an opportunity to improve asthma symptoms and reduce ED visits and hospitalisations. A review of group interventions for people with asthma or COPD (Quinones et al 2014) also found that self-management group education can result in a decrease in health service utilisation and improvements in quality of life. Another study by Fedele et al. (2013) showed that a group-based asthma education program offered in Spanish to Latina mothers from a low income background had a positive impact on maternal asthma knowledge.

Education was the focus of several of the effective CHW programs described above (Davis et al., 2016; Labre et al, 2012; Rau-Murthy et al., 2017; Suther et al., 2016). It was also the focus of In-home and School-based programs (Bucher & Thompson (2012; Campbell et al, 2015; Channing, 2012; Clark, 2012; Suther et al., 2016;). The previously-described study evaluating an education program that targeted pharmacists (Elaro et al, 2014) emphasizes how other members of the care team can contribute to population-level health outcomes. Educating these team members might be a viable option.

## Exercise

As diabetes and COPD can be managed with exercise (Diabetes Australia , n.d.; Lung Foundation Australia, n.d.), it has been a focus of programs targeting disease management for adults with these conditions. There is some evidence that it is effective. Exercise, in the form of strength training has been shown to reduce HbA1c in adults with diabetes (Teychanne et al., 2015). It has also been shown to be effective for COPD management. One study (Amin et al. 2014) compared a community-based exercise (CBE) program to standard care for people with COPD. The study demonstrated that those participants who were enrolled in the CBE program experienced significant improvements in endurance, strength, quality of life and reduced dyspnoea (breathing difficulty). The findings also suggested that CBE should be introduced earlier to delay the development of common comorbidities of COPD.

## Multifaceted

Numerous effective intervention programs are multifaceted, comprising a range of strategies. Education is a key component in these multifaceted interventions. Other strategies that have been combined with education in various combinations include support, counselling, coaching, goal setting, environmental assessment, service coordination, referral pathways, exercise, behaviour modification, surveys, and motivational incentives.

Evaluation of a culturally tailored self-management education program for African American adults with diabetes, that comprised education, support, and goal setting showed positive benefits in terms of improved cardiovascular levels and self-care behaviour (Williams et al. 2014). Exercise has also been included in multifaceted programs for people with diabetes. Enhancing the strength training program for people with diabetes, (discussed above), by including education (in the form of printed information), counselling and motivational incentives, resulted in even greater benefit for participants. The enhanced program showed higher odds of its adoption (as compared to standard strength training program), and also significant higher reduction in HbA1c (Teychanne et al., 2015). A New Zealand diabetes program paired self-management education with exercise over a 12-week duration, and yielded significant improvements in a number of clinical measures such as waist circumference, exercise behaviour, 6-minute walk tests and self-efficacy (Higgs et al 2016). The Lose-to-Win weight loss intervention for people with diabetes consisted of fitness and lifestyle counselling sessions (comprising education, exercise and nutrition) that occurred over the course of 10 weeks. The program resulted in improvement in cholesterol, blood glucose, and blood pressure levels. The authors noted that the educational sessions in particular empowered participants to take control of their health status (Parker et al. 2017).

Many of the effective interventions discussed previously were multifaceted. CHW programs comprised education and various combinations of support, counselling, service coordination and referral pathways, and environmental assessments (Cadzow et al, 2014; Campbell et al, 2015; Channing, 2012; Peretz et al. 2012; Prezio et al., 2013; Riddell et al 2016). Telehealth programs included education and various combinations of support, coaching, motivational messages, reminders, and surveys (Clark et al., 2012; Shah et al., 2015; Steventon et al 2013; Taylor & Siddiqui, 2016; Veenstra et al., 2015). The pharmacy intervention included education, support, health coaching, goal setting and behaviour modification (Chang et al, 2014; Labre et al, 2012)

## Factors or conditions impacting on effectiveness

### Cultural sensitivity

A plethora of research shows that there is a higher prevalence of ill health among culturally and linguistically diverse minority population groups as compared to majority populations, including in the diseases of interest. As such, it is not surprising that many successful programs attributed outcomes (at least partially) to their adaptation and sensitivity to the culture(s) of the targeted group.

CHW's (referred to as Community Health Ambassadors in Project H.I.G.H. (Helping Individuals Get Healthy)) were an essential part of the intervention. According to the program evaluators:

*“Individuals who have the respect and trust of the community and who also live in the community are not only better equipped to understand the unique cultural needs of their communities, but are also eminently qualified to translate the mission of comprehensive health care to community peers”* (pg 25, Suther et al. 2016).

In the Community Health Worker asthma program (Peretz et al. 2012), the culturally appropriate education and support delivered by the bilingual community health workers was integral to the program's success. The health workers had strong community connections, spoke the same languages as many residents and were able to relate to common obstacles that local families faced. A review of barriers to effective asthma management by Alicea-Alvarez et al. (2014) also placed importance on culturally sensitive community-based asthma education models, noting they can help to overcome barriers to effective management and improve asthma outcomes. The community group-based education program offered in Spanish to Latina mothers from a low income background had a positive impact on maternal asthma knowledge. However there was limited efficacy with long-held asthma medication beliefs of this population group (Fedele et al. 2013). This indicates that while the language of instruction was significant, beliefs related to asthma medication are difficult to influence among this group through education.

Another example of a culturally sensitive program was based around formulating the intervention to be relatable and inclusive of the cultural practices of the target population. A study by Levack et al. (2016) described differences between Maori and non-Maori people in the number of factors which influenced their uptake of pulmonary rehabilitation in New Zealand. The study found that programs with a holistic approach that were culturally specific and respectful, where Maori patients felt culturally safe, were enablers for ongoing engagement in pulmonary rehabilitation. Programs which are *“designed and implemented in a manner that encourages participants to engage regularly with them”* (pg. 497) can result in greater uptake and participation of the target population.

There were two key lessons that emerged from the literature on other (not CHW) diabetes programs, (outlined below) in relation to working with particular ethnic/cultural minority groups:

- 1) The program should be culturally-tailored, and
- 2) Members of the community of interest should be included in program design and potentially in implementation and evaluation.

In an investigation of community responses to a clinical screening, arts, and community development program staffed by Aboriginal health workers in a rural West Australia community, Sinclair and colleagues (2016) found that healthy lifestyle is enabled by remote community setting, especially in concert with outreach programs staffed by Aboriginal health workers. In addition, high regard for a program among community members is important when implementing programs in Aboriginal and Torres Strait Islander communities as shown in the implementation of a program aimed at ameliorating foot-related diabetes complications in a local community (Ballestas et al 2014). Maori and Pacific Islander people included in the 12 week self-management and exercise program (Higgs et al 2016) indicated the program to be culturally supportive. Culturally-tailored diabetes education programs can lead to better outcomes, especially when dealing with patient populations made up largely of a particular ethnic group (Prezio et al 2013). The study by Williams et al., (2014) also highlighted the importance of cultural sensitivity, to program success in education programs targeting particular ethnic or cultural groups. A field report of a behavioural weight-loss program designed for Mexican-American diabetic mothers and overweight/obese daughters showed that participating with their respective family members made it easier to work towards exercise and

diet goals (Sorkin et al 2013). This showed that cultural adaptation and improving accountability can be effective program mechanisms for engagement, especially in exercise programs.

## Community engagement

One way of ensuring cultural sensitivity in programming is to include community members in the design, implementation and evaluation of programs. Members of an Aboriginal and Torres Strait Islander community in Western Australia were consulted at each step of design and implementation of the program aimed at ameliorating foot-related diabetes. (Ballestas et al, 2014). In the investigation by Sinclair and colleagues (2016) the outreach clinical services and the inclusion of Aboriginal health workers were important enablers of health in rural Aboriginal communities. In their evaluation of a culturally sensitive asthma program utilising community health workers, Peretz et al. (2012) stressed that the key lesson learnt was that the program would not have functioned without the commitment and ongoing active involvement of its community partners. In this example this partnership consisted of program partners within the community, community health workers, participants (and their feedback) and health care staff. They also found that the community-based health workers who had strong ties to the community were fundamental to the success of the program. The model of this program was also attributed to program success as it is easily adaptable, culturally sensitive and takes a holistic approach to education and support.

In regards to CHWs in particular, much can be gained from engaging the communities of interest. Recruiting CHWs from the general neighbourhood where an intervention is to be delivered can lead to higher satisfaction with the CHW in diabetes-related interventions (Lopez et al 2017) and more effective asthma interventions (Channing 2012). CHW programs should build on existing community-based infrastructure, such as community clinics already present for low-income and/or vulnerable populations (Clark, 2012).

## Program design, recruitment and implementation

As noted in previous sections, there are a number of practices for participant recruitment that have been utilised with varying success in the literature. Pharmacies, as a physical space where people with the conditions of interest can be targeted, has been successfully used to recruit individuals into health education and exercise programs (Parker et al 2017). An RCT for a community-based exercise and nutritional supplementation program was able to best recruit participants through targeted mail-outs and state/local print media. These were the most costly but most effective strategies (Miller et al. 2016).

The literature also identified effective ways and approaches for recruiting program implementers. The Levack et al. 2016 study found that the programs key success was driven by the Māori nurse's recruitment and retention efforts. The nurses spent time connecting with patients at both an individual and cultural level. Many participants had suspicions and general distrust of health services in general and the Māori nurses helped them overcome this barrier to participation in the program. This same study attributed program success due to the holistic approach of the program. This research also suggests that there is great value within Indigenous-led pulmonary programs for Indigenous minority groups. Programs need to be designed and implemented in a way which

encourages participants to engage with them. And, as highlighted previously, CHW programs celebrated success often as a result of bringing on representatives from the communities in which the programs were to be delivered.

Researchers have also indicated a number of lessons learned around designing programs that have the potential to reduce preventable hospitalisations. For instance, CHW programs can be most effective if designed for, and to reach, the neediest portion of the population (Riddell et al 2016). As previously noted, CHW programs should also build on existing community-based infrastructure, such as existing community clinics (Clark, 2012). Local community-based organisations can also help with recruitment (Peretz, 2012). Training for CHW's should include skills-based or case-based teaching (Ferguson et al. 2012). Issues of health literacy should be taken under consideration when developing training materials for implementers that do not come from a health or public health background. The need for this was highlighted in the study of the peer-led educational intervention that was successful in significantly increasing diabetes knowledge and empowerment (Davis et al). One of the limitations of this program was that the material from the manual was too advanced, and needed to be modified significantly because participants and peer leaders encountered language and speech barriers.

## Other factors or conditions

The literature provides a number of other lessons learned for ensuring success of programs that can help reduce potentially preventable hospitalisations in the general population. An intervention on patients being discharged from hospital was adapted based on feedback, which provides a number of interesting insights that could be of use in South West Sydney. Patients with multiple co-morbidities reported they were overwhelmed, and wanted to focus on one thing at a time during the intervention. Patient motivation for health behaviour was enhanced by including CHWs in tracking patient progress towards disease management goals. Finally, clinical navigation was a significant issue, so a clinic-based support group was also established (Kangovi et al 2016).

Commercially-available programs (e.g. Weight Watchers) in conjunction with evidence-based interventions can be impactful (O'Neil et al 2016; Reed et al 2016). Some research also focused on assessing the needs or wishes of people with diabetes in relation to training opportunities. For instance, there was more interest in strength training programs among chronic disease patients (CVD, diabetes) as compared with weight control programs (Sciamanna et al 2014). In diabetes management, clinical measurement is important but particularly challenging outside of the hospital or surgery. A comparative effectiveness study found point of care HbA1c testing is comparable with clinical (laboratory) setting measurement, and might therefore be a time and cost saving option for disease management (McDonnell et al 2012). This also offers a viable option for clinical measurement in community programs aimed at people with diabetes.

There were a few keys to success when integrating CHWs into clinical teams and environments. Clinical teams needs to have readiness to accept CHWs as part of the team for success (Ferguson et al 2012). Walton and colleagues (2012) noted lessons learned for integrating CHWs into a health care coordination team. While CHWs have been used to provide culturally sensitive health information and social support, programs can integrate them further into the care coordination

within the health system to deliver diabetes education and assist with chronic disease management. Chronic disease management software can be useful in supporting CHW's in this capacity.

## Special Considerations for Areas of Locational Disadvantage

There were many factors that were particularly relevant to locationally disadvantaged areas among the papers reviewed, providing guidance for development and implementation of interventions to reduce PPH in SWSLHD. Project H.I.G.H., being delivered in an area of locational disadvantage was very successful. This may be due to its family-centred approach, which was an important cultural consideration in this locationally disadvantaged community (Suther et al 2016). The study by Channing (2012) detailed the success of a program which utilised a layperson from the community to deliver the program. This enabled a cultural and communal connection with the study participants. This method was effective in building trust and the community members as health care workers were extremely well placed to understand barriers to disease management. A review of community-based approaches to childhood asthma recognised that it is vital to implement programs where the burden of disease is highest and that the negative impacts of asthma are increasing in low-income urban neighbourhoods (Clark, 2012). The review found that overall, successful programs tended to incorporate the following characteristics: recognition of the multiple factors influencing childhood asthma and its control; consideration of the target population and shaping the intervention to their needs and in collaboration with these groups; incorporation of principles of learning and change; social and physical environments were acknowledged; venues selected were those in which large numbers of families could be reached (e.g. school, electronic means, community-based).

In order to address heart failure in locationally disadvantaged communities, evidence shows that disadvantaged areas with high minority populations experience higher rates of out of hospital cardiac arrest and lower rates of bystander CPR (Sasson et al. 2015). The study also highlighted barriers to intervening, particularly contacting emergency services in these areas. These included fear of involvement of law enforcement, immigration status and lack of recognition of cardiac event. This study recommended that culturally sensitive, tailored public education campaigns could improve bystander CPR rates in disadvantaged neighbourhoods.

## Potential cost savings

From the studies that were included in the review, cost savings were reported for interventions designed for asthma and diabetes. There is compelling evidence of significant cost savings, especially for certain types of programs. CHW programs and mobile phone-based programs with a case manager resulted in greater cost savings than other types of programs reviewed. These programs had the commonality of a specific, assigned professional following up with patients and providing feedback, encouragement, and assistance in disease management. A community health worker delivered diabetes education program for uninsured Mexican Americans estimated a ratio of \$355 USD per quality-adjusted life year gained for intervention participants (Prezio et al 2014). Diabetes self-management education program as part of multi-component initiative did not reduce ED visits, inpatient stays, or costs for participants. However, it did help improve clinical indicators among

participants and thus might lead to fewer costs of future adverse health events (Burton et al 2017). The mobile phone-based diabetes management program in which participants and their case manager interacted on a regular basis resulted in a reduction in HbA1c value. This translates into reductions of other complications, in turn yielding estimated average yearly savings of \$556.50 USD per patient (Taylor and Siddiqui, 2016). An evidence-based community health worker asthma home visit program estimated savings of \$633.88 per patient (190% return on investment), which was directly attributed to the reduction in hospitalisations (Campbell et al. 2015/Martin, 2016). Rau-Murthy (2017) evaluated the cost savings of an asthma education program delivered by asthma educators, finding it resulted in a reduction of ED and hospital admissions which was estimated to save \$600,000 in savings for the cohort (n=574). Finally, Channing (2012) evaluated the return on investment of a Community Health Educator program. As a result of the reduction of emergency department visits and inpatient admissions, for every \$1 invested in the program there was up to \$15 savings.

A cost benefit analysis by Basu et al., 2017 showed that CHW's provide a feasible intervention to reduce hospital utilisation costs. For people with uncontrolled hypertension and congestive heart failure, only 4-5 visits to the ED (approximately 3-4%) would need to be averted by a CHW to achieve cost neutrality. Most other chronic conditions would require between 7-12% of visits to be averted to achieve cost savings.

## Overview of results

Table 4 provides an overview of the types of interventions identified in the literature. The table is organised by 'mode of delivery' and 'intervention content'. It provides the relevant disease types, any reported impact of PPH rates, equity considerations and any program specific cost implications.

**Table 4: Overview of results**

	Diseases that have this type of program (evidence in review)	Reported decrease in rates of PPH	Equity Considerations – Population groups targeted	Measured Cost-effectiveness
<b>Mode of delivery</b>				
<b>Community Health Worker</b>	<ul style="list-style-type: none"> <li>○ Diabetes</li> <li>○ Asthma</li> <li>○ Heart Failure</li> </ul>	Yes	<ul style="list-style-type: none"> <li>○ Racial/ethnic/minority groups</li> <li>○ Low income</li> <li>○ Uninsured</li> </ul>	Yes
<b>Telehealth</b>	<ul style="list-style-type: none"> <li>○ Diabetes</li> <li>○ Heart failure</li> <li>○ COPD</li> </ul>	Yes	<ul style="list-style-type: none"> <li>○ Elderly populations</li> <li>○ Racial/ethnic/minority groups</li> </ul>	Yes

<b>Pharmacy</b>	<ul style="list-style-type: none"> <li>○ Diabetes</li> <li>○ Asthma</li> </ul>	Yes	<ul style="list-style-type: none"> <li>○ Rural populations</li> </ul>	No
<b>Other</b>	<ul style="list-style-type: none"> <li>○ Diabetes</li> <li>○ Asthma</li> <li>○ Heart failure</li> </ul>	Yes	<ul style="list-style-type: none"> <li>○ Racial/ethnic/minority groups</li> <li>○ Age groups</li> <li>○ Education level</li> <li>○ Low income</li> <li>○ Rural</li> <li>○ Public housing tenants</li> </ul>	Yes
<b>Intervention Content</b>				
<b>Education</b>	<ul style="list-style-type: none"> <li>○ Diabetes</li> <li>○ Asthma</li> </ul>	Yes	<ul style="list-style-type: none"> <li>○ Racial/ethnic/minority groups</li> </ul>	No
<b>Exercise</b>	<ul style="list-style-type: none"> <li>○ Diabetes</li> <li>○ COPD</li> </ul>	No	<ul style="list-style-type: none"> <li>○ Racial/ethnic group/minority groups</li> </ul>	No
<b>Multifaceted</b>	<ul style="list-style-type: none"> <li>○ Diabetes</li> <li>○ Asthma</li> <li>○ COPD</li> <li>○ Heart failure</li> </ul>	Yes	<ul style="list-style-type: none"> <li>○ Public housing residents</li> <li>○ Elderly populations</li> <li>○ Rural populations</li> <li>○ Low income</li> <li>○ Racial/ethnic/minority groups</li> </ul>	Yes

Note: If any intervention for any of the diseases listed addressed PPHs, equity or costs, they were listed as ‘yes’ or described which population groups were targeted. For a more detailed overview of each individual paper, see Appendix 2.

## Discussion

This review sought to identify community-based programs that could help prevent hospitalisations associated with five diseases/conditions: asthma, COPD, diabetes, heart failure, and UTI. The literature indicated a number of types of programs with various modes of delivery such as CHW, telehealth and pharmacy all with varying degrees of success. The literature also identified a number of different content focusses of interventions and factors that can influence a program’s effectiveness. This success was often due to the presence of program design, implementation and evaluation practices such as consulting and engaging the targeted community and incorporating principles of cultural sensitivity. For areas of locational disadvantage, engagement of the target community and contextual sensitivities were particularly important in effective program design, implementation and evaluation. In some evaluations, researchers noted the cost saving potential of the studied intervention.

The fact that no literature was found for effective community-based interventions for UTI was a significant finding given that this condition, of the five reviewed, accounted for the most number of hospitalisations in SWSLHD in 2015-2016 (Centre for Epidemiology and Evidence, n.d.). All of the other conditions are chronic diseases, making UTI and associated kidney infection a clear outlier. Hospitalisations caused by UTI and related complications are typically acute, leaving a very small window of opportunity to intervene at the community level. UTIs can be caused in a variety of ways, among which are catheter induced infections. Understanding the reasons behind UTI presentations in SWSLHD (e.g. patient demographics, primary cause of infection) could guide further investigation into programs that prevent related hospitalisations.

Data has shown the extent of hospitalisations which are associated with the five selected conditions and that these are very costly for the health system (Bellon et al, 2017), so it is not surprising that community-based interventions from Australia and abroad focused on communities of individuals with these conditions.

With the local context (demographics) of SWSLHD considered, the literature indicates that the best investment in population-level programming would be to employ a model similar to the CHW strategies outlined above. Research shows that significant cost savings are possible, oftentimes in the form of avoidable hospitalisations, by utilising CHWs (Basu et al. 2017, 4-5 avoided ED visits per CHW would achieve cost neutrality for a CHW program). Further, there is evidence that indicates these interventions are successful in improving disease knowledge and self-confidence in disease management, particularly for asthma and diabetes (e.g. Cadzow et al, 2014; Channing, 2012; Clark, 2012; Kangovi et al, 2016; Martin, 2016; Prezio et al, 2014; Riddell et al, 2016). The literature indicates that this model is particularly effective when considering vulnerable populations (including areas of locational disadvantage), which is particularly relevant in the SWSLHD context. The model could be adapted to fit the SWSLHD context. For example, data from HealthStats show men of all ages have higher rates of hospitalisation for asthma as compared to women. SWSLHD could consider all trends of PPHs when adopting and investing in any intervention aimed at reducing PPH (Centre for Epidemiology and Evidence, n.d.).

In terms of health equity, SWSLHD could undertake an equity analysis of the populations who are being hospitalised for each condition before initiating any program. Programs can be then be targeted and adapted to reach population groups experiencing the highest need. For example, the rate of PPH among the Aboriginal and Torres Strait Islander population of SWSLHD is twice that of non-Aboriginal and Torres Strait Islander population (Centre for Epidemiology and Evidence, n.d.). Once the priority communities are identified, these groups can also be engaged in program design and delivery to determine what program aspects would be acceptable, appropriate and accessible in terms of what sort of interaction or support should be expected of the CHWs (disease education, help navigating clinical practice, goal setting and tracking). Where possible CHWs should be recruited from the area in which the program will be delivered, and trained in cultural competence in working with the diverse populations of SWSLHD. Engagement of the local community in the development, recruitment, delivery and evaluation of any program is particularly important when considering areas of locational disadvantage.

## Limitations

Community-based public health programs (as opposed to clinical) tend to intervene at the beginning of the PPH causal pathway, whereas hospitalisation is at the end. As such, it was often difficult to draw conclusions regarding the potential effect that some of the interventions reviewed had on rates of hospitalisations. Of the 56 papers included in the review, only 14 had a direct link to hospitalisations

Further, purely community-based programs frequently did not include a clinical measure in evaluation. In the literature reviewed, self-reported measures of health, wellbeing, and disease management were more common than quantitative clinical measures. Clinical measures, however, are likely a more robust indicator of risk for hospitalisation.

## Conclusion

This review identified a number of evidence-based programs that yield clinically significant and other health relevant impacts. Often these interventions have been developed and applied in contexts that are different from SWSLHD. Fortunately, there are a number of evidence based programs which can be adapted for new settings. Future work could investigate how potentially effective interventions could be translated into the SWSLHD context. Evaluations should be planned and conducted to support program implementation.

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# Appendices

# Appendix 1: Australia's 22 Ambulatory Care Sensitive Conditions (ACSCs)

**Table 1: There are 22 types of potentially preventable hospitalisations – Australia's 22 Ambulatory Care Sensitive Conditions (ACSCs)**

ACSC Category	Description	Proposed prevention strategies (examples)
Angina	Chest pain caused by insufficient blood flow to the heart	Medication; ongoing control and management
Asthma	Chronic disease of the airways, intermittently affecting breathing	Medication; ongoing control and management; tobacco cessation and mitigation of indoor air pollution
Bronchiectasis	Chronic infection resulting in widening of the airways and damage to the lungs	Disease management; tobacco cessation and mitigation of indoor air pollution
Cellulitis	Bacterial infection of the skin	Early diagnosis and treatment (medication); access to primary health care
Congestive cardiac failure (CCF)	A chronic condition where the heart is weakened and may be unable to pump sufficient blood to the body	Behaviour modification and lifestyle change; medication; ongoing control and management
Convulsions and epilepsy	Neurological diseases characterised by seizures	Medication; ongoing control and management
Chronic obstructive pulmonary disease (COPD) – incl. emphysema and chronic bronchitis	Progressive and disabling destruction of lung tissue and narrowing of airways leading to shortness of breath and reduced capacity for activity	Disease management programs; specialist rehabilitation clinics; tobacco cessation and mitigation of indoor air pollution
Dental conditions	Dental caries and other diseases of the oral region	Access to dental care
Diabetes complications	Type 1 and 2 diabetes mellitus can lead to serious complications if not managed, incl. organ damage	Medication; disease management programs; telehealth; specialist diabetes clinics
Ear, nose and throat infections (ENT)	E.g. Tonsillitis, Pharyngitis	Access to primary health care
Eclampsia	Convulsions in pregnant women with high blood pressure threatening health of both mother and baby	Management of blood pressure during pregnancy
Gangrene	Death or decay of body tissue from obstructed circulation or infection, sometimes resulting in amputation	Access to primary health care
Hypertension	Persistently high blood pressure	Behaviour modification and lifestyle change; medication; ongoing control and management
Iron deficiency anaemia	Lack of iron resulting in fewer red blood cells and reduced oxygen in the blood	Dietary changes; iron supplementation; access to primary health care
Nutritional deficiencies	Severe malnutrition, lack of nutrients	Dietary changes; access to primary health care
Other vaccine-preventable conditions	E.g. Chicken pox, Measles, Mumps, Rubella, Diphtheria, Whooping cough, Rotaviral enteritis	Vaccination

ACSC Category	Description	Proposed prevention strategies (examples)
Pelvic inflammatory disease	Bacterial infection and inflammation of the female genital tract	Early diagnosis and treatment; screening; sex education; access to primary health care
Perforated/bleeding ulcer	A serious complication of an untreated stomach ulcer	Early diagnosis and treatment (medication); access to primary health care
Pneumonia and influenza (vaccine-preventable)	Pneumonia is inflammation of the lungs caused by infection; Influenza is a viral infection of the nose, throat, airways, and lungs	Vaccination
Pneumonia (not vaccine-preventable)	Some forms of pneumonia do not yet have a vaccine	Access to primary health care
Rheumatic heart diseases	Heart inflammation, which can result in permanent damage	Medication; ongoing control and management
Urinary tract infections, including pyelonephritis (UTI)	Infection of the urinary system, usually bacterial, that can lead to severe kidney damage if left untreated	Early diagnosis and treatment (medication); access to primary health care

Sources: World Health Organisation (WHO) (2011); Katterl et al. (2012); Council of Australian Governments (COAG) (2015)

# Appendix 2: Data Extraction Tables

## Asthma

Database	Reference	Source (country and type)	Research Design	Sample Size	Duration of Study	Measurement tools	Summary of Research	Limitations	Equity consideration	Direct link to hospitalisation	Potential Themes
MEDLINE	Alicea-Alvarez, N., Swanson-Biearman, B., & Kelsen, S. G. (2014). A review of barriers to effective asthma management in Puerto Ricans: cultural, healthcare system and pharmacogenomic issues. <i>Journal of Asthma</i> , 51(1), 97-105.	Journal Article, USA	Literature review		1990-2012 Literature		<p>Barriers to effective asthma management in Puerto Ricans include: 1)health system policies 2) insurer compensation patterns 3) clinician attitudes and 4) cultural values.</p> <p>Culturally sensitive community based asthma education models can improve asthma outcomes (decrease morbidity, improve update of asthma medication) for Puerto Ricans.</p>		Targeted- Puerto Ricans	No	Culturally sensitive programs Education (patient/caregiver)
Embase	Bucher, J. A., & Thompson, C. W. (2012). Promoting Health in Low-Income Communities: The Asthma Safe Kids Program Delivered by an Academic Nurse Managed Center. <i>Journal of Asthma and Allergy Educators</i> , 3(5), 215-220.	Journal Article, USA	Report	33 children with asthma	18 months	Knowledge test	<p>Findings of the intervention: knowledge increase and a reduction of average ED visits and hospitalisations</p> <p>Lessons learnt : Descriptions of asthma-related community programs lack program planning and delivery aspects as they focus on findings. Suggestion to use interactional community planning model 'community field theory'. Using 'what works' locally, guided by properties of an interactional theory that balances task verses relationship poles may result in improvements in recruitment and family outreach in this health promotion area.</p>		Low -income, public housing neighbourhoods	Yes reduction in ED visits and hospitalisations (although not statistically significant)	In-home Educational (patient/caregiver)
MEDLINE	Channing, A. H. (2012). Overcoming barriers through community engagement. Paediatric asthma program succeeds through	Editorial, USA	N/A descriptive (paediatric asthma intervention program		Ongoing over 10 years in 2012 (intervention)	Morbidity, urgent health resource utilisation and quality of life (reduction of asthma triggers in	<p>Identification of the gap in communication between PCPs and families- barrier. Therefore, Community Health Educators model used.</p> <p>Benefits of CHE- layperson from the community, cultural and communal connection with the study</p>		Low income, minority communities	Yes, 72% reduction in number of ED visits. Study found that every dollar invested	Community Health Educator In-home Support of navigation of the health system

	collaboration and commitment. Healthcare Executive, 27(2), 64, 66.		using CHEs)			the home, improve asthma-related knowledge and confidence of caregiver)	<p>participants. Extremely effective in building trust with families and are well placed to address the barriers families face in the management of a child's asthma. Also provides valuable employment to communities in need.</p> <p>CHE's dont need any previous experience but they undergo extensive Asthma Education Training. The work with families in the home (six visits annually) to provide education on asthma management and addressing asthma triggers in the home (environmental assessment)</p> <p>In 2008, a evaluation found that social and economic issues that impede a family's ability to manage asthma are complex and often require expertise that goes beyond medical professionals or CHE. So they were funded to launch a comprehensive component: Healthy Home, Healthy Child: The Westside Children's Asthma Partnership (HHHC). The focus is on children with poorly controlled asthma living on the West Side of Chicago.</p> <p>People who use the program have experienced a 72% decrease in ED visits and a 65% decrease in asthma attacks during the 12 month period of enrolment. Also children in the program experienced a 40% decrease in number of days they experience asthma symptoms.</p> <p>Engaging community to improve health status is a good approach.</p>			in a CHE, spending of \$15 in ED or inpatient is avoided.	Educational (patient/caregiver) Educational (HC provider)
MEDLINE	Clark, N. M. (2012). Community-based approaches to controlling childhood asthma. Annual Review of Public Health, 33, 193-208.	Journal Article, USA	Review?				<ol style="list-style-type: none"> <li>1. The negative impacts of asthma is increasing in low-income urban neighbourhoods</li> <li>2. Asthma is managed primarily out of clinical care</li> <li>3. community-based programs are necessary to enable families to build capacity to manage asthma</li> <li>4. School-based programs and community coalitions are particularly effective means to enhance asthma management capacity</li> <li>5. Comparative and translational-focused research is needed to identity the most effective asthma control strategies and make them widely available.</li> </ol>		Many studies consider low income neighbourhoods and specific population groups (particularly African American)	Yes, some studies use hospital visits as a measure of success.	In-home Educational (patient/caregiver) School-based Telephone counselling Community Health Worker Community engagement/participation Systems

						<p>Working with and within vulnerable communities can be a productive way to help resolve public health problems. Recognition that it is vital to go where the burden of disease is highest.</p> <p>Community based approaches to asthma control:</p> <ol style="list-style-type: none"> <li>1. School focused studies- most focussed on asthma self-management and environmental control. Delivered in classrooms, school-based health clinics (counselling by nurses), mobile units on school grounds. Little rigour around evaluation of these initiatives, 5 RCTs found that education for self-management improves symptoms, health care use, absenteeism, academic performance and students or parents quality of life. All involve the parent in some way. There are major issues when funding these programs, both through the investment of money but also time (taken away from academic time). Initiatives focused on removing environmental allergens are difficult to implement as triggers vary and are brought in from the home so they can never be allergen free environments. However, simple strategies such as the 'Tools for Schools'- ensuring cleanliness, ventilation and clean air filters are beneficial in themselves.</li> <li>2. Electronic media- (computer assisted asthma instruction/games, web based programs) mixed results as the research is at its very early stages.</li> <li>3. Home visits- nurses or community health workers usually implemented as an outreach service from clinical services. Mainly focused on education about asthma and modifying the indoor environment to reduce dust mites, cockroach antigen, animal dander and other asthma triggers. Higher intensity versions of the model were more effective at improving quality of life measures and reduced need for urgent health services.</li> <li>4. Education in community-based clinics- patient education based</li> <li>5. Telephone counselling- relatively new, so limited rigorous evaluation. 3 studies show decreases in hospitalisations, increase in PC use, increase in medicine use.</li> <li>6. Outdoor air pollution control- remains a general goal of public health efforts. Studies show positive</li> </ol>				<p>approach (system-wide changes)  Computer based  Community health clinic  Environmental control</p>
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						<p>impact.</p> <p>7. Coalitions for system and policy change- Efforts by organisations within neighbourhood or regions especially in or near hotspots, to bring about changes that will affect large numbers of people with asthma. Engaging the people who it affects in determining ways to fix it. Studies show that in areas which coalitions have occurred (and resulted in policy and system changes conducive to asthma control) asthma status had improved. Coalitions take on the needed system-wide changes evident in vulnerable communities have promising benefits. However there is no assessment of costs of this model and its outcomes that it achieves.</p> <p>Characteristics of successful programs:</p> <ul style="list-style-type: none"> <li>- Recognising the multiple factors that influence childhood asthma and its control</li> <li>- Most consider the nature of the target population (often low-income children of colour) and shape the intervention to their needs</li> <li>- Principles of learning and change were integrated into majority of the interventions</li> <li>- Both social and physical environments were acknowledged</li> <li>- Venues selected through which large numbers of families can be reached (school, electronic means, phone counselling)</li> </ul>				
MEDLINE	Elaro, A., Shah, S., Pomare, L. N., C. L. A., & S, Z. B.-A. (2014). PACE: Pharmacists use the power of communication in paediatric asthma. International Journal of Clinical Pharmacy, 36(5), 976-985.	Journal Article, Australia	Pre-post mixed method	44 Pharmacists	Pharmacist satisfaction and acceptability of the workshops, confidence using communication strategies pre and post, self-reported change pre post. Main outcome measure: Pharmacist self-reported changes in communication and teaching behaviours during a paediatric	<p>Intervention: adapting the PACE (Practitioner Asthma Communication and Education) framework to the Australian pharmacy context and delivering training to pharmacists of the educational program about communication skills and asthma related practices.</p> <p>Findings:</p> <ol style="list-style-type: none"> <li>1. High satisfaction with the workshop and value of the interactive nature of the workshop.</li> <li>2. Post the workshop pharmacists reported significantly higher levels in using the communication strategies, confidence in their application and helpfulness.</li> <li>3. Post- pharmacists reported checking for written asthma self-management plan possession and inhaler device technique more frequently and</li> </ol>	No asthma outcomes measured.	No	No	Pharmacy Educational (HC Provider)

						<p>asthma consultation.</p> <p>provided verbal instructions more regularly to patients are carers at initiation of new medication.</p> <p>Pharmacists are eager to form a collaborative working relationship with GPs in the development of written asthma self-management plans. Pharmacists are also ideally positioned within the PC system to optimise patient disease self-management. Potential future role of pharmacists- using their medication expertise and taking on a stronger role in development of asthma self-management plans for their patients. Although they were aware of strategies prior to the workshop but only implemented them after the workshop. Pharmacists enhanced their fundamental skills and provides communication strategies in the management of asthma.</p> <p>Next steps of PACE- would be to focus on the interdisciplinary communication and behavioural strategies for GPs and allied health providers in the management of paediatric asthma. Pharmacists and GPs working collaboratively to improve asthma management. There is also a need to evaluate the PACE intervention on asthma outcomes.</p>				
Embase	<p>Fedele, D. A., Koinis-Mitchell, D., Kopel, S., Lobato, D., &amp; McQuaid, E. L. (2013). A community-based intervention for Latina mothers of children with asthma: What factors moderate effectiveness? <i>Children's Health Care</i>, 42(3), 248-263.</p>	Journal Article, USA	Randomised Control Trial	115		<p>Asthma knowledge (maternal), changes in medication beliefs, contextual stress</p> <p>Intervention: participants invited to attend DAB (draw-a-breath) group based asthma educational program at their community health clinic, offered in Spanish and English. One 2.5 hour group session for children with asthma and a concurrent, but separate, groups for their primary care givers.</p> <p>Overall: the findings demonstrate that the program was successful in increasing maternal asthma knowledge among low-income Latina mothers. This was attributed to a number of factors; the delivery of the program in a culturally tailored format, the continuous adaptation of the program overtime based on participant feedback and the focus on using visual methods and hands-on skill training, in combination with oral-instruction, to meet the needs of parents with lower literacy.</p> <p>Statistical analysis showed a significant increase in</p>	<p>Targeted approach- results may not be generalisable to other ethnic minorities or low-income families, also fathers.</p>	<p>Targeted- Latino mothers, predominately low income</p>	No	<p>Culturally sensitive programs Educational (patient/caregiver) Community Health Clinic</p>

						<p>asthma knowledge. There was no significant difference in maternal beliefs in medication necessity or concerns around asthma medication.</p> <p>Links to demographic data: Mothers above the poverty threshold endorsed lower beliefs about the necessity of medication. Higher maternal education was associated with lower beliefs of the necessity of medication. Maternal education was no associated with differential changes in asthma knowledge. Mothers with higher depressive symptoms reported decreased medication concerns.</p> <p>Results suggest that mothers with higher levels of contextual stress require more intensive education efforts to result in changes of similar magnitude to mothers with lower levels of contextual stress.</p> <p>Remaining barrier- long-held asthma medication beliefs e.g. concern about long term complications or reliance on medication are still present. Suggestion to overcome this through ongoing messaging from different providers in order to address these concerns.</p>				
MEDLINE	Labre, M. P., Herman, E. J., Dumitru, G. G., Valenzuela, K. A., & Cechman, C. L. (2012). Public health interventions for asthma: an umbrella review, 1990-2010. <i>American Journal of Preventive Medicine</i> , 42(4), 403-410.	Journal Article, USA	Literature Review	42 Papers		<p>Of the 42 review papers that were found, 19 assessed that effectiveness of education and/or self-management (including school based, computer based and individualised plans), 9 assessed the reduction of indoor triggers, 9 assessed the improvement of the provision of health care and 5 examined other interventions.</p> <p>Asthma education/self management- general asthma education, self management education, self-monitoring. Many of the studies found a reduction in hospital/ED visits, increases in knowledge and better asthma management.</p> <p>Environmental interventions- control of indoor triggers. Limited evidence for the efficacy of these programs, however, reviews focusing on a single trigger or single interventions found evidence of effectiveness using the measures of improvements of asthma symptoms, school days missed and</p>	No, although it acknowledges that the condition is particularly prevalent in children and certain minority groups.	Yes, some studies use hospital visits as a measure of success.	<p>Environmental control</p> <p>In-home Education (patient/caregiver)</p> <p>Support of navigation of the health system</p> <p>School-based community health worker</p> <p>Systems approach (system-wide changes)</p> <p>Educational (provider)</p>	

						<p>healthcare utilisation. Home visits of community health workers were favourable but the strength of the evidence is unclear.</p> <p>Provision of Health care- administrative/systems change and provider education. Systems change based programs demonstrated improvements in use of medication. Provider education based studies provided benefits in reducing length of stay, hospital costs, continuity of care, increased doctor knowledge and better prescribing behaviour. Engagement of a pharmacist in the HC team also provided benefits for symptoms and healthcare utilisation.</p> <p>State or community asthma control programs should prioritize 1) implementing interventions for which this review has found evidence of effectiveness 2) evaluating promising interventions that have not yet been rigorously assessed.</p>				
MEDLINE	<p>Martin, M. (2016). Community health worker program enhances asthma outcomes. <i>Journal of Pediatrics</i>, 168, 254.</p> <p>Campbell JD, Brooks M, Hosokawa P, Robinson J, Song L, Krieger J. Community Health Worker Home Visits for Medicaid-Enrolled Children With Asthma: Effects on Asthma Outcomes and Costs. <i>Am J Public Health</i> 2015;105:2366-72.</p>	Journal Article, USA	Randomized parallel-group trial	373		<p>Asthma symptom free days, caretakers QoL, urgent care utilisation, cost (return on investment)</p>	<p>The intervention: Community Health Worker home visit program (streamlined version), 4 visits with up to 2 telephone contacts, topics deemed most relevant to each participant through interviews and exposure. CHW provides education, support and service coordination. CHW makes initial visit to assess participants knowledge of asthma, asthma control level, challenges with controlling asthma, self-management practices and exposure to asthma triggers. Followed by visits 0.5, 1.5 and 3.5 months later. CHW also provided support via phone email or additional home visits where needed. Participants received a low emission vacuum cleaner, cleaning supplies, roach abatement supplies and allergen-impermeable bedding. The CHWs involved children in the home visit activities. Asthma control was assessed based on child's self-report, included the child in education and offered coaching on correct use of asthma devices.</p> <p>Results: Intervention group had significantly greater improvements in asthma symptom free days (2.1 days more over 2 weeks) and caretakers QoL (0.4 units more) than the control group. The</p>	<p>Medicaid- low income Caretakers education levels 62.2% of sample were Hispanic, 15.3 non-Hispanic black and 8.8% non-Hispanic white.</p>	<p>Yes, link to urgent health care utilisation (hospitalisation, ED, urgent clinic) The intervention was expected to save \$1340.92 for the \$707.04 additional cost invested in the average patient. Making the estimated cost saving of \$633.88 per patient. The ROI was 190%.</p>	<p>Community Health Worker Educational (Patient/caregiver) In-home Environmental Control Cost Benefit</p>

							<p>intervention group also experiences a reduction in urgent health care utilisation (1.3 fewer visits over 12 months). The intervention was significantly more effective among caretakers with less than high school education. Asthma symptom free days and caretakers quality of life was also increased in this group.</p> <p>Cost analysis: Due to the annual reductions in hospitalisations, the intervention was expected to save \$1340.92 for the \$707.04 additional cost invested in the average patient. Making the estimated cost saving of \$633.88 per patient. The ROI was 190%.</p> <p>The streamlined community health worker asthma home visit program for children with uncontrolled asthma in Medicaid increased symptom-free days and caretaker asthma-related QoL and reduced urgent health care utilisation and costs.</p>				
MEDLINE	Peretz, P. J., Matiz, L. A., Findley, S., Lizardo, M., Evans, D., & McCord, M. (2012). Community health workers as drivers of a successful community-based disease management initiative. American Journal of Public Health, 102(8), 1443-1446.	Field Action report, USA	Care coordination program	472 families	2006-2012	Hospitalisations and ED visits, caregiver confidence in controlling asthma	<p>Intervention: Bilingual community health workers, based in community organisations and the local hospitals provided culturally appropriate education and support to families who needed help managing asthma. Based around comprehensive asthma education, home environment assessments, trigger reduction strategies and clinical and social referrals</p> <p>Results: After 12 months, hospitalisations and ED visits decreased by more than 50% and caregiver confidence in controlling the child's asthma increased to nearly 100%.</p> <p>Key lesson/best practice model- commitment and involvement of community partners.</p>		Sample more than half of local residents are foreign born, 1 in 4 households is linguistically isolated and 1 in 3 families live below the poverty line. Culturally sensitive model (CHWs from the communities, speak the languages)	Yes, link to hospitalisations and ED visits (decreased more than 50%), participants identified when child is admitted to hospital with a diagnosis of asthma.	Community health workers Culturally sensitive care Educational (patient/caregivers) Environmental controls Support of navigation of the health system
Embase	Quinones, A. R., Richardson, J., Freeman, M., Fu, R., O'Neil, M. E., Motu'apuaka, M., & Kansagara, D. (2014). Educational group visits for the management of chronic health conditions: A systematic review.	Journal Article, USA	Systematic Review	10 papers relating to asthma/COPD		Service utilisation, improvements in quality of life	Results (asthma): Didactic, self-management and experimental group visits. 2 studies reported a decrease in health service utilisation, 2 studies showed improvements in QoL. Group interventions in comparison to usual care.	Small sample relevant to asthma	No	No	Group Interventions

	Patient Education and Counseling, 95(1), 3-29.										
Embase	Rau-Murthy, R., Bristol, L., & Pratt, D. (2017). Community-Based Asthma Education. American Journal of Managed Care, 23(2), e67-e69.	Journal article	Prospective observational study	574		Asthma understanding, healthcare utilisation and estimated costs	<p>Intervention: Asthma education program. The patient-centred goals of this program are 4-fold: 1) increase quality of life, 2) decrease "sick visits" to primary care physician, 3) decrease lost work or school days, and 4) decrease ED/urgent care visits and hospitalizations. Treating providers refer to the program and consequently Asthma Educators provide up to 10 hours of instruction within a continuous 6 month period.</p> <p>Results: patients reported better controlled asthma and increased asthma knowledge. Hospital ED presentations (0.7 visit per patient) and inpatient admissions (0.06 per patient) decreased. Costs associated with ED visits is \$1500 per visits, a approximate saving of \$600,000 for this cohort. Inpatient costs are \$3600 for children and \$5500 for adults, resulting in a \$230,000 saving for this cohort.</p>	72% Medicaid patients (low income)	Yes, Hospital ED presentations (0.7 visit per patient) and inpatient admissions (0.06 per patient) decreased. Costs associated with ED visits is \$1500 per visits, a approximate saving of \$600,000 for this cohort. Inpatient costs are \$3600 for children and \$5500 for adults, resulting in a \$230,000 saving for this cohort.	Educational (patients/caregivers) Asthma Educator Cost Saving for hospitals.	
MEDLINE	Woodhouse, L. D., Livingood, W. C., Toal, R., Keene, D., Hines, R. B., Tedders, S., . . . Kellum, A. (2015). Evaluation of Diverse Community Asthma Interventions: Balancing Health Outcomes with Developing Community Capacity for Evidence-Based Program Measurement. Population Health Management, 18(5), 342-350.	Journal Article, USA	Mixed Methods developmental evaluation	962	5 Years		<p>Types of interventions ranged from community-based asthma camps, hospital ED-based programs, community-based trigger control programs, school nurse asthma services, and primary care-based clinical interventions (5 sites)</p> <p>Results: reduction in hospitalisations and ED visits although not able to be aggregated to test statistical significance</p>	Lack of standardised approach to the asthma control interventions, not robust.	Low SES population Majority of participants were African American	Yes, reduction in hospitalisations and ED visits although not able to be aggregated to test statistical significance	Community Capacity Building School based

## Diabetes

Database	Reference	Source (country and type)	Research Design	Sample Size	Duration of Study	Measurement tools	Summary of Research	Limitations	Equity consideration	Direct link to hospitalisation	Potential Themes
Global Health	Ballestas, T., McEvoy, S., Swift-Otero, V., Unsworth, M. (2014). A metropolitan Aboriginal podiatry and diabetes outreach clinic to ameliorate foot-related complications in Aboriginal people. Australian and New Zealand Journal of Public Health 38(5), 492-293.	Australia (Western Australia)  Report in a Journal (not a full article)	A mixed methods approach: - focus groups; - face-to-face interviews with staff; - review of program documents; - clinic visits to conduct the environmental scan; - analysis of the program's administrative database.	702 clients served 6 staff (coordinator, two podiatrists, one Aboriginal diabetes educator, one Aboriginal health professional and one Aboriginal administrative secretary)	2 years	unlisted	Outcome evaluation has not been conducted. Authors indicate program's success by citing level of attendance and the high regard for the program within the local community.	This isn't a full paper with methods and results listed.	lots of consultation with Aboriginal community in designing the program.	article references a clinical outcome evaluation that is planned which will include the assessment of hospitalisation rates	Aboriginal Community health educator
MEDLINE	Bielamowicz, M. K., Pope, P., Rice, C. A. (2013). Sustaining a creative community-based diabetes education program: motivating Texans with type 2 diabetes to do well with diabetes control. Diabetes Educator 39(1), 119-27.	U.S.A. (Texas)  Journal Article	Mixed methods: pre/post-test questionnaires observation	2835 (2/3 of whom had diabetes)	4 years (multiple cohorts)	pre/post test captured: - knowledge; - behaviour; haemoglobin A1C	Cooking Well With Diabetes (CWWDD) program provided a short-term impact of knowledge gain, and the adoption of healthy cooking practices was observed among program participants. No reduction of blood glucose levels and haemoglobin A1C was noted, though this may be due to the short time between pre-test and post-test not being sufficient to realize and measure such reductions.	longer term follow up was not achieved, so not sure how durable changes in knowledge and behaviours were  many participants' self-reported A1C levels were	none	none	Educational intervention (patient)  cooking-related

								not usable			
Global Health	Burton, J., Eggleston, B., Brenner, J., Truchil, A., Zulkiewicz, B. A., Lewis, M. A. (2017). Community-based health education programs designed to improve clinical measures are unlikely to reduce short-term costs or utilization without additional features targeting these outcomes. Population Health Management 20(2), 93-98.	U.S.A. (Camden, New Jersey)  Journal Article	multivariable analysis of records	From each data source-Medical records: 125 Camden Health Database : 87261	3 years	Analysed for 3 outcomes: (1) ED visit rates, (2) inpatient admission rates, and (3) total hospital charges	This study assessed whether a diabetes self-management education (DSME) program offered as part of a multicomponent initiative could affect emergency department (ED) visits, hospital stays, and the associated costs for an underserved population in addition to the clinical indicators that DSME programs attempt to improve.No reductions in ED visits, inpatient stays, or costs for participants were found over time in intervention group or relative to the comparison groups. Some clinical indicators improved among participants, and these might lead to fewer costly adverse health events in the future.	non-equivalent comparison and program groups  DSME is meant to slow disease progression, thus is not taken/used when disease has progressed to point of hospitalisation for diabetes (kidney failure, amputations, and diabetic neuropathy)	none	Study was aimed at identifying changes in ED visit rates, inpatient admission rates, and hospital charges	Program design to target "frequent flyers" might be better  Educational intervention (patient)
Global Health	Cadzow, R.B., Vest, B.M., Craig, M., Rowe, J.S., Kahn, L.S. (2014). "Living well with diabetes": evaluation of a pilot program to promote diabetes prevention and self-management in a medically underserved community. Diabetes Spectrum 27(4), 246-255.	U.S.A. (Buffalo, New York)  Journal Article	Mixed methods. Qualitative data included Health Talker written summaries of conversation content. Quantitative data included participant demographics and reported perceptions of the conversation's impact on their knowledge	Health Talkers (who deliver program) 12 women 1 man  Community: 208	6 months	10-item survey that measured demographics and experience with diabetes  Health Talker notes	The Neighbourhood Health Talker Program used community members trained as cultural health brokers to engage their communities in conversations about "living diabetes well." Program evaluators used mixed methods to analyse post-conversation surveys and Health Talker field notes. These indicated an increase in diabetes-related knowledge and increased confidence among conversation participants. Conversations included discussion of barriers and facilitators to lifestyle changes and effective self-management that are frequently overlooked in a clinical setting.	sample size and representativeness (total pool of 700)  not a validated instrument	sample was diverse	none	Note: Assumption for inclusion is that greater knowledge of diabetes means fewer hospitalisations  Community health workers Culturally sensitive program Educational intervention (patient)

			of diabetes and self-management techniques.								
Global Health	Chang, F., Gupta, N.S., Smith, L., Stringer, D. (2014). The impact of a community pharmacy-based coaching program on patient confidence and lifestyle. <i>Open Journal of Preventive Medicine</i> 4(6), 499-503.	Canada Journal Article	participants recruited at community pharmacy in rural Ontario, Canada	4	3 months	demographics, blood pressure (BP), waist circumference (WC), blood glucose levels (BG), body weight (W), and lifestyle behaviours	Individual in-person interviews were conducted to identify specific goals to effectively self-manage their condition and to rate their confidence in their ability to fulfil these goals. Three monthly sessions were held to review and update goals, and to record blood pressure, waist circumference and weight measurements. Results: At the end of the study, all four achieved success in reaching and maintaining their personal dietary and physical activity goals. Significantly, all participants expressed increased confidence in their ability to self-manage their diabetes after health coaching.	sample size resource-intensive	rural populations targeted	none	Pharmacy Coaching
MEDLINE	Davis, S., Keep, S., Edie, A., Couzens, S., Pereira, K. (2016). A Peer-led Diabetes Education Program in a Homeless Community to Improve Diabetes Knowledge and Empowerment. <i>Journal of Community Health Nursing</i> 33(2), 71-80.	U.S.A. (Grand Rapids, Michigan) Journal Article	pre/post-test peer education intervention (4 sessions)	31	4 weeks	For participants: Diabetes Empowerment Scale-Short Form; diabetes knowledge items; demographics For implementers: peer leader participation and knowledge Qualitative measures: field notes for QI regarding participant interaction, content delivery, barriers to implementation, threats to feasibility, and opportunities for improvement	Knowledge scores increased significantly during sessions covering signs, symptoms, and complications of diabetes and diabetes medications. Empowerment scores after attending the 4-week program were significantly increased when compared to scores prior to the first session. Field notes and post implementation focus group support increased empowerment and knowledge among participants.	Material from manual was too advanced, needed to be modified significantly participants and peer leaders encountered language and speech barriers low sample size	specifically focused on homeless and low-income population	none	Educational program (patient; peer-led)
Global	Ferguson, W.J., Lemay, C.A., Hargraves, J.L.,	U.S.A.	qualitative and	10 CHW trainees	13 months	knowledge and self-reported skill	There were statistically significant increases in the scores of CHWs' self-reported knowledge in 8 of	low sample size not good		none	lessons learned for developing a

Health	Gorodetsky, T., Calista, J. (2012). Developing community health worker diabetes training. Health Education Research 27(4), 755-765	Journal Article	quantitative evaluation included pre/post-knowledge outcomes and encounter data from the field	and 6 Community Health Centres		confidence on surveys CHW Encounter Form to document patient encounters qualitative interview	15 curricular domains. Qualitative analysis revealed that CHWs preferred skill based and case-based teaching, shorter training days but more contact hours. CHWs reported that pre-deployment training alone is insufficient for successful integration into care teams. CHW supervisors reported that CHC's readiness to accept CHWs as members of the care team was as important to successful deployment as training. With respect to implementation, supervision by social workers was deemed more successful than nursing supervision. Field data showed that patient encounters lasted less than 30 min and self-management goals focused on appointment keeping, diet, exercise and glucose testing	generalizability			diabetes-specific CHW training program
MEDLINE	Higgs, C., Skinner, M., Hale, L. (2016). Outcomes of a community-based lifestyle programme for adults with diabetes or pre-diabetes. Journal of Primary Health Care 8(2), 130-139.	New Zealand Journal Article	prospective observational study of an intervention, with no parallel control, with baseline and repeated quantitative outcome measures and supportive qualitative data collection on acceptability	36 to 20 by the end	12 weeks	standardised measures of cardiorespiratory fitness, waist circumference, exercise behaviour and self-efficacy at each of the three time points. The six minute walk test (6MWT) was used to measure cardiorespiratory fitness	The 12-week community programme included twice-weekly sessions of self-management education and exercise, supervised by a physiotherapist, physiotherapy students and a nurse. Clinically significant improvements were found from baseline (n = 36) to programme completion (n = 25) and 3-months follow-up (n = 20) for the six minute walk test, waist circumference, exercise behaviour, and self-efficacy. Good programme acceptability was demonstrated by themes suggesting a culturally supportive, motivating, friendly, informative atmosphere within the programme.	no control group or blinding small sample size	Maori and Pacific Islanders included in patient population	none, although it was noted that attrition was largely due to medical reasons. Majority had multi-morbidities	- training for patients - Exercise component - culturally supporting
Global Health	Kangovi, S., Carter, T., Charles, D., Smith, R.A., Glanz, K., Long, J.A., Grande, D. (2016). Toward a scalable, patient-centered community health worker	U.S.A. (Pennsylvania) Journal Article	Qualitative interviews with patients to understand barriers to discharge	21 patients (multimorbidity), 30 primary care staff from 3	7 months	N/A	This study used a qualitative design-mapping process to adapt an evidence-based CHW intervention, originally developed and tested in the hospital setting, for use among outpatients with multiple chronic conditions. Three key themes informed adaptation of the original intervention for outpatients with multiple conditions. First,	small number of qualitative interviews conducted: the revisions made based on these interviews may	patients came from high-poverty neighbourhood	Yes, trying to avoid future hospitalisations after discharge	good guidelines on a CHW intervention for people being discharged  Community health

	model: adapting the IMPaCT intervention for use in the outpatient setting. Population Health Management 19(6), 380-388		care Design mapping to adapt IMPaCT intervention	primary care clinics			outpatients were overwhelmed by their multiple conditions and wished they could focus on 1 at a time. Thus, the first major revision was to design a low-literacy decision aid that patients and providers could use to select a condition to focus on during the intervention. Second, motivation for health behavior change was a more prominent theme than in the original intervention. It was decided that in addition to providing tailored social support as in the original intervention, CHWs would help patients track progress toward their chronic disease management goals to motivate health behavior change. Third, patients were already connected to primary care; yet they still needed additional support to navigate their clinic once the intervention ended. The intervention was revised to include a weekly clinic-based support group.	not have reflected the perspectives of the broader patient population. It was adapted for a small number of settings			worker Input from patients and providers Support of follow up after visit with provider
Global Health	Lopez, P.M., Islam, N., Feinberg, A., Myers, C., Seidl, L., Drackett, E., Riley, L., Mata, A., Pinzon, J., Benjamin, E., Wyka, K., Dannefer, R., Lopez, J., Trinh-Shevrin, C., Maybank, K.A., Thorpe, L.E. (2017). A place-based community health worker program: feasibility and early outcomes, New York City, 2015. American Journal of Preventive Medicine 52(3), S284-S289.	U.S.A. (New York, NY)  Journal Article	Intervention evaluation design was a non-randomized, controlled quasi-experiment	random sample telephone survey, n=1,663; six focus groups, n=55	1 year of time passed, but data collection occurred for each participant at 3-month follow up	blood pressure self-reported physical activity general mental health status, self-perceived chronic disease management, healthcare access, self-efficacy, and quality of life	At the 3-month follow-up, nearly all intervention participants reported high satisfaction with their CHW (90%) and HA (76%). Intervention participants showed significant improvements in self-reported physical activity (p=0.005) and, among hypertensive participants, self-reported routine blood pressure self-monitoring (p=0.013) compared with comparison participants. No improvements were observed in self-efficacy or clinical measures at the 3-month follow-up. CHWs were recruited from public housing and general neighbourhood.	participants in treatment and controls not randomly selected limited sample size	public housing residents	none	Community health workers (peer/from community) Educational intervention (patients) related to self-management
Embase	McDonnell, M.E., Jahreis, K., Khan, W., Bourland, A.C., Cullum-Dugan, D., Hanrahan, P., Apovian, C.M. (2012). Point-of-care hemoglobin A1c testing in a community diabetes prevention program. Diabetes 61, A308-A309.						To review the correlation between point-of-care HbA1c testing and laboratory HbA1c measurement in patients with diabetes in clinical settings. The pooled results showed a positive correlation between point-of-care HbA1c testing and laboratory HbA1c measurement.		none	none	point of care testing can be used as HbA1c measure (implications for designing programs)

Embase	Miller, E.G., Nowson, C.A., Dunstan, D.W., Kerr, D.A., Solah, V., Menzies, D., Daly, R.M. (2016). Recruitment of older adults with type 2 diabetes into a community-based exercise and nutrition randomised controlled trial. <i>Trials</i> 17(467), ??.	Australia  Journal Article	RCT, but this article describes recruitment process	198	n/a	n/a	The aim of this report is to describe the recruitment strategies used and the success of each approach in recruiting older adults with type 2 diabetes into a 6-month community-based exercise and nutritional supplementation randomised controlled trial (RCT). A secondary aim is to assess the costs associated with the recruitment methods used. The most effective recruitment strategies were targeted mass mail-outs (39 % of the total participant sample), state (27 %) and local (14 %) print media. In total recruitment expenditure was AUD\$40,421, which equated to AUD\$35 per enquiry and AUD\$204 per eligible participant. Targeted mail-outs and state print media were the most expensive strategies each accounting for 38 % of total expenditure. To recruit around 200 older adults with type 2 diabetes into a community-based lifestyle intervention trial in a timely manner, it is important to ensure that an adequate budget is allocated to recruitment as targeted mail-outs and state/local print media were the most costly but effective strategies.	The effects of the monetary reimbursement on incentive to participate in the trial were not assessed.  The recruitment strategies found to be most successful in sourcing eligible participants for this trial were also the ones which were repeated multiple times potentially biasing the findings	none	none	Educational program (patients)  Best practices on recruitment
MEDLINE	O'Neil, P.M., Miller-Kovach, K., Tuerk, P.W., Becker, L.E., Wadden, T.A., Fujioka, K., Hollander, P.L., Kushner, R.F., Timothy Garvey, W., Rubino, D.M., Malcolm, R.J., Weiss, D., Raum, W.J., Salyer, J.L., Hermayer, K.L., Rost, S.L., Veliko, J.L., Sora, N.D. (2016). Randomized controlled trial of a nationally available weight control program tailored for adults with type 2 diabetes. <i>Obesity</i> 24(11), 2269-2277.	U.S.A.  Journal Article	RCT	563	1 year	n/a	This study examined the effects on glycaemic control and weight loss of the standard Weight Watchers program, combined with telephone and email consultations with a certified diabetes nutrition counselling and education (standard care, SC). Intervention group had lower HbA1C levels, greater weight loss, and greater reductions in waist circumference. Widely available commercial weight loss programs with community and online components, combined with scalable complementary diabetes education, may represent accessible and effective components of management plans for adults with overweight/obesity and T2DM.	the design did not permit ascertainment of the individual contributions of the certified diabetes educator counselling and the Weight Watchers program	results are described by ethnic group	none	using evidence-based and commercially available programs
Global Health	Parker, R., Brooks, W., Wright, J., Nielsen, N., Gross, B. (2017). Community partners join	U.S.A.  Journal	pre/post screening of health metrics and	467 participants	3 years	Participants were screened using the Diabetes Risk Test from the American	Objective was to create an initiative to change the culture of a small community to improve quality of life as it relates to health for the residents through the use of health-related educational sessions, a	Each individual intervention section lasted only 10 weeks,	County in which intervention was delivered was socio-economically		initial exam was in pharmacy  group exercise

	forces: battling obesity and diabetes together. Journal of Community Health 42(2), 344-348.	Article	feedback about program			Diabetes Association	coordinated fitness and nutrition program, and the construction of community fitness trails. (The Lose-to-Win weight loss intervention consists of fitness and lifestyle counselling sessions that occur during the 10-week program.) Compared the use of a health-focused community driven program to the status quo in seeking opportunities to improve perception and understanding of one's health and overall quality of life for participants. Among the various techniques identified to improve a community's health outcomes, dissemination of information through the use of educational sessions empowered citizens to take control of their health status, and ultimately, their quality of life.	limiting the ability to extrapolate findings into a long-term intervention time frame.	disadvantaged, had higher than average rates of obesity and related comorbidities		session  educational component - presentation from an expert on a health-related topic
MEDLINE	Pilkington, K., Loeff, M., Polley, M. (2017). Searching for Real-World Effectiveness of Health Care Innovations: Scoping Study of Social Prescribing for Diabetes. Journal of Medical Internet Research 19(2), e20.	U.K. (England, Ireland)  Journal Article	review	24 projects; 11 as published papers, 12 as Web-based reports, and 1 as both a paper and a Web-based report.	n/a	n/a	The aim of our study was to characterize, collate, and analyse the evidence from evaluation of social prescribing for type 2 diabetes in the United Kingdom and Ireland, comparing information available on publicly available websites with the published literature. The findings of this scoping study do not prove that social prescribing is an effective measure for people with type 2 diabetes in the United Kingdom, but can be used to inform future evaluation and contribute to the development of the evidence base for social prescribing.	Researchers attempted to identify evaluations of what is effectively a process, the referral of patients from primary care to a nonmedical, community-based activity, program, or service, rather than an intervention per se. Some studies may not have referred specifically to social prescribing and described the intervention using different wording due to the lack of consensus on terminology in	none	none	Point of intervention is clinical setting  intervention itself is social prescribing (e.g. 50 min exercise per week)

								this area, thus precluding their identification.			
MEDLINE	Prezio, E.A., Cheng, D., Balasubramanian, B.A., Shuval, K., Kendzor, D.E., Culica, D. (2013). Community Diabetes Education (CoDE) for uninsured Mexican Americans: a randomized controlled trial of a culturally tailored diabetes education and management program led by a community health worker. Diabetes Research & Clinical Practice 100(1), 19-28.	U.S.A. (Texas)  Journal Article	RCT	180	1 year		The purpose of this randomized controlled trial was to determine the impact of a culturally tailored diabetes education program led by a community health worker (CHW) on the HbA1c, blood pressure, body mass index (BMI) and lipid status of uninsured Mexican Americans with diabetes. Mean changes of HbA1c over 12 months showed a significant intervention effect in the CoDE group compared with controls. HbA1c decreased significantly from baseline to 12 months within the intervention and control groups. No differences between groups for secondary outcomes were found. This study supports the effectiveness of CHWs as diabetes educators/case managers functioning as integral members of the health care team in community clinic settings serving uninsured Mexican Americans.	study groups could not be blinded to the physicians; initial decrease in HbA1c observed in the control group may have been due in part to the fact that this group was also provided with glucose testing devices and testing strips; various components of the CoDE program such as diabetes knowledge, meal planning and diet counselling, glucose monitoring, medication adherence, or case management could not be evaluated separately so it is not possible to state which components contributed the most to HbA1c improvement	specifically focused on an ethnic minority population	none	Community health workers Culturally sensitive Hispanic Population

MEDLINE	Prezio, E.A., Pagan, J.A., Shuval, K., Culica, D. (2014). The Community Diabetes Education (CoDE) program: cost-effectiveness and health outcomes. American Journal of Preventive Medicine 47(6), 771-779.	U.S.A. (Texas)  Journal Article	secondary data analysis of an RCT	180	n/a	n/a	To examine the long-term cost-effectiveness and improvements in diabetes-related complications of a diabetes education and management intervention led by community health workers among uninsured Mexican Americans. During a 20-year time horizon, participants who received the intervention would be expected to have significantly lower haemoglobin A1c levels, fewer foot ulcers, and a reduced number of foot amputations in comparison with a control group receiving usual medical care. An incremental cost-effectiveness ratio of \$355 per quality-adjusted life year gained was estimated for intervention participants during the same time period.	results obtained from this simulated RCT may not represent diabetes care delivered outside the context of a clinical trial  this is modelling outcomes, not actual outcomes	particularly vulnerable population - uninsured and ethnic minority.  however, different health insurance structure than that in Australia	none	financial argument
Embase	Riddell, M.A., Dunbar, J.A., Absetz, P., Wolfe, R., Li, H., Brand, M., Aziz, Z., Oldenburg, B. (2016). Cardiovascular risk outcome and program evaluation of a cluster randomised controlled trial of a community-based, lay peer led program for people with diabetes. BMC public health 16(1), 864-???	Canada (Ontario)  Journal Article	randomised cluster design with a peer support intervention and routine care control arms	In summary, 24 groups (clusters) were allocated to either intervention or usual care.  n=240	1 year	WHO STEPwise approach to Surveillance (STEPS) protocol with some minor modifications. Self-administered survey at baseline, 6 and 12 months after the start of the intervention seeking information on demographic, clinical, behavioural, quality of life (EQ-5D), diabetes distress (DDS-4), depression (PHQ-9) diabetes self-care, satisfaction with diabetes support and diabetes services utilisation (GPAQ ver 2.1). Lab Tests: HbA1c, total Cholesterol (TC), high-density lipoprotein (HDL),	This study is an evaluation of a "real world" peer support program aimed at improving the control and management of type 2 diabetes (T2DM) in Australia. Eleven of 12 planned groups were successfully implemented in the intervention arm. Both the usual care and the intervention arms demonstrated a small reduction in 5 year UKPDS risk and the mean values for biochemical and anthropometric outcomes were close to target at 12 months. There were some small positive changes in self-management behaviours. The positive changes in self-management behaviours among intervention participants were not sufficient to reduce cardiovascular risk, possibly because approximately half of the study participants already had quite well controlled T2DM at baseline. Future research needs to address how to enhance community based programs so that they reach and benefit those most in need of resources and supports to improve metabolic control and associated clinical outcomes.	low response rate almost half of those individuals recruited already had reasonably good glycaemic control	not really, they looked at different characteristics at baseline but do not present results based on these demographics	none	Support of navigation of the health system as well as diabetes management  Community Health Workers

						low-density lipoprotein, TC/HDL ratio, triglycerides at each time point.					
Global Health	Sciamanna, C.N., Patel, V.A., Kraschnewski, J.L., Rovniak, L.S., Messina, D.A., Stuckey, H.L., Curry, W.J., Chuang, C.H., Sherwood, L.L., Hess, S.L. (2014). A strength training program for primary care patients, Central Pennsylvania, 2012. Preventing Chronic Disease 11(6), ??.	U.S.A. (Pennsylvania)  Journal Article	cross-sectional survey	414  not reported what % had diabetes	n/a	2 items to gauge interest in strength training and weight control program. Healthy Days Measure from CDC. Self-reported health. Physical activity with one item. Current strength training activities, demographics, smoking status and medical history.	More patients were interested in a strength training program than in a weight control program. Almost 3/4 of those reporting 10 or more days of poor physical health were interested in a strength training program compared with 49.5% of those reporting no days of poor physical health. Those reporting poorer physical health had 2.7 greater odds of being interested in a strength training program compared with those reporting better physical health. Patients with hypertension, diabetes, or high cholesterol were not more interested in a strength training program than those without these conditions. .	high rates of interest may not participate into high rates of participation	none	none, but many of the respondents likely had diabetes-related comorbidities that account for hospitalisations in SWS	types of programs of interest to diabetics (and others)
Global Health	Sinclair, C., Stokes, A., Jeffries-Stokes, C., Daly, J. (2016). Positive community responses to an arts-health program designed to tackle diabetes and kidney disease in remote Aboriginal communities in Australia: a qualitative study. Australian and New Zealand Journal of Public Health 40(4), 307-312.	Australia (Western Australia)  Journal Article	qualitative interviews	26  unclear how many participants actually had diabetes, also focused on kidney failure	roughly 6 months	n/a	The Western Desert Kidney Health Project (WDKHP) is an innovative clinical screening, arts-health and community development program, staffed by Aboriginal health workers. The WDKHP is aimed at prevention and early detection, improving the chance of better management of kidney disease among people in 10 predominantly Aboriginal communities in rural Western Australia. Outreach clinical services can be an appropriate method of engaging people in remote communities in addressing diabetes and kidney disease. The remote community setting can act as an 'enabler' of healthy lifestyle for Aboriginal people, particularly when augmented by well-designed outreach programs.	some interviews were relatively short, with an absence of detail to contextualise responses. Only middle-age and older adults were interviewed	Aboriginal population  rural	none	could offer insight into diabetes and kidney failure-related programs in rural Aboriginal communities
MEDLINE	Sorkin, D.H., Biegler, K.A., Peyreda, M., Kilgore, D., Dow, E., Ngo-Metzger, Q. (2013). Unidas por la Vida	U.S.A. (Southern California)  Journal	unclear, control and intervention group, and people	89		Centre for Epidemiologic Studies-Depression Perceived Stress	Unidas por la Vida, a behavioural weight-loss program, was developed for use among low-income, Mexican-American women with diabetes and their overweight/obese adult daughters. Ninety-four percent of participants reported that		low income	none	Hispanic population  Educational

	(United for Life): implementing a culturally-tailored, community-based, family-oriented lifestyle intervention. Journal of Health Care for the Poor & Underserved 24(2), 116-138.	Article	were randomly assigned to one or another			Scale SF-36 Health Survey	they enjoyed participating in the Unidas program. About 82% reported that participating with their mother/daughter made it easier to work toward their exercise and diet goals, and 83% reported that participation in the Unidas program improved their mother/daughter relationship. Importantly, over 92% of participants reported that they made healthier food choices and 87% reported exercising more as a result of participating in the program. No data on health improvement is reported.				(patient)
MEDLINE	Suther, S., Battle, A. M., Battle-Jones, F., Seaborn, C. (2016). Utilizing health ambassadors to improve type 2 diabetes and cardiovascular disease outcomes in Gadsden County, Florida. Evaluation & Program Planning 55, 17-26.	U.S.A. (Gadsden County, Florida)  Journal Article	unclear	346	2 years		Project H.I.G.H. (Helping Individuals Get Healthy) was developed to target the priority areas of type 2 diabetes and cardiovascular disease. Utilizing trained community health ambassadors, CDC's The Road to Health Toolkit as well as New Beginnings: A Discussion Guide for Living Well with Diabetes was used as a model for a community-based educational program. The overall goal of Project H.I.G.H was to implement and evaluate: (1) a coordinated, behaviour-focused, family-centred, community-based educational program and; (2) a client service coordination effort resulting in improved health outcomes (BMI, Glucose Levels*, BP) for individuals with type 2 diabetes and cardiovascular disease in Gadsden County, Florida. Overall, Project H.I.G.H. was very successful in its first year at motivating participants to delay or prevent diabetes and/or cardiovascular disease or at the very least to start taking better care of their health. Of the 53 participants that received monitors due to high glucose levels and had completed the program by June 2014, 89% showed improvements in glucose levels.	many participants couldn't make last appointment for BPs, Glucose readings, and BMIs	low income county with higher incidence of diabetes as compared to rest of state	Not exactly, but the program actually ended up referring some participants to emergency medical services because their blood pressures were deemed high enough to cause stroke or heart attack.	Community health workers  culturally sensitive
Embase	Taylor, A., Siddiqui, F. (2016). Bringing Global Health Home: The Case of Global to Local in King County, Washington. Annals of Global Health 82(6), 972-980.	U.S.A. (Seattle area, Washington)  Journal Article		50	1 year		Mobile phone-based diabetes management. Patients were trained on how to use the app and how to share their app-generated reports with their G2L case manager. Using both the app and text messaging, participants were asked to share information on their blood glucose tests, diet, exercise, mood, and other things they felt they wanted to communicate with their case manager. On a weekly basis, participants send their app-		none	not discussed, but I would argue that the cost savings estimates factored in hospitalizations	Mobile phone intervention  case manager

							generated report to the case manager so their blood glucose and other information can be reviewed. Importantly, the case manager also sends personalized text messages to participants largely focused on sharing encouraging words, reminders, and tips on diet and exercise. More than one-third of participants improved their HbA1c value with an average reduction of 1.26%. These results are significant because a 1% reduction in HbA1c value translates into a reduction in the risk of eye, kidney, and nerve disease by approximately 40% and diabetes-related death by 21%. More than one-third of participants improved their HbA1c value (an indicator used to assess improvement in overall glucose control) with an average reduction of 1.26%. These results are significant because a 1% reduction in HbA1c value translates into a reduction in the risk of eye, kidney, and nerve disease by approximately 40% and diabetes-related death by 21%.The project yielded a positive return on investment of 10%, which equates to an average yearly savings of \$556.5 per patient.				
Global Health	Teychenne, M., Ball, K., Salmon, J., Daly, R. M., Crawford, D. A., Parneet, Sethi, Jorna, M., Dunstan, D. W. (2015). Adoption and maintenance of gym-based strength training in the community setting in adults with excess weight or type 2 diabetes: a randomized controlled trial. International Journal of Behavioral Nutrition and Physical Activity 12(105), ??.	Australia (Melbourne)  Journal Article	cluster-randomized controlled trial	318	1 year	modified version of the CHAMPS (ST adoption and maintenance) Blood samples (HbA1c) three-repetition maximum strength test (muscle strength) A modified version of the Active Australia Survey	In adults who were overweight or with type 2 diabetes (T2DM), the aim of this study was to compare the effectiveness of a standard ST program (SST) to an enhanced program (EST) on the adoption and maintenance of ST and cardio-metabolic risk factors and muscle strength. In stratified analyses including only those with T2DM, relative to the SST group, the adjusted OR of adopting ST in the EST group was 8.2 (95 % CI 1.5–45.5). In those with T2DM, there was a significant reduction in HbA1c in the EST compared to SST group during the adoption phase (net difference, -0.13 % [-0.26 to -0.01]), which persisted after 12-months (-0.17 % [-0.3 to -0.05]).	minimal contact in 6-month follow up for standard of care group (making it seem like they had less maintenance)	~50% no university degree	none	Exercise program
MEDLINE	Tucker, C. M., Lopez, M. T., Campbell, K., Marsiske, M., Daly, K., Nghiem, K., Rahim-Williams, B., Jones, J.,	U.S.A. (Florida)  Journal	pre/post	130	not discussed	The Patient Demographic and Medical Information Questionnaire	the present study was to test the effects of a culturally sensitive, health empowerment- focused, community- based health promotion program tailored to adult patients with type 2 diabetes on these patients' body mass index (BMI), blood	small sample size participants didn't properly report glucose	92.3% of participants were black or Latino	none	use of theory community members involved in research team culturally sensitive

	Hariton, E., Patel, A. (2014). The effects of a culturally sensitive, empowerment-focused, community-based health promotion program on health outcomes of adults with type 2 diabetes. <i>Journal of Health Care for the Poor &amp; Underserved</i> 25(1), 292-307.	Article				(PatientDMIQ) Adherence to Treatment Measure (DMT) The Strain Questionnaire	pressure, and self- reported blood glucose levels, treatment adherence, and stress levels. At post-test, program participants in the intervention group as compared to those in the control group demonstrated significantly lower levels of BMI, diastolic blood pressure, and physical stress.	levels sometimes			Educational (patients)
Global Health	Walton, J. W., Snead, C. A., Collinsworth, A. W., Schmidt, K. L. (2012). Reducing diabetes disparities through the implementation of a community health worker-led diabetes self-management education program. <i>Family and Community Health</i> 35(2), 161-171	U.S.A. (Dallas, Texas)  Journal Article		not included	12-18 months		might exclude because this is more process-oriented (how to integrate community health workers into care delivery team)  Lessons learned from integrating CHWs into healthcare team. Established diabetes-specific CHW in hospital to deliver DEP. Number of visits with the CHW, age, sex, ethnicity, clinic, did not have a significant effect on the mean HbA1c change from baseline. The analysis of patient satisfaction surveys revealed that more than 98% of DEP participants indicated the highest level of satisfaction with the care they received (4 on a 4-point Likert scale) in their answers to all 4 questions pertaining to service delivery posed after each visit with the CHW.		uninsured, Hispanic, low-income		best practices for integrating CHWs (they have a good discussion in this article)
MEDLINE	Williams, I. C., Utz, S. W., Hinton, I., Yan, G., Jones, R., Reid, K. (2014). Enhancing diabetes self-care among rural African Americans with diabetes: results of a two-year culturally tailored intervention. <i>Diabetes Educator</i> 40(2), 231-239.	U.S.A. (Charlottesville, Virginia)  Journal Article	quasi-experimental design	25	12 Months	Spoken Knowledge in Low Literacy patients with Diabetes Questionnaire A1C Blood test Medical Outcome Study SF-12	From baseline to 3-month follow-up assessment, participants exhibited significant improvement on several physiological and behavioural measures. Given the small sample size, hypothesis testing was limited. Results show change from baseline over time, illustrating that the primary outcome of A1C decreased, although not significant. Additionally, participants reported more knowledge about diabetes self-management and personal care skills (i.e. exercise and foot care) that persisted over time. The feasibility of the culturally tailored DSME was established, and participation with the program was high.	small sample size	Specifically aimed at the Black community	none	use of theory culturally sensitive Education program African-Americans

## COPD

Database	Reference	Source (country and type)	Research Design	Sample Size	Duration of Study	Measurement tools	Summary of Research	Limitations	Equity consideration	Direct link to hospitalisation	Potential Themes
MEDLINE	Amin, S., Abrazado, M., Quinn, M., Storer, T. W., Tseng, C. H., & Cooper, C. B. (2014). A controlled study of community-based exercise training in patients with moderate COPD. <i>BMC Pulmonary Medicine</i> , 14, 125.	Journal Article, USA	Small parallel group randomized control study	19	2 years	Session compliance, intensity adherence, treadmill endurance time, muscle strength, dyspnoea and health status	<p>Intervention: 12 week progressive endurance and strength training at a local health club under the guidance of a PT vs control: to a continuation of unsupervised habitual physical activity.</p> <p>Results: those in the CBE (Community-based exercise) group increased their endurance time by 134 seconds (decreased 59 seconds in the control). Strength increased in the CBE group by 93% (untested in control). Respiratory scores improved in the CBE group by 4.6 points (control 0.7). Dyspnoea score increased by 5.1 points indicating less shortness of breath (decreased 0.2 in control). Whilst there were improvements in body weight and body composition, these were not significant.</p> <p>The study found increases in exercise endurance time and muscle strength, along with improved health-related quality of life, and reduced dyspnoea in those who under- went exercise training compared to those who received nutritional counselling only (Control).</p> <p>Findings suggest that not only should there be a shift in the philosophy of pulmonary rehabilitation but that CBE should be introduced earlier in the progression of COPD so as to delay development of comorbidities associated with the lack of regular exercise and deconditioning.</p>	Small sample size, however its a pilot	No	No	Community based exercise Physical activity
Embase	Desveaux, L., Beauchamp, M.,	Journal	Systematic	16 studies		Functional capacity (FC) and	Of the 17 programs, 13 were delivered in a community facility. The programs ranged from 8	Chronic disease focus- some	No	No	Allied Health Community based

	Goldstein, R., & Brooks, D. (2014). Community-based exercise programs as a strategy to optimize function in chronic disease a systematic review. Medical Care, 52(3), 216-226.	Article, USA	Review	(2198 individual s)		health related quality of life (HRQOL)	<p>weeks to 18 months in duration. The majority of exercise sessions were 40-60 minutes, with a frequency of 2-3 sessions per week, with on 1 home program requiring daily exercise. Over 85% of the studies focused on aerobic exercise and resistance training as their primary components. 4 were unsupervised, 4 were delivered in the home setting, of the remaining 12 studies, 9 were supervised by a trained instructor and 2 by a physiotherapist.</p> <p>Results: 6 of the 12 studies evaluating HRQOL measures showed significant differences between groups in favour of the community intervention. 5 of the 13 studies evaluating FC also demonstrated positive changes from the community interventions. There were a number of adverse events (i.e. injury etc. unintended as part of the interventions).</p>	were osteoarthritis focused			exercise Physical Activity In-home
MEDLINE	Desveaux, L., Harrison, S., Lee, A., Mathur, S., Goldstein, R., & Brooks, D. (2017). "We are all there for the same purpose": Support for an integrated community exercise program for older adults with HF and COPD. Heart & Lung, 46(4), 308-312.	Journal Article, Canada	Semi-structured interviews	11		Attitudes towards CBE	<p>Intervention: 2 CBE rehabilitation programs delivered by interdisciplinary team and included supervised exercise, risk factor and lifestyle education and psychosocial support.</p> <p>Results: Deductive thematic analysis uncovered three themes: 1) transitioning to community exercise is challenging (from hospital based rehab to CBE citing difficulty adhering e.g. lack of appropriate facilities), highlighting participants' struggle with unstructured maintenance and a lack of appropriate programs; 2) a structured, group-based program tailored to functional ability facilitates adherence, describing participants views on the importance of routine, and accountability; and 3)"We are all there for the same purpose"- participant support for integrated exercise, including the benefit of multiple perspectives and sustainability</p> <p>Participants expressed the need for minimally supervised community based programs to support adherence and highlighted the importance of a program tailored to functional ability with a motivating program leader. CBE provides an opportunity to reduce HC costs but must be</p>	HF and COPD	No	No- although states there is an opportunity to reduce the use of healthcare resources.	Physical Activity Community Based exercise Educational (patient/caregiver)

							implemented with a strong link between HC and community facilities.			
Embase	<p>Levack, W. M. M., Jones, B., Grainger, R., Boland, P., Brown, M., &amp; Ingham, T. R. (2016). Whakawhanaungatanga: The importance of culturally meaningful connections to improve uptake of pulmonary rehabilitation by maori with COPD - A qualitative study. International Journal of Copd, 11(1), 489-501.</p>	Journal Article, NZ	Qualitative research (grounded theory kaupapa Maori methodology) interviews and focus groups	25			<p>Study findings: Findings from this study demonstrated that while there were a number of factors influencing the uptake of pulmonary rehabilitation that were common to all participants, regardless of ethnicity or background, the experiences of the indigenous Māori participants differed from those of the non-Māori participants. Shared factors were grouped into four themes: 1) past experiences, 2) attitudes and expectations, 3) access issues, and 4) program experiences. These factors were moderated by the involvement of family and peers, interactions with health professionals, the way information on programs was presented, and by new illness events.</p> <p>For Maori, there were a number of additional factors relating to cultural experiences of pulmonary rehabilitation: 1) high value of whakawhanaungatanga: the making of culturally meaningful connections with others, this was so highly valued that some indicated that when this was absent- they felt discouraged to attend. Holistic programs were favoured. Other important factors of delivery were 2)context that was culturally familiar 3) value placed on time after formal class spent sharing stories with one another with program staff (including being in Maori language, not being constricted to western models of disease, recognition of Maori medicine/healing methods and autonomy of Maori knowledge) 4) Connection with Maori things when first receiving information (positive first impression) 5) with hospital based programs- opportunity for additional cultural support services to be integrated (e.g. free transport which also provided time when picking up from home for sharing, rapport building and information sharing) 5) time and effort spent by Maori nurses on recruitment and retention- making participants feel valued, helped them see potential benefits of the program and contributed to adherence.</p> <p>Overall: Pulmonary rehabilitation is a highly</p>	Maori population (Indigenous peoples)	No	Culturally sensitive care Lessons learnt

							successful intervention for people with COPD. However, pulmonary rehabilitation is only effective if programs are designed and implemented in a manner that encourages participants to engage regularly with them. Failure to include cultural practices in the delivery of mainstream pulmonary rehabilitation may act as a barrier to the uptake and participation of indigenous, minority peoples.				
Embase	Mousing, C. A., & Lomborg, K. (2012). Self-care 3 months after attending chronic obstructive pulmonary disease patient education: A qualitative descriptive analysis. Patient Preference and Adherence, 6, 19-25.	Journal Article, Denmark	Semi-structured interviews	11		Patient perspectives on group education impact on self-care	<p>Intervention: 8 week group patient education program covering disease education (physician and specialist nurse, nutritional advisor, physiotherapist and occupational therapist), and physical training (physiotherapist) as a group and individual based goal setting (occupational therapist) and clinical tests (physiotherapist and occupational therapist). Group sizes in the studied patient education program were seven, eight, and twelve participants. In Denmark, most health care services are free of charge. Accordingly, participation in patient education was financed by the municipal health services and included no user fees. Each session lasted 2 hours, and time was divided into two parts: education and physical fitness.</p> <p>Findings: Themes that arose were categorised as:  (1) ability to handle COPD symptoms- most participants noted that the information received increased their knowledge of COPD. This resulted in a sense of calm and security in understanding symptoms as well as coping strategies. Many participants associated increased walking with a reduction in dyspnoea symptoms.  (2) the social aspect of patient education- Some participant reported a previous reduction in social activities due to their COPD diagnosis. The intervention gave an opportunity to socialise with other COPD patients. Participants reported looking forward to seeing other members, noting this as a motivational aspect to attend. The intervention lead to a feeling of solidarity which helped participants maintain their new exercise habits.  (3) the time aspect (e.g. "ripening period").- patients suggested that the GP should recommend education programs to their patients at an earlier</p>	No, but generally older participants which sits within the regular distribution of disease.	No	Education (patient/caregiver) Group interventions Allied health Physical Activity	

							<p>stage of COPD. Although participants experienced immediate benefits it was acknowledged that change takes time, some participants didn't experience benefits till months after. Recommendations were made for a follow up consultation after the program ceased. Being interviewed made participants aware of changes they had made.</p> <p>Overall: the intervention resulted in an increase in knowledge of COPD and its symptoms. Together with the acquisition of new tools to handle their symptoms in everyday life following the patient education program, this new knowledge improved the participants' self-care ability.</p>				
Global Health	Reed, J. L., Harris, J. M., Midence, L., Yee, E. B., & Grace, S. L. (2016). Evaluating the Heart Wise Exercise <sup>TM</sup> program: a model for safe community exercise programming. BMC Public Health, 16(190).	Journal Article, Canada	Cross-sectional study mix methods	29 Facilities & 127 participants		Program criteria and survey of participants	<p>Intervention: HWE developers identified and encouraged existing community-based exercise programs to build capacity for serving patients with chronic disease, with the goal of broad delivery of safe and appropriate exercise classes for stable outpatients with chronic disease. This is achieved by working with interested facilities to ensure they meet specific safety criteria, educating their exercise leaders, and then providing HWE materials to these facilities to market their Heart Wise Exercise sessions to clients.</p> <p>The six specific criteria programs must meet to be recognized as "Heart Wise" are: (1) encouraging daily aerobic exercise; (2) incorporating a warm-up, cool down and self-monitoring; (3) allowing participants to exercise at a safe level and offering options to modify intensity; (4) accepting participants with chronic health conditions; (5) offering health screening for all participants; and, (6) having a documented emergency plan that is known to all fitness leaders (who have current cardiopulmonary resuscitation certification), phone access to local paramedic services and having an automated external defibrillator (AED) on-site.</p> <p>Results: Criteria 1: 71 % of leaders encouraged daily aerobic exercise; participants reported engaging in 194 min/week of aerobic exercise.</p>	No	No	Group interventions Education (patient/caregiver) Physical activity	

							<p>Criteria 2: 100 % of programs incorporated a warm-up and cool-down, and 84 % encouraged self-monitoring during class. Criteria 3: 98 % of programs offered options for participants to exercise at their appropriate intensity. Criteria 4: HWE participants reported having chronic conditions including arthritis (41 %), osteoporosis (26 %) diabetes (8 %), heart disease (6 %) and chronic obstructive pulmonary disease (6 %). Criteria 5: 93 % of instructors offered health screening for participants. Criteria 6: 100 % of sites had automated external defibrillators, and 90 % of the instructors were aware of the documented emergency plan.</p> <p>The participants reported being, on average, 'somewhat happy' to 'very happy' with HWE locations; program dates and times; leaders' knowledge of disease and exercise; exercise intensity; cost; and, social aspect.</p>				
Embase	Steventon, A., Tunkel, S., Blunt, I., & Bardsley, M. (2013). Effect of telephone health coaching (Birmingham OwnHealth) on hospital use and associated costs: Cohort study with matched controls. <i>BMJ (Online)</i> , 347 (7920) (no pagination)(f4585).	Journal Article, UK	Retrospective case control	2698		<p>Number of hospital admissions per head over 12 months after enrolment.</p> <p>Intervention: Telephone health coaching involved a personalised care plan and a series of outbound calls usually scheduled monthly.</p> <p>Results: emergency admissions increased more quickly among intervention participants than matched controls (difference 0.05 admissions per head, 95% confidence interval 0.00 to 0.09, P=0.046). Outpatient attendances also increased more quickly in the intervention group (difference 0.37 attendances per head, 0.16 to 0.58, P&lt;0.001), as did secondary care costs (difference £175 per head, £22 to £328, P=0.025).</p> <p>The program did not lead to the expected reductions in hospital admissions or secondary care costs over 12 months, and could have led to increases.</p>	No	Yes, increased cost due to increased admissions	Telephone Coaching		
Embase	Zwerink, M., Van Der Palen, J., Van Der Valk, P., Brusse-Keizer, M., & Effing, T. (2013). Relationship between daily physical activity and exercise capacity in	Journal Article, The Netherlands	Secondary analysis of a Randomised Control Trial		159	<p>Daily physical activity and exercise capacity</p> <p>Aim: To investigate the relation between daily physical activity level and exercise capacity in patients with COPD using data of a randomised controlled trial in which the exercise intervention was aimed at improvement of both physical activity and exercise capacity (the COPE-II study)</p>	No	No.	Physical Activity		

patients with COPD. Respiratory Medicine, 107(2), 242-248.							Results: The current study showed that daily physical activity and exercise capacity were only moderately correlated in patients with COPD. Additionally, in patients with COPD who participated in a physiotherapeutic exercise programme, the relationship between change in exercise capacity and change in daily physical activity was moderate to weak. In the control group, change in exercise capacity and change in daily physical activity were not correlated. In this study, a moderate to weak relationship was found between daily physical activity and exercise capacity. These results strengthen our beliefs that exercise interventions need to target not only exercise capacity but also behaviour change with regard to daily physical activity, to achieve improvement in both parameters				
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## Heart Failure

Database	Reference	Source (country and type)	Research Design	Sample Size	Duration of Study	Measurement tools	Summary of Research	Limitations	Equity consideration	Direct link to hospitalisation	Potential Themes
Embase	Basu, S., Jack, H. E., Arabadjis, S. D., & Phillips, R. S. (2017). Benchmarks for reducing emergency department visits and hospitalizations through community health workers integrated into primary care: A cost-benefit analysis. Medical Care, 55(2), 140-147.	Journal Article, USA	Simulation-cost analysis			Reduction in ED visits and associated inpatient hospitalisation	Intervention: Using a microsimulation of patient health care utilisation, costs and revenues, the study estimated what proportion of ED visits and hospitalisations would be prevented by a CHW program. The CHW programs would identify patients with a history of at least one ED visit for a chronic condition in the prior year.  Results: CHWs assigned to patients with uncontrolled hypertension and congestive heart failure, as compared with other common conditions, achieve cost-neutrality with the lowest number of averted visits to the ED. To achieve cost-neutrality, 4–5 visits to the ED would need to		No	Yes, ED presentations and hospitalisations	Community Health Worker

							<p>be averted per year by a CHW assigned a panel of 70 patients with uncontrolled hypertension or congestive heart failure approximately 3%–4% of typical ED visits among such patients, respectively. Most other chronic conditions would require between 7% and 12% of ED visits to be averted to achieve cost-savings.</p> <p>Depending on the patients primary diagnosis, offsetting the costs of a CHW program is a feasible approach to reducing ED presentations and hospitalisations.</p>				
Embase	Berger, S. (2017). How to develop and execute a public health agenda: From grass roots to legislation. <i>Cardiology in the Young</i> , 27(S1), S101-S103.	Journal Article, USA					<p>Intervention: Community cardiopulmonary resuscitation programs with an emphasis on high-quality lay rescuer community cardiopulmonary resuscitation.</p> <p>Findings: There is ample evidence to suggest that lay rescuer community cardiopulmonary resuscitation saves lives.</p>				School based
MEDLINE	Desveaux, L., Harrison, S., Lee, A., Mathur, S., Goldstein, R., & Brooks, D. (2017). "We are all there for the same purpose": Support for an integrated community exercise program for older adults with HF and COPD. <i>Heart &amp; Lung</i> , 46(4), 308-312.	Journal Article, Canada	Semi-structured interviews	11		Attitudes towards CBE	<p>Intervention: 2 CBE rehabilitation programs delivered by interdisciplinary team and included supervised exercise, risk factor and lifestyle education and psychosocial support.</p> <p>Results: Deductive thematic analysis uncovered three themes: 1) transitioning to community exercise is challenging (from hospital based rehab to CBE citing difficulty adhering e.g. lack of appropriate facilities), highlighting participants' struggle with unstructured maintenance and a lack of appropriate programs; 2) a structured, group-based program tailored to functional ability facilitates adherence, describing participants views on the importance of routine, and accountability; and 3) "We are all there for the same purpose"- participant support for integrated exercise, including the benefit of multiple perspectives and sustainability</p> <p>Participants expressed the need for minimally</p>	HF and COPD	No	No- although states there is an opportunity to reduce the use of healthcare resources.	Physical Activity Community Based exercise Educational (patient/caregiver)

							supervised community based programs to support adherence and highlighted the importance of a program tailored to functional ability with a motivating program leader. CBE provides an opportunity to reduce HC costs but must be implemented with a strong link between HC and community facilities.				
Embase	Sasson, C., Haukoos, J. S., Ben-Youssef, L., Ramirez, L., Bull, S., Eigel, B., . . . Padilla, R. (2015). Barriers to Calling 911 and Learning and Performing Cardiopulmonary Resuscitation for Residents of Primarily Latino, High-Risk Neighborhoods in Denver, Colorado. <i>Annals of Emergency Medicine</i> , 65(5), 545-552.	Journal Article, USA	Qualitative (focus groups and detailed semi-structured interviews)	64 participants		Focus on barriers to calling 911 and performing CPR	<p>It is already known that poor and minority neighbourhoods have higher rates of out-of-hospital cardiac arrests and lower rates of bystander CPR and survival.</p> <p>Study: Six focus groups and 9 key informant interviews were conducted in Denver during the summer of 2012. Purposeful and snowball sampling, conducted by community liaisons, was used to recruit participants. Focus groups and interviews were in English and Spanish. Two reviewers analysed the data to identify recurrent and unifying themes. A qualitative content analysis was used with a 5-stage iterative process to analyse each transcript.</p> <p>Findings: The study identified 6 key barriers to calling 911: 1) fear of becoming involved because of law enforcement 2) fear of being involved for financial implications (cost) 3) fear of being involved due to immigration status 4) lack of recognition of cardiac arrest event 5) language concerns and 6) fear of violence.</p> <p>Importance to understand the impact of culturally sensitive, tailored public education campaigns may affect the provision of bystander CPR- further research needed.</p>	Exploratory study-generalisability is a concern.	Yes, Latino population (minority populations), low socioeconomic status	No.	Barriers to intervention
Embase	Shah, M. N., Wasserman, E. B., Gillespie, S. M., Wood, N. E., Wang, H., Noyes, K., . . . McConnochie, K. M. (2015). High-Intensity Telemedicine Decreases Emergency Department Use for Ambulatory Care	Journal Article, USA	Prospective cohort			ED visits for ACSCs	Intervention: Intervention group participants could use Health-e-Access, the older adult high-intensity telemedicine program, when they had acute illness symptoms. Health-e-Access provided patient-to-provider, real-time, or store-and-forward telemedicine services. The extensive services available included video and audio communication, images (e.g. skin), video clips (e.g. movement), sound (e.g. lung sounds), and 12 lead	Not HF focussed but 'heart trouble' is one.	Yes, aged population (disease specific)	Yes, ED visits decreased	Telemedicine Aged population

	Sensitive Conditions by Older Adult Senior Living Community Residents. Journal of the American Medical Directors Association, 16(12), 1077-1081.					<p>electrocardiograms.</p> <p>Results: During the study period, control participants had 310 ED visits for ACSCs, for a rate of 0.195 visits/ person-year. Intervention participants visited the ED for ACSCs 85 times, for a rate of 0.138 visits/person-year [unadjusted rate ratio (RR): 0.71, 95% confidence interval (CI): 0.53-0.94]. Among intervention participants, ED use for ACSCs decreased at an annual rate of 34% (RR: 0.661, 95% CI: 0.444-0.982), whereas, in the control group there was no statistically significant change in ED use over time (RR: 1.01, 95% CI: 0.90-1.14).</p> <p>Findings: Providing acute illness care by high-intensity telemedicine to older adults residing in SLCs significantly decreases the rate of ED use for ACSCs over 1 year, compared with no change in the rate of ED use for ACSCs among the control group.</p>			
Embase	Veenstra, W., op den Buijs, J., Pauws, S., Westert, M., & Nagelsmit, M. (2015). Clinical effects of an optimised care program with telehealth in heart failure patients in a community hospital in the Netherlands. Netherlands Heart Journal, 23(6), 334-340.	Journal Article, Netherlands	Prospective	102	HF hospital admission, bloody pressure & QoL	<p>Intervention: home based TV program providing educational material, medication reminders, health-related surveys and motivational messages to encourage the prescribed lifestyle regimen. Patients were given automated devices for daily measurements of blood pressure, heart rate and weight at home. A nurse Practitioner evaluated the measurements everyday using a dedicated clinical user interface. With tailored alarm settings, the NP could identify which patients exceeded the alarm limits.</p> <p>Results: the number of unplanned admission for HF decreased from 1.29 to 0.31 admissions per year after the telehealth introduction. Blood pressure decreased independent of medication. QoL increased during the intervention and disease knowledge remained high throughout the follow-up period.</p>		Yes, reduction in unplanned visits.	In-home Telemedicine