

REVIEW ARTICLE

How widespread are the use of frameworks and theories in applied health promotion research in rural and remote places? A review of programs targeted at cardiometabolic risk factors

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ABSTRACT

Introduction: In Australia, modifiable cardiometabolic risk factors are in excess in rural and remote communities. High-quality community-level health promotion is paramount for the management of population health risk in such settings, especially in the context of reduced access to healthcare services. Two indicators of quality of health promotion programs are the use of formal frameworks and the adoption of socio-behavioural theories upon which to base intervention strategies. This study examined the extent to which these two quality elements were reported in health promotion programs designed to reduce cardiometabolic disease (CMD) risk in rural and remote settings.

Methods: PubMed, ScienceDirect, Cochrane Library and EBSCOHost were searched using search strings linking health promotion programs, the geographic setting and CMD and risk factors. A title/abstract eligibility screen was conducted prior to full-text assessment. Articles had to report on the planning, implementation or evaluation of intervention strategies to be eligible. Articles were ineligible if they reported clinical drug trials or behaviour prescription efficacy trials.

Results: Of eligible programs ($n=62$) from 66 articles, 37% ($n=22$) reported using a framework and 35% ($n=22$) reported the use of theories. While 16% ($n=10$) reported using both, 48% ($n=30$) reported neither.



Conclusions: Fewer than one in five published health promotion programs for CMD risk in rural and remote settings report being both guided by a formal framework and underpinned by theory. This low level of explicit reporting of quality indicators suggests a large scope for improvement in the conduct and reporting of health promotion programs for CMD risk in rural and remote settings.

Key words: Australia, cardiometabolic risk, frameworks, health behaviour theory, health promotion, health promotion planning, implementation, program evaluation.

Introduction

In Australia, cardiometabolic risk factors (CMRs) and cardiometabolic diseases (CMDs) are in excess in rural and remote communities, which can be disadvantaged by reduced access to primary and secondary health services¹ and other conditions of 'place' that drive the expression of risk factors in individuals, termed 'environmental risk conditions'^{2,3}. Together, the poorer access to health services and the population risk conferred by factors that are not amenable to change by 'treating the individual' using traditional health services makes high-quality community health promotion paramount for the management of population health risk in these settings.

The most prevalent CMD, type 2 diabetes mellitus, and its common causal risk factor abdominal obesity are endemic in the developed world and rising to epidemic levels across the developing world. Current evidence suggests that abdominal obesity constitutes the major clinical risk factor for the development of CMDs, with population attributable risks of 47% (for type 2 diabetes) and 13% (for cardiovascular disease) in Australia⁴.

Producing positive behavioural change to reduce this major causal risk factor requires targeting health behaviour at multiple levels, such as individual, organisational and community (as well as political). Thus, health promotion programs built upon a solid understanding of health behaviours and the socio-environmental contexts in which they occur have been found to be the most successful⁵.

The quality of applied health promotion research and practice varies, and the failure of low-quality programs has been associated with four major factors: (1) poorly specified or poorly rationalised intervention strategies⁶; (2) atheoretical approaches or theory failure⁵; (3) implementation failure⁶; and (4) weak evaluation⁷.

The impact of these factors may be minimised by the use of comprehensive frameworks, which enables strategic planning and implementation of interventions, which can be further improved through evaluation. The content and structure of these frameworks are largely based on the guiding principles in which initiatives should be empowering, participatory, holistic, intersectoral, equitable, sustainable, and multistrategy – features that have evolved throughout the modern history of health promotion⁸. Furthermore, a sound theoretical basis underpinning the design of intervention strategies has been shown to increase the ultimate likelihood of success of health promotion programs, with increasing evidence suggesting larger effects with the use of multiple theories⁵.

This study aims to examine the extent to which health promotion programs focusing on modifying CMR or CMD in rural and remote settings report the use of health promotion planning, implementation and evaluation frameworks and pertinent socio-behavioural theories.

Methods

A search of the literature indexed in PubMed, ScienceDirect, the Cochrane Library and EBSCOHost was performed, backwards from December 2013 with no limit for maximal



comprehensiveness. The search was limited to English language. The search strategy, as follows, was developed in order to achieve the stated research objective.

First, search terms for frameworks or theories were not specifically included as this would bias the results towards papers that report such use. Rather, health promotion programs were first searched for using the following terms: '(community intervention OR complex intervention OR community-based participatory research OR health promotion program)'

Second, for CMR- and CMD-focused health promotion programs, behavioural and environmental intervention strategies are critical, so to reduce the possibility of missing pertinent studies in the above search, a search line was also included based on behavioural and environmental interventions using the following terms: '(behavioral risk factor* OR lifestyle OR environment*)'

Third, a geographical setting focus was taken on rural and remote populations. Definitions of rural, remote and regional differ from country to country so all three terms were included: '(rural OR regional OR remote)'. Other terms such as 'agricultural populations', 'isolated populations', 'indigenous populations' could also have been included; however, the latter two are not necessarily confined to rural and remote geographies.

Last, health promotion programs that target the prevention and management of CMD and reduction of CMR in the population were focused on. Common terms in this literature include obesity, metabolic syndrome, type 2 diabetes and cardiovascular diseases so the following search terms were included: '(obesity OR type 2 diabetes OR metabolic syndrome OR cardiometabolic risk OR cardiovascular disease risk)'. All studies identified by the search were assessed for relevance on the basis of a screen of the title and abstract, and, further to the search criteria, articles were eligible for inclusion if they reported on the planning and/or implementation and/or evaluation of intervention strategies. Exclusion criteria were also applied and included: (1) the study does not report on planning, implementation or evaluation of an

intervention; (2) clinical drug trials such as these are not within the scope of community health promotion; (3) behaviour prescription efficacy trials such as these are not within the scope of the application of health promotion strategies in real-world contexts; (4) reports only on the development of a framework or theory (rather than on its application in context) and (5) not in a rural, regional or remote setting.

The full text of the selected articles was then accessed and reassessed for final inclusion, with additional relevant articles being selected using the reference lists of the included articles. A flowchart of the study selection is presented in Figure 1. Data extraction was then performed using a standardised form, which was piloted on the first ten articles and then adjusted accordingly. Data were collected on the study aim and conclusion; sample size and participant criteria; study design/methods; comparison/control groups; planning, implementation and evaluation framework used; theoretical constructs integrated; and process, impact and outcome evaluation. These data are synthesised in Table 1 (supplementary). A second author, who was blinded to the results of the first author, assessed approximately 15% of articles identified from abstracts and performed inclusion/exclusion screening and data extraction as aforementioned. This was in order to validate the results of the first author, and due to the high consistency during the literature screening and data extraction process, examining the remaining 85% of articles was unnecessary.

Results

Figure 1 represents the results of the database search, the application of inclusion and exclusion criteria, and additional inclusions based on reference list searches. A total of 1150 unique articles were identified by the initial search, and of these, 88 articles were eligible for study inclusion after applying the exclusion criteria based on title and abstract alone. Except for eight articles, the full text was retrieved and following further assessment, a total of 66 articles were included in Table 1, with 62 different programs being reported.

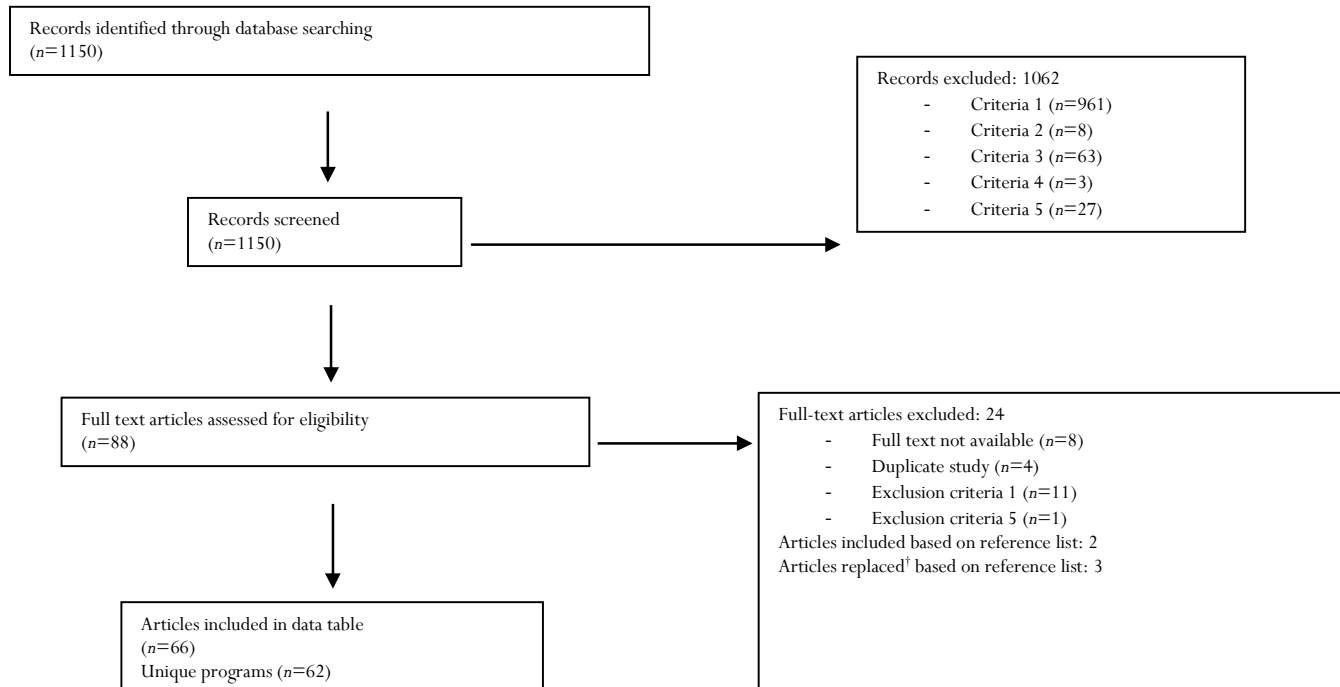


Figure 1: Flowchart of search results and the application of inclusion and exclusion criteria and reference list searching.

Of the 62 programs summarised (Table 1), 23 used a planning, implementation and evaluation framework (37%). The frequency of the reported frameworks is shown in Table 2, with the community based participatory research and social ecological model being the most frequently reported, respectively. Of the 62 programs, 22 explicitly reported the adoption of appropriate whole theories or theoretical constructs (35%). The frequency of reported theories is shown in Table 3, with social cognitive theory and its predecessor social learning theory being the most frequently reported, followed by the transtheoretical model. In total, 32 programs (52%) reported using one or other of a framework (for planning, implementation and evaluation) or pertinent theories to underpin intervention strategies. Within these, ten programs (16%) reported use of both.

The frequency of both reported framework and theory use varied to a small degree across different health promotion settings. Table 4 shows the frequency of reporting of both frameworks and theories across the settings of primary care, whole-of-community and community organisations (including schools and workplaces). The greater frequency of reported use of both frameworks and theories occurred in the community organisation settings.

Each program that had progressed to implementation as reported in the articles included an impact and outcome evaluation ($n=52$), and of these, nine explicitly reported an impact evaluation (17%), and 14 an outcome evaluation (27%). Twenty-four programs included a process evaluation (46%), 18 of which explicitly reported such (75%).



Table 1 (supplementary): A summary of the key data extracted from the 62 unique programs (66 unique journal articles) regarding the quality of applied health promotion programs targeting cardiometabolic disease risk in rural and remote populations. The key elements of quality examined were the explicit reporting of a planning, implementation and evaluation framework(s); and explicit reporting of the integration of appropriate behavioural theories/theoretical constructs into the development of intervention strategies⁹⁻⁷⁴

Study (reference)	Aim	Setting	No. of participants (+ important criteria)	Design/methods	Comparison/control groups	Planning, implementation and evaluation framework used		Appropriate theoretical constructs explicitly integrated		Results (evaluation)		
						Yes/No	Specify	Yes/No	Specify	Process	Impact	Outcome
Adams et al. 2012 (ref. 9)	To test whether a mentored, home-based healthy lifestyle intervention targeting both American Indian primary caregivers and their 2–5-year-old children will reduce 'American Indian' child overweight	Whole-of-community	150 child–carer dyads 2–5-year-old American Indian children and their primary caregivers	Randomised controlled trial with a CBPR approach	Yes – intervention (home mentoring and tool kit lessons) and control (tool kit lessons and mailings only)	Yes	CBPR	Yes	Social cognitive and family systems theories	NYI		
Balogopal et al. 2012 (ref. 10)	To test the effectiveness of a 6-month community-based DM prevention and management program in rural Gujarat, India	Whole-of-community	1638 rural Indians ≥18 years	CBPR approach	No	Yes	CBPR	No	NA	Yes Explicit	Yes Inferred	Yes Inferred
Ho et al. 2006 (ref. 11)	(1) To explore the needs and perceptions of community members surrounding health and DM (2) To assess the feasibility of adapting programs from Sandy Lake (3) To engage the community in the development of an integrated intervention program through participatory activities	Whole-of-community	72 participants from three communities	Participatory research and ethnography Qualitative and quantitative methods, including in-depth interviews, group activities, demonstrations, observations and discussions with participants	No	Yes	Participatory research	No	NA	NYI		
Zimmerman et al. 2012 (ref. 12)	This research describes the development and implementation of SSWICH, and examines the success of the initiative in reaching a population of rural women in southernmost Illinois.	Whole-of-community	Over 600 women in the community	Collaborative, ecological framework. SSWICH used a collaborative, multi-strategy approach to reduce cardiovascular disease risk in rural women through community-based health promotion, peer education and a mass media campaign. Evaluation data from each strategy were used to examine the success of SSWICH in reaching the women in southernmost Illinois.	No	Yes	CBPR	No	NA	Yes Inferred	Yes Inferred	Yes Inferred
Yeary et al. 2011 (ref. 13)	To assess the feasibility of delivering an adapted diabetes-prevention program intervention by lay health advisor leaders through rural churches	Community organisation	26 African Americans	CBPR approach	No	Yes	CBPR	Yes	Social cognitive theory	Yes Explicit	Yes Inferred	Yes Inferred



Table 1: cont'

Study (reference)	Aim	Setting	No. of participants (+ important criteria)	Design/methods	Comparison/control groups	Planning, implementation and evaluation framework used		Appropriate theoretical constructs explicitly integrated		Results (evaluation)		
						Yes/No	Specify	Yes/No	Specify	Process	Impact	Outcome
Bazzano et al. 2009 (ref. 14)	To increase knowledge, skills, and self-efficacy regarding health, nutrition, and fitness among adults with developmental disabilities	Whole-of-community	44 completed program (31 eligible) Community-dwelling adults 18–65 years, BMI ≥ 25 plus another risk factor for DM	Single-group community-based demonstration project	No	Yes	CBPR	Yes	Social cognitive theory	Yes Inferred	Yes Inferred	Yes Explicit,
de Silva-Sanigorski et al. 2010 (ref. 15)	To determine the effectiveness of the Romp & Chomp intervention in reducing obesity and promoting healthy eating and active play in children aged 0–5 years	Whole-of-community	12 000 children aged 0–5 years	Initial study: community-wide, multi-setting, multi-strategy intervention This study was a repeat cross-sectional with a quasi-experimental design	Yes – comparison Comparison communities were exposed to subtle rather than directed health-promotion activities	Yes	Socioecologic framework	No	NA	Yes Explicit	Yes Explicit	Yes Explicit
Puder et al. 2011 (ref. 16) Niederer et al. 2009 (ref. 17)	To test the effect of a multidimensional lifestyle intervention on aerobic fitness and adiposity in predominantly migrant preschool children	Schools	652 children	One year cluster randomised controlled single blinded trial	Yes – control Lifestyle intervention (physical activity, sleep, nutrition, media use) vs no intervention	Yes	Social ecological model	No	NA	Yes Explicit	Yes Inferred	Yes Explicit
Prabhakaran et al. 2009 (ref. 18)	To outline the methods of developing a comprehensive CVD prevention and health promotion program, present the results of this program, and discuss their implications	Workplaces	6806 industrial site employees and their family members aged 10–69 years	Cross-sectional survey with a multi-level, multi-method and multi-component intervention	Yes – control Intervention vs no intervention	Yes	Socioecological theory	Yes	Social cognitive theory, social learning theory	No	Yes Inferred	Yes Inferred
Duffany et al. 2011 (ref. 19)	To present the results of a several-year planning process that includes a theoretical framework and study design that highlights the key elements of conducting complex community interventions in developing country settings	Whole-of-community	12 200 people from Community Interventions for Health sites in four countries (intervention and comparison)	3-year pilot study	Yes – control Intervention population and control population	Yes	Social ecological model	No	NA	Yes Explicit	Yes Explicit	Yes Inferred
Greening et al. 2011 (ref. 20)	To evaluate a healthy lifestyle school-based obesity intervention in a rural southern community, where the rate of obesity ranks as the highest	Schools	450 children 6–10 years, 204 attended the intervention school and 246 attended the control school	School-based intervention trial	Yes – an 8-month intervention program was completed at the intervention school The control school followed the state's standard health curriculum	No	NA	Yes	Social learning theory	Yes Inferred	Yes Explicit	Yes Explicit



Table 1 cont'd

Study (reference)	Aim	Setting	No. of participants (+ important criteria)	Design/methods	Comparison/control groups	Planning, implementation and evaluation framework used		Appropriate theoretical constructs explicitly integrated		Results (evaluation)		
						Yes/No	Specify	Yes/No	Specify	Process	Impact	Outcome
Draper et al. 2010 (ref. 21)	Primary aims of HealthKick: promote healthful eating habits and increase regular participation in health enhancing physical activity to prevent overweight, and reduce risk of chronic diseases (particularly T2DM); and to promote the development of an environment within the school and community that facilitates the adoption of healthy lifestyles	Schools	16 schools (sample size not provided)	Three-phase design: intervention mapping and formative assessment, intervention development, and outcome and process evaluation	Yes – control Intervention 'co-implementation' schools and control 'self-implementation' schools	Yes	Intervention mapping	Yes	Social cognitive theory	Yes Explicit	Yes Inferred	Yes Explicit
Williamson et al. 2008 (ref. 22) Williamson et al. 2012 (ref. 23) Newton et al. 2011 (ref. 24)	Primary aim of the LA Health project is to test the efficacy of two school-based approaches for obesity prevention: primary prevention alone and a combination of primary and secondary prevention which will be compared to a no-intervention control group	Schools	2102 (in randomised controlled trial) 607 (in observation control group) Children in grades 4–6	Cluster randomised controlled trial	Yes – control Primary intervention (environmental approach) vs primary plus secondary intervention (classroom/internet approach) vs no intervention	No	NA	Yes	Social learning theory	Yes Explicit (ref. 24)	Yes Inferred (ref. 23)	Yes Explicit (ref. 22)
Carr et al. 2008 (ref. 25)	To determine whether the Active Living Every Day internet-delivered theory-based physical activity behaviour change program increases physical activity and improves cardiometabolic disease risk factors in sedentary overweight adults.	Whole-of-community	32 adults 21–65 years, BMI 18–40, sedentary lifestyle	Randomised controlled trial	Yes – control 16-week Active Living Every Day intervention vs delayed intent-to-treat control condition	No	NA	Yes	Social cognitive theory, transtheoretical model	Yes Explicit	Yes Inferred	Yes Explicit
Parra-Medina et al. 2010 (ref. 26)	To assess the effectiveness of a culturally appropriate, theory-based intervention to reduce dietary fat and increase moderate-intensity physical activity in primary care settings among underserved African American women	Primary care	266 African American women ≥35 years	Randomised controlled trial	Yes – comparison Standard care intervention (provider counselling, nurse goal setting, and educational materials) vs comprehensive intervention (standard care intervention plus 12 months of telephone counselling and tailored print materials)	No	NA	Yes	Social cognitive theory, transtheoretical model	Yes Explicit	Yes Inferred	Yes Inferred
Winett et al. 1999 (ref. 27)	To describe an intervention based on social cognitive theory that entails integrating self-regulatory procedures with social and environmental supports in rural churches serving people from lower socioeconomic groups	Community organisation	12 rural, low socioeconomic status churches	Cluster-controlled intervention study	Yes – comparison social cognitive theory intervention vs information-only program	No	NA	Yes	Social cognitive theory	No	Yes Inferred	Yes Inferred



Table 1: cont'd

Study (reference)	Aim	Setting	No. of participants (+ important criteria)	Design/methods	Comparison/control groups	Planning, implementation and evaluation framework used		Appropriate theoretical constructs explicitly integrated		Results (evaluation)		
						Yes/No	Specify	Yes/No	Specify	Process	Impact	Outcome
Von Gruenigen et al. 2008 (ref. 28)	To assess feasibility of a lifestyle intervention program for promoting weight loss, change in eating behaviours, and increased physical activity in obese endometrial cancer survivors	Primary care	45 women, BMI>25, stage I or II endometrial cancer, received surgery, no evidence of disease at time of enrolment	Prospective two-group randomised controlled trial	Yes – control Lifestyle intervention vs usual care	No	NA	Yes	Social cognitive theory	No	Yes Inferred	Yes Inferred
Simmons et al. 2008 (ref. 29)	To assess the impact of personal lifestyle change supported by changes in the surrounding social and physical environment	Whole-of-community	5240 non-pregnant Maori family members without DM ≥28 years	Randomised cluster-controlled trial	Yes – control intervention (incl. personal support delivered by a Maori Community Health Worker) vs no intervention	No	NA	Yes	Social cognitive theory	No	Yes Inferred	Yes Inferred
Kilkinen et al. 2006 (ref. 30)	To evaluate the adaptability of an effective intervention model to Australian primary healthcare settings	Primary care	237 adults 40–75 years, DM risk score ≥12, capillary plasma glucose ≤11 mmol/L	Longitudinal pre-test post-test study	No	Yes	Health action process approach	Yes	Social learning theory, self-regulation theory, transtheoretical model	No	Yes Inferred	Yes Inferred
Daniel et al. 1999 (ref. 31)	To test the effect of a community-directed DM intervention program at the population level	Whole-of-community	925 adults ≥18 years, pregnant women excluded Intervention (475), comparison (212 and 238)	Quasi-experimental	Yes – comparison Single intervention community matched to two comparison communities	Yes	Precede–proceed model	Yes	Social learning theory, health belief model, theory of reasoned action, community change models, socio-behavioural theory	Yes Explicit	Yes Explicit	Yes Explicit
Hageman et al. 2011 (ref. 32)	To compare the effectiveness of an interactive website only, interactive website plus a peer-led online support group, and interactive website plus professional weight loss counselling via email in facilitating initial weight loss (baseline to 6 months), guided continuing weight loss and maintenance (7–18 months) and self-directed weight maintenance (19–30 months)	Whole-of-community	306 women 45–69 years, BMI 28–45, residents in one of ten rural counties in a Midwestern state in the US	Randomised controlled trial	Yes – control Interactive website vs interactive website plus peer-led online support group vs interactive website plus professional weight loss counselling via email	Yes	Health Promotion Model	Yes	Social cognitive theory	Yes Explicit	NYI	
Balagopal et al. 2008 (ref. 33)	This study evaluated a 7-month community-based non-pharmacological lifestyle intervention to prevent/reduce the risk of developing DM and its complications in a resource-poor village in Tamilnadu, India	Whole-of-community	703 village inhabitants (118 youth 10–17 years and 585 adults)	Collective population approach	No	Yes	Collective population approach	No	NA	Yes Inferred	Yes Inferred	Yes Explicit



Table 1:cont'd

Study (reference)	Aim	Setting	No. of participants (+ important criteria)	Design/methods	Comparison/control groups	Planning, implementation and evaluation framework used		Appropriate theoretical constructs explicitly integrated		Results (evaluation)		
						Yes/No	Specify	Yes/No	Specify	Process	Impact	Outcome
Riddell et al. 2012 (ref. 34)	The protocol for a cluster randomised controlled trial of group-based peer support for people with T2DM in a community setting	Whole-of-community	120 participants per study arm. Participants and peer leaders, able to understand English, 25–75 years and diagnosed with T2DM for more than 12 months are eligible	A cluster randomised controlled evaluation of a group-based peer support program. This multi-faceted intervention comprises four interconnected components for delivering support to the participants	Yes – control. The intervention arm participate in the peer-support program for 12 months; the control arm will continue with their usual care.	Yes	Reach, Efficacy, Adoption, Implementation, and Maintenance framework	No	NA	NYI		
Rowley et al. 2000 (ref. 35)	To assess the sustainability and effectiveness of a community-directed program for primary and secondary prevention of obesity, DM and cardiovascular disease in an Aboriginal community in north-west Western Australia	Whole-of-community	n=49 high-risk individuals, and n=200 at baseline, 185 at 2-year and 132 at 4-year follow-ups	Evaluation of health outcomes in a cohort of high-risk individuals and cross-sectional community samples process (interventions and their implementation) and impact (diet and exercise behaviour)	Yes – but not considered by the authors to be a true control group, as the groups were self-selected. Persons participating in diet or physical activity interventions (the 'intervention group') were compared with persons not participating in diet or physical activity interventions (the 'non-intervention group')	No	NA	No	NA	Yes Explicit	Yes Explicit	Yes Explicit
Wapner et al. 2010 (ref. 36)	To address barriers to access to health services and medical education, the authors conducted TAKE ACTION, a small-scale pilot intervention to evaluate the effectiveness of a multidisciplinary, healthy lifestyle program for overweight youth and parents living in a rural community	Whole-of-community	14 youth and 12 parents participated in the program. Eligible youth were 6–17 years with BMI ≥85th percentile and a co-participating parent	Single-arm pilot study	No	No	NA	Yes	TTM	No	Yes Inferred	Yes Explicit
Debussche et al. 2012 (ref. 37)	To test the efficacy of a long-term (2 years) structured group self-management educational intervention in improving blood glucose in non-recent, insufficiently controlled DM.	Primary care	240 outpatients ≥18 years with T2DM treated for ≥1 year and initial HbA1c ≥7.5% for ≥3 months	Randomised two-arm controlled trial	Yes – control Initial blinded structured education program, then unblinded group-based on-going structured self-management education support vs no on-going support	No	NA	Yes	Socio-constructivism, social contextualisation, empowerment, action planning	NYI		
Huang et al. 2011 (ref. 38)	To evaluate the effects of a community intervention program, which focused on improving the hypertension knowledge, diets and lifestyles in a rural Chinese area	Whole-of-community	1509 (≥35 years, not suffering from CAD, DM or chronic kidney disease)	Community intervention trial	Yes – control Intervention (hypertension education and dietary and lifestyle guidance) vs no intervention	No	NA	No	NA	No	Yes Inferred	Yes Inferred



Table 1: cont'd

Study (reference)	Aim	Setting	No. of participants (+ important criteria)	Design/methods	Comparison/control groups	Planning, implementation and evaluation framework used		Appropriate theoretical constructs explicitly integrated		Results (evaluation)		
						Yes/No	Specify	Yes/No	Specify	Process	Impact	Outcome
Janicke et al. 2011 (ref. 39)	To evaluate the effects of a behavioural 'family-based' intervention and a behavioural 'parent-based' intervention relative to an education control condition, delivered via group contacts to overweight and obese children and/or their parents in rural counties, on children's standardised BMI	Primary care	240 parent-child dyads (240 children 8–12 years with a BMI≥85th percentile for age and gender plus parent/legal guardian(s) (if ≤75 years))	Three-arm randomised controlled trial	Yes – control (a) A family-based behavioural group intervention (b) A parent-only behavioural group intervention (c) An education control condition	No	NA	No	NA	NYI		
Johnson et al. 2010 (ref. 40)	To determine the effectiveness of a 6-week beauty salon-based health intervention in improving diet, physical activity, and water consumption behaviours in African American women using a quasi-experimental design	Community organisation	20 African American women aged 18–70 years who were beauty salon clients	Quasi-experimental design (pilot study)	Yes – comparison Intervention (motivational sessions, information packet and starter kit) vs no intervention	No	NA	No	NA	No	Yes Inferred	Yes Inferred
Adams et al. 2011 (ref. 41) Adams et al. 2009 (ref. 42)	Tooty Fruity Veggie aimed to reduce the incidence of overweight and obesity childhood by increasing the proportion of children who eat a nutritionally adequate diet, improving 12 fundamental movement skills and increasing the proportion of children with adequate physical activity levels	Schools	18 preschools (matched with 13 control preschools) (3–5 years)	One-year intervention with a quasi-experimental design study	Yes – control	Yes	Health Promoting Schools framework	Yes	Health belief model, competence motivational theory	Yes Explicit	Yes Explicit	Yes Inferred
Naylor et al. 2010 (ref. 43)	To explore the feasibility and implementation of Action Schools! BC in three remote Aboriginal communities in northern British Columbia	Schools	3 rural remote Aboriginal schools	Case study design	No	Yes	Action Schools! BC	No	NA	Yes Explicit	Yes Inferred	Yes Inferred
Nguyen et al. 2012 (ref. 44)	Evaluate the impact of healthy lifestyle promotion campaigns on CVD risk factors in the general population in the context of a community-based program on hypertension management	Whole-of-community	4650 adults >25 years	Quasi-experimental study	Yes – control intervention commune (hypertensive-targeted management program integrated with a community-targeted health promotion) vs no new program	No	NA	No	NA	No	Yes Explicit	Yes Inferred
Parker et al. 2010 (ref. 45)	The LIFE Project is a 10-week intervention designed to reduce obesity in rural African American women	Community organisation	28 African American or Black non-pregnant women 25–64 years	Church-based 10-week weight-loss educational intervention program	Yes – comparison Spiritually based vs non-spiritually based interventions	No	NA	No	NA	No	Yes Inferred	Yes Inferred



Table 1:cont'd

Study (reference)	Aim	Setting	No. of participants (+ important criteria)	Design/methods	Comparison/control groups	Planning, implementation and evaluation framework used		Appropriate theoretical constructs explicitly integrated		Results (evaluation)		
						Yes/No	Specify	Yes/No	Specify	Process	Impact	Outcome
Qiao et al. 2010 (ref. 46)	(1) To raise the public awareness of DM and DM risk factors, and promote healthy diet and physical activity (2) To reduce the number of high-risk people developing DM through lifestyle counselling (3) Early diagnosis of DM (4) To evaluate the effectiveness, cost-effectiveness, feasibility, acceptability and sustainability of the programs	Primary care	1313 individuals with impaired fasting glucose/impaired glucose tolerance	Randomised controlled trial	Yes – control Intervention (lifestyle counselling) vs no intervention	No	NA	No	NA	No	Yes Inferred	Yes Explicit
Reinhardt et al. 2012 (ref. 47)	To investigate whether phone-based lifestyle education using motivational interviewing resulted in positive lifestyle change post gestational DM for women in a large rural area	Primary care	38 women following gestational DM diagnosis	Pilot randomised controlled trial	Yes – control Intervention (6-month phone-based motivational interviewing) vs no intervention	No	NA	No	NA	Yes Inferred	Yes Inferred	Yes Inferred
Sarrafzadegan et al. 2009 (ref. 48)	To assess the effects of a comprehensive, integrated community-based lifestyle intervention on diet, physical activity and smoking in two Iranian communities	Whole-of-community	12 600 adults from urban and rural populations	Community-based lifestyle intervention program	Yes – control Two intervention counties (Isfahan and Najaf-Abad) and a control area (Arak)	No	NA	No	NA	No	Yes Inferred	Yes Inferred
Vadheim et al. 2010 (ref. 49)	To evaluate the feasibility of translating the DPP lifestyle intervention into practice in a rural community	Whole-of-community	101 adults ≥ 18 years, $BMI \geq 25$ plus one other diabetic/CVD risk factors	Risk reduction intervention study	No	No	NA	No	NA	No	Yes Inferred	Yes Inferred
Vadheim et al. 2010 (ref. 50)	To assess the feasibility of delivering an adapted group-based version of the DPP's lifestyle intervention through telehealth video conferencing	Primary care	27 adults ≥ 18 , $BMI \geq 25$ plus one other DM/CVD risk factors	Controlled DPP intervention	Yes – comparison DPP lifestyle intervention through telehealth vs on-site	No	NA	No	NA	No	Yes Inferred	Yes Inferred
Ackermann et al. 2008 (ref. 51)	To evaluate the delivery of a group-based DPP lifestyle intervention in partnership with the YMCA	Community organisation	92 adults, ADA risk score ≥ 10 and CCBG of 110–199 mg/dL	Pilot cluster-randomised trial	Yes – comparison Compare group-based DPP lifestyle intervention delivery by the YMCA to brief counselling alone	No	NA	No	NA	Yes Inferred	Yes Inferred	Yes Inferred



Table 1: cont'd

Study (reference)	Aim	Setting	No. of participants (+ important criteria)	Design/methods	Comparison/control groups	Planning, implementation and evaluation framework used		Appropriate theoretical constructs explicitly integrated		Results (evaluation)		
						Yes/No	Specify	Yes/No	Specify	Process	Impact	Outcome
Stock et al. 2007 (ref. 52)	To pilot Healthy Buddies in one elementary school and evaluate the effect of the program on students' health knowledge and behaviours, self-competence, body satisfaction, disordered eating behaviours and fitness, as well as physical characteristics of height, weight, BMI, blood pressure, and heart rate	Schools	383 children (kindergarten to year 7)	Controlled prospective pilot study	Yes – control Intervention (Healthy Buddies program) vs no intervention	No	NA	No	NA	No	Yes Inferred	Yes Inferred
Dalton et al. 2011 (ref. 53)	(1) To establish a primary-care based and parent-mediated childhood overweight intervention program in the primary care setting (2) To explore the efficacy of this intervention in promoting healthier behaviours of children (3) To examine the acceptability and feasibility of the approach among parents and primary care providers	Primary care	80 children 5–11 years, BMI≥85th percentile plus one parent/guardian who agrees to participate in the study	Cluster-randomised controlled trial	Yes – control 10-week intervention with parents of obese/overweight children vs no intervention	No	NA	No	NA	NYI		
Janicke et al. 2013 (ref. 54)	To assess the effectiveness of a behavioural family weight management intervention in an important and at-risk population, overweight young children, 3–6 years, and their parents from underserved rural counties	Whole-of-community	96 parent-child dyads Children 3–6 years, BMI≥85th percentile, plus participating parent/guardian(s) ≤75years	Two-arm pilot randomised controlled trial	Yes – control Behavioural family-based intervention vs a waitlist control	No	NA	No	NA	No	Yes Inferred	Yes Inferred
Janicke et al. 2008 (ref. 55)	Primary aim of Project STORY is to evaluate the effects of a behavioural 'family-based' intervention and a behavioural 'parent-based' intervention, delivered via group contacts to overweight children and/or their parents in rural counties, on children's standardised body mass index	Whole-of-community	90 parent-child dyads Children 8–13 years with BMI≥85th percentile plus participating parent/guardian(s) living in same house	Three-arm randomised planning and feasibility study	Yes – control (a) A family-based behavioural group intervention (b) A parent-only behavioural group intervention (c) A waitlist control condition	No	NA	No	NA	NYI		



Table 1: cont'd

Study (reference)	Aim	Setting	No. of participants (+ important criteria)	Design/methods	Comparison/control groups	Planning, implementation and evaluation framework used		Appropriate theoretical constructs explicitly integrated		Results (evaluation)		
						Yes/No	Specify	Yes/No	Specify	Process	Impact	Outcome
Pettman et al. 2009 (ref. 56)	To evaluate the health benefits of a minimally prescriptive group-based lifestyle intervention in participants with the metabolic syndrome	Whole-of-community	153 obese adults with metabolic syndrome	Randomised controlled parallel group design	Yes – control Intervention (education, practical strategies and group-based support) vs no intervention	No	NA	No	NA	No	Yes Inferred	Yes Inferred
Samuel-Hodge et al. 2012 (ref. 57)	To present the rationale, study design, and baseline characteristics of a type 2 translational study that evaluates both the processes and outcomes of a weight loss intervention for low-income women given at 6 county health departments in North Carolina	Primary care	189 women 40–64 years, BMI 27.5–45	Randomised controlled trial	Yes – control Weight Wise intervention vs wait-listed control	Yes	Reach, Efficacy, Adoption, Implementation, and Maintenance framework	No	NA	Yes Explicit	Yes Inferred	Yes Explicit
Robinson-Whelen et al. 2006 (ref. 58)	To examine the efficacy of a health promotion program for women aging with physical disabilities	Whole-of-community	137 women ≥45 years with a physical limitation ≥1 year duration that interferes with ADL	Randomised controlled trial	Yes – control 8-week health promotion program vs waitlist control group	No	NA	Yes	Social learning theory	No	Yes Inferred	Yes Inferred
Vogt et al. 2008 (ref. 59)	To illustrate how survey and key informant data can enhance knowledge of local study populations and guide interventions to improve asthma control and treatment	Whole-of-community	4925 adults in the Behavioural Risk Factor Surveillance Survey system in Salinas	Large community based intervention	No	No	NA	No	NA	No	Yes Inferred	Yes Inferred
Taylor et al. 2006 (ref. 60)	To determine whether increasing levels of extracurricular activity could reduce weight gain in children	Whole-of-community	384 children 5–12 years	Controlled intervention study	Yes – control Lifestyle intervention vs no intervention	No	NA	No	NA	No	Yes Inferred	Yes Inferred
Gracey et al. 2006 (ref. 61)	To attempt to prevent T2DM and other nutrition-related lifestyle diseases through community-based lifestyle modification	Whole-of-community	4 discrete, remote Aboriginal communities (population sizes 200, 400, 350 and 400)	Community-based lifestyle modification intervention study	No	No	NA	No	NA	No	Yes Inferred	Yes Inferred
Amundson et al. 2009 (ref. 62)	To evaluate the feasibility of translating the DPP lifestyle intervention into practice in the general community	Primary care	293 adults ≥18 years, BMI≥25, plus one or more diabetic/CVD risk factors	Lifestyle modification intervention program	No	No	NA	No	NA	No	Yes Inferred	Yes Inferred
Williams et al. 2004 (ref. 63)	To test a worksite intervention designed to reduce CVD risk factors in low-income African American women	Workplaces	294 (160 rural and 134 urban low-income African American women employees)	Risk factor reduction intervention	No (but comparisons made to the AHA national sample)	Yes	Health promotion model	No	NA	No	Yes Inferred	Yes Inferred



Table 1: cont'd

Study (reference)	Aim	Setting	No. of participants (+ important criteria)	Design/methods	Comparison/control groups	Planning, implementation and evaluation framework used		Appropriate theoretical constructs explicitly integrated		Results (evaluation)		
						Yes/No	Specify	Yes/No	Specify	Process	Impact	Outcome
Ronda et al. 2004 (ref. 64)	To realise an effective combination of population strategy, (aiming at all inhabitants), and high risk strategy, (focusing on individuals with a high risk for CVD) so that CVD can be reduced	Whole-of-community	4 low socioeconomic status areas in Maastricht, (Mariaberg 5100, Malberg 6300, Wittevrouwenveld 6000, Heugemerveld 3000)	Community project – community-wide health intervention High-risk project – randomised controlled intervention study	Yes – control	Yes	Precede–proceed model	Yes	Health belief model, theory of planned behaviour, transtheoretical model	Yes Explicit	Yes Explicit	Yes Inferred
Aoun and Rosenberg 2004 (ref. 65)	To increase the quality of life of participants through the provision of knowledge and skills about cardiac events and their management, as well as participation in physical activity programs; to increase compliance with diet, exercise and non-smoking regimens and prescribed medications	Primary care	203 hospital clients with a history of hospital admission for a cardiac event related to ischaemic heart disease and those identified to be at high risk of CAD	Cardiac rehabilitation program	No	No	NA	No	NA	No	Yes Inferred	Yes Inferred
Lupton et al. 2003 (ref. 66)	To change cardiovascular risk factors through community-based intervention in a fishing community in the Norwegian Arctic	Whole-of-community	4 communities (intervention community Båtsfjord (2500) and three control communities (total ~5000) from the same coastal area)	Quasi-experimental design	Yes – control Intervention (based on empowerment and cooperation) vs no intervention	Yes	Community empowerment	No	NA	No	Yes Inferred	Yes Inferred
Mayer-Davis et al. 2004 (ref. 67)	To evaluate the effectiveness of a state-of-the-art lifestyle intervention for weight management and metabolic control of DM	Whole-of-community	187 adults ≥45 years, BMI≥25, clinical diagnosis of DM	Randomised controlled trial	Yes – control 'Intensive-lifestyle' vs 'reimbursable-lifestyle' interventions vs usual care (control)	No	NA	No	NA	No	Yes Inferred	Yes Inferred
Rowley et al. 2000 (ref. 68)	To assess the sustainability and effectiveness of a community-directed program for primary and secondary prevention of obesity, DM and cardiovascular disease in an Aboriginal community in north-west Western Australia	Whole-of-community	49 (high-risk overweight and diabetic people)	Controlled intervention study	Yes – control Intervention vs no intervention (self-selected) (in high-risk intervention) No comparison for the wider community intervention	No	NA	No	NA	Yes Explicit	Yes Explicit	Yes Explicit
Weinshall et al. 1999 (ref. 69)	To examine the impact of a systematic risk factor screening and counselling carried out by family physicians and family nurses within the larger framework of a community intervention programme for the prevention of cardiovascular disease	Whole-of-community	1893 people aged 30, 40, 50 and 60 years in community	Quasi-experimental design	Yes – reference Intervention area (Northern Sweden municipality (5500 inhabitants)) vs reference area (Northern Sweden region (510 000 inhabitants))	No	NA	No	NA	No	Yes Inferred	Yes Inferred



Table 1: cont'd

Study (reference)	Aim	Setting	No. of participants (+ important criteria)	Design/methods	Comparison/control groups	Planning, implementation and evaluation framework used		Appropriate theoretical constructs explicitly integrated		Results (evaluation)		
						Yes/No	Specify	Yes/No	Specify	Process	Impact	Outcome
Gibbins et al. 1993 (ref. 70)	To assess the effectiveness of a program for reducing cardiovascular risk in men in terms of clinical measurements and perceptions of patients	Primary care	526 men 28–60 years, attending well persons clinic	Collection of paired data on men attending well person clinics over 3–5 years. Questionnaire to determine changes in risk related habits	No	No	NA	No	NA	No	Yes Inferred	Yes Inferred
Lakerveld et al. 2008 (ref. 71)	To investigate the effects of a CBP, compared with providing written information and brochures only on the risk of developing T2DM and/or CVD in high-risk individuals	Primary care	600 adults 30–50 years, abdominal obesity (male waist ≥ 102 cm, female waist ≥ 88 cm), plus high risk of developing T2DM and/or CVD	Randomised controlled trial	Yes – control Intervention (CBP plus motivational interviewing and problem-solving treatment) vs control (written information about their risk and brochures)	Yes	Cognitive behavioural program	Yes	Theory of planned behaviour, theory of self-regulation	Yes Explicit	NYI	
Chow et al. 2009 (ref. 72)	To investigate the effects of algorithm-based care on individuals at very high risk of a cardiovascular event who were identified and managed according to basic guidelines	Whole-of-community	44 villages ≥ 30 years at high risk of CVD	Factorial, cluster-randomised trial design	Yes – control Algorithm-based care approach vs health-promotion campaign (villages will be exposed to one, both or neither)	No	NA	No	NA	NYI		
Harrell et al. 2005 (ref. 73)	To evaluate the effectiveness of a school-based pilot intervention program aimed at increasing knowledge of CVD risk factors among fifth grade students in a rural Mississippi community	Schools	205 fifth-grade students	Controlled school-based intervention	Yes – control 16-week school-based intervention vs control school within same community	No	NA	No	NA	No	Yes Inferred	Yes Inferred
Perri et al. 2008 (ref. 74)	To compare the effectiveness of extended-care programs designed to promote successful long-term weight management, using Cooperative Extension Service offices in rural communities as venues for the trial	Primary care	234 obese women 50–75 years with BMI > 30 from rural communities who completed an initial 6-month weight-loss program at Cooperative Extension Service	Randomised controlled trial	Yes – control Extended care (problem-solving counselling delivered in 26 biweekly sessions via telephone or face to face) vs an education control group (received 26 biweekly newsletters containing weight-control advice)	No	NA	Yes	Self-regulation theory	No	Yes Inferred	Yes Inferred

ADA, American Diabetes Association; ADL, activities of daily living; CAD, coronary artery disease; CBP, cognitive behavioural program; CBPR, community-based participatory research; CCBG, casual capillary blood glucose; CVD, cardiovascular disease; DM, diabetes mellitus; DPP, Diabetes Prevention Program; HbA1c, haemoglobin A1c; NA, not applicable; NYI, not yet implemented; SSWICH, Southern Seven Women's Initiative for Cardiovascular Health; T2DM, type 2 diabetes mellitus

The frequency of both reported framework and theory use varied to a small degree across different health promotion settings. Table 4 shows the frequency of reporting of both frameworks and theories across the settings of primary care, whole-of-community and community organisations (including schools and workplaces). The greater frequency of reported use of both frameworks and theories occurred in the community organisation settings.

Each program that had progressed to implementation as reported in the articles included an impact and outcome evaluation ($n=52$), and of these, nine explicitly reported an impact evaluation (17%), and 14 an outcome evaluation (27%). Twenty-four programs included a process evaluation (46%), 18 of which explicitly reported such (75%).



Table 2: Proportion of planning, implementation and evaluation frameworks used in health promotion programs targeting cardiometabolic disease risk in rural and remote places

Planning, implementation, evaluation framework	Frequency of reported use
Community based participatory research	6
Social ecological model	4
Precede-proceed model	2
Health promotion model	2
Re-aim framework	2
Intervention mapping	1
Action schools! BC	1
Collective population approach	1
Health promoting schools framework	1
Community empowerment	1
Health action process approach	1
Cognitive behavioural program	1

Table 3: Proportions of whole theories or specific constructs used in health promotion programs targeting cardiometabolic disease risk in rural and remote places

Theory	Frequency of reported use
Social cognitive theory	12
Social learning theory	6
Transtheoretical model	5
Health belief model	3
Self-regulation theory	3
Theory of planned behaviour	2
Theory of reasoned action	1
Socio-constructivism	1
Social contextualisation	1
Empowerment	1
Action planning	1
Competence motivational theory	1
Community change models	1
Socio-behavioural theory	1
Family system theories	1

Table 4: A summary of the explicit reporting of the use of health promotion frameworks and theories by health promotion setting, from the 62 unique programs covered in the 66 reviewed articles

Setting	Number of studies	Framework number (% total)	Theory number (% total)
Primary care	15	3 (20)	6 (40)
'Whole-of-community'	32	10 (31)	9 (28)
Community organisations (combined)	15	7 (47)	7 (47)
Schools	8	4 (50)	4 (50)
Workplaces	2	2 (100)	1 (50)
Other	5	1 (20)	2 (40)



Discussion

The most successful health promotion interventions are those designed with a structured framework for the ongoing development and maintenance of the program, and which enable continuous improvement through evaluation⁷⁵. These frameworks embody the cardinal principles of health promotion, by increasing community capacity and empowering individuals, creating supportive environments, encouraging participation, taking a broad view of health and fostering intersectoral collaboration⁸. Furthermore, those designed with an explicit theoretical foundation are more effective at improving health behaviour⁵. Despite this, the development and implementation of health-promotion intervention strategies often proceeds without the use of these evidence-based approaches⁷⁶.

This review has demonstrated, in the context of health promotion programs targeting the reduction of CMD risk in rural and remote populations, that 16% reported using both a standardised framework and pertinent theoretical constructs to underpin intervention strategy development and implementation. Moreover, 50% of programs did not incorporate either a framework or a theoretical foundation, strongly suggesting that the quality and rigour of applied health promotion programs targeting the reduction of CMD risk in rural and remote populations can be strengthened.

These findings tended to vary by the nature of the health promotion setting in rural and remote communities with community organisational interventions (including school and workplace-based programs) more frequently reporting the use of frameworks and theories when compared with 'whole-of-community' or primary care based programs.

In the 37% of programs that reported using a planning, implementation and evaluation framework, the most frequently used were community-based participatory research (CBPR) (26%) and social ecological model (SEM) (17%). However, there were ten alternative frameworks or models that were adopted and reported in this literature. CBPR is a transformative research model, which encourages

community involvement and social action, facilitating health-oriented interactions and cohesiveness between academics, health professionals and the community. This enables interventions to be implemented across a larger population, and through integrating community theories into the research, this increases the likelihood of an intervention being long-lasting and successful⁷⁶.

SEM was translated to a set of guidelines for community health promotion in 1996⁷⁷. It positions behaviour as the outcome of interest, being determined by public policy, community factors, institutional factors, interpersonal processes and primary groups, and intrapersonal factors. This model targets both social environmental factors and the individual for health promotion, with interventions aimed at changing intrapersonal, interpersonal, institutional, community and global parameters⁷⁸.

Both of these models have much in common with the precede-proceed model, which is perhaps the most comprehensive, integrated and well-known health promotion model, composed of formative phases (Precede: social, epidemiological, behavioural, environmental, educational and organisational diagnoses; resources and support appraisal), followed organically by implementation (representing the transition to Proceed) and evaluation of process (theory function), impact (on behavioural goals) and outcomes (on health and quality of life goals)^{15,79}.

Of the adopted and explicitly reported theories in 35% of programs, social cognitive theory (SCT) and its predecessor social learning theory together accounted for close to half of all reported use across these health promotion programs (45%). However, more than a dozen other theories were adopted by the remainder of programs. SCT conceptualises human behaviour as the result of continuous reciprocal interaction between cognitive, behavioural and environmental factors; observation, imitation, and modelling of others' behaviours drives the individual's behaviour, which is subsequently either reinforced or deterred by reward or punishment, respectively. SCT describes four steps through



which the individual must proceed: attention, retention, reproduction and motivation⁸⁰.

The reasons for the choices of frameworks and theories adopted for these health promotion programs in these settings was in most cases not well articulated, although common to most frameworks was the principle that adopted theories should have meaning in the community setting and reflect the communities' understanding of CMD causation, prevention and management. This study has examined the extent of use, and has added to the literature knowledge about the frequency rank of framework and theory use for cardiometabolic health promotion in underserved rural and remote settings. However, future work should seek to better understand the reasons behind the adoption of specific frameworks and theories in health promotion programs across different community settings and target populations.

The possible impact of publication bias needs to be considered in the extrapolation of these findings beyond health promotion programs that are published in the academic literature. Many health promotion programs may have occurred in rural and remote settings that were never published and this review provides no knowledge of whether they were conducted under common frameworks or whether pertinent socio-behavioural theories were adopted in the development of intervention strategies. A limitation of this review is that a single author performed all the inclusion and exclusion criteria assessments and data extraction from full texts. Validation of inclusion/exclusion screening and data extraction was performed by a second author on approximately 15% of articles. Future research in this area could include investigating the interaction between the effectiveness and the quality of these programs in terms of their conceptual foundation.

Conclusions

Analysis of published literature indicates that 35% of health promotion programs targeting CMD risk in rural and remote settings reported using a planning, implementation and evaluation framework, and 35% reported a theoretical basis for intervention strategies. With approximately 20% overlap

of programs reporting the use of both, this means half of the studies reviewed did not report using either a framework or theoretical basis for intervention. The most successful health promotion interventions are those that are based on these fundamental principles. Therefore, this review highlights the considerable remaining scope for improvement in the quality of conduct and reporting of health promotion programs targeting CMD risk in rural settings.

The combination of high prevalence of CMD and relatively poor access to primary healthcare services in rural and remote populations in Australia contributes to excess morbidity and mortality. In these settings, the use of best practice community health promotion programs is of increasing importance in order to optimise the ability of the discipline to achieve population health improvements in these disadvantaged populations.

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