

Use of social impact bonds in financing health systems responses to non-communicable diseases: scoping review

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ABSTRACT

There is an interest to understand how social impact bonds (SIBs), a type of innovative financing instrument used in impact investment, can be used to finance the prevention of non-communicable diseases (NCDs). This is the first scoping review that explores the evidence of SIBs for NCDs and their key characteristics and performance. The review used both published and grey literature from eight databases (MEDLINE, NCBI, Elsevier, Cochrane Library, Google, Google Scholar, WHO publications and OECD iLibrary). A total of 83 studies and articles were eligible for inclusion, identifying 11 SIBs implemented in eight countries. The shared characteristics of the SIBs used for NCDs were impact investment companies as investors, local governments as outcome payers, not-for-profit service providers and an average US\$2 015 456 private initial investment. The review revealed a lack of empirical evidence on SIBs for NCDs. Conflict of interest and lack of public disclosure were common issues in both the published and grey literature on SIBs. Furthermore, only three SIBs implemented for financing NCDs were meeting all their target outcomes. The common characteristics of the SIBs meeting their target outcomes were evidence-based interventions, multiple service providers and an intermediated structure. Overall, there is a need for more high-quality studies, particularly economic evaluations and qualitative studies on the benefits to target populations, and greater transparency from the private sector, in order to ensure improved SIBs for preventing NCDs.

INTRODUCTION

Non-communicable diseases (NCDs) comprise of chronic conditions, such as cardiovascular diseases, chronic respiratory diseases, cancer, diabetes and mental health. In 2018, NCDs were responsible for 71% of all worldwide deaths, more than the combination of maternal, infectious, perinatal and nutrition-related diseases,^{1 2} with the burden disproportionately falling on low-income and middle-income countries.³ Furthermore, the cost of NCDs is substantial and is likely to grow each year with a growing ageing population, costly health technology and increasing

Key questions

What is already known?

- Previous studies have commonly explored the benefits and challenges of social impact bonds (SIBs).
- Some SIB characteristics (cause, outcome payer, service provider, intermediary outcomes, financial return) were briefly reported in the previous literature.
- However, a synthesis of all key characteristics was not known for all SIBs for non-communicable diseases (NCDs), and no previous study had analysed the performance of SIBs for NCDs.

What are the new findings?

- Our study suggested very limited use of SIBs with limited investment covering a small proportion of populations.
- Conflict of interest and lack of public disclosure of the financial terms were common issues in both the published and grey literature on SIBs—a concern echoed in earlier studies.
- Furthermore, only three SIBs implemented for financing NCDs were meeting all their current target outcomes. The risk of gaming for financial incentives in the SIBs also could not be ruled out due to the presence of self-reported outcomes, low rigour evaluation and low transparency.

What do the new findings imply?

- There is a need for a larger number of high-quality studies.
- We identify the need to develop suitable metrics to enable consistent measurement of performance and comparative evaluation of SIBs.
- Without any economic evaluation, return on investment analysis and the disclosed full costs of implementation, the financial value of SIBs over traditional sources of funding could not be verified.

exposure to risk factors. It is estimated that, without action, NCDs will lead to 52 million deaths each year and an estimated US\$47 trillion will be lost by 2031.^{4 5} The United Nations High-Level Meeting on NCDs in 2018 identified the challenges of financing stronger

Box 1 Examples of innovative financing instruments

Types:

- ▶ Social impact bonds, for example, Fresno's AIM4Fresno.
- ▶ Advance market commitments, for example, GAVI's pneumococcal conjugate vaccines.
- ▶ Investment funds, for example, The Global Health Innovative Technology Fund.
- ▶ Front-loading, for example, International Finance Facility for Immunisation (IFFIm).
- ▶ Debt-swaps/buy-downs, for example, Global Fund's Debt2Health.
- ▶ Levies, for example, UNITAID's airline tax.

health systems responses for NCDs globally.⁶ Currently, there is a gap in financing NCDs both at the domestic and global level. Innovative financing and impact investing are proposed as solutions to augment domestic and global financing for health systems responses to NCDs.

WHO defines innovative financing as new or non-traditional sources for raising funds for health and approaches that aim to improve the efficiency of available resources.⁷ Innovative financing is suggested to raise funds to supplement domestic resources and traditional development assistance, modify the design of existing financing instruments and to mobilise private sector contributions and voluntary or philanthropic contributions.⁷ For global health, there are several innovative financing 'mechanisms' (Global Fund, GAVI, UNITAIDS) used to pool, manage and invest funds and several innovative financing 'instruments' (social impact bonds (SIBs), advance market commitments, investment funds, front-loading, debt-swaps, levies) used to mobilise new funds (box 1).⁸

SIBs are an innovative financing instrument used for impact investing, which have been promoted by WHO.⁹ SIBs are defined as contracts where private investors provide the initial capital to fund an intervention, and governments reimburse those investors^{10 11} (see box 2 on examples). Several national governments, including those of Israel and New Zealand, have developed or expressed interest in developing SIBs for funding the prevention of diabetes, mental health, asthma and other chronic diseases.¹² However, there are few peer-reviewed studies on the use of SIBs for financing the prevention of NCDs.

To date, published studies have focused either on pay for success contracts in the USA,¹³ or on SIBs for the non-health sector,^{14 15} but not on the application and performance of SIBs used to finance NCDs.^{16 17}

This scoping review aims to address the research question on the evidence available for the key characteristics and performance of SIBs implemented worldwide for financing NCDs. First, we create a unique database of all SIBs implemented for NCDs. This provides a comprehensive synthesis of the key characteristics of these projects and their performance. Second, we explore which SIBs

Box 2 Examples of social impact bonds

The first social impact bond (SIB) originated in 2010,⁷¹ to finance a prisoner rehabilitation project in Peterborough Prison in the UK.⁷² The first SIB for health was launched in the United States in 2013 (by Social Finance USA and Collective Health) and financed interventions to reduce chronic asthma in low-income children residing in Fresno, California.

According to the most recent Social Finance SIB database, 138 SIBs have been implemented in 25 countries, with US\$441 million capital raised.⁷³ Despite the existence of SIBs financing responses to non-communicable diseases, there has not been a study tracking the evidence available of their key characteristics and performance.

The academic literature on SIBs is relatively new and has a growing interest, evidenced by the increasing number of publications from 2011 to 2019.⁷⁴ According to a bibliometric analysis, only 3 individual articles appeared in 2011 while 17 appeared in the first half of 2019.⁷⁴ With regard to research design, commentaries represent almost half of the studies on SIBs in the academic literature.⁷⁴ However, economic analyses,^{75 76} single case studies⁷⁷ and landscape analyses¹⁶ are also present.⁷⁴ The themes commonly explored are the benefits and challenges of SIBs. The key benefits explored include enhancing corporate governance, accountability, quality and monitoring through the method of shared incentives.⁷⁴ Furthermore, the ability to provide resources to scale up evidence-based preventive programmes is also an identified potential benefit.⁷⁴ Challenges are often cited as private investors' influence in public service provision, risk of 'gaming' or 'cream-skimming' and complexity in terms of the number of stakeholders, monitoring, designing and implementing SIBs.⁶⁷

for NCDs are currently not disclosing key characteristics or meeting their target outcomes.

METHODS

We conducted a scoping review in order to synthesise the evidence of the key characteristics and performance of the implemented SIBs for NCDs, in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses scoping review checklist.¹⁸ This scoping review also used methodology papers as a guide.¹⁹ We used a scoping review methodology to map the SIBs for NCDs as the field is nascent, publication themes are widely scattered, and 'conventional searches of academic databases are less likely to be fruitful'.²⁰ It was not appropriate or possible to involve patients or the public in the design, conduct, reporting or dissemination plans of our research.

Data source

Data were gathered from both the academic literature and grey literature in order to be comprehensive, given the nascent field, and were complemented by key-informant knowledge. The search of the academic and grey literature was set from 2002 to 2020 since the innovative financing discourse emerged in 2002 with the International Conference on Financing for Development in Mexico. Databases were MEDLINE (Ovid), PubMed/NCBI, Elsevier (Scopus), Cochrane Library, Google,

Google Scholar, WHO publications and OECD iLibrary. The most recent search was in December 2020.

We included grey literature (particularly conference presentations and studies) to mitigate publication bias,²¹ and ensure that the validity of the scoping review was not adversely affected.²² Other grey literature sources included reports, briefs, brochures and webpages of the stakeholders (investors, evaluators, service providers, intermediaries, outcome payers), conference papers and presentations and SIB databases.

Key informant knowledge was an additional and supplementary data source to confirm data, particularly in relation to performance which was often unclear or not stated in the literature. This was obtained through emails. Purposive sampling was used as key informants were selected for their knowledge and experience of the existing SIBs for NCDs. Emails of key informants were obtained through Google searches and webpages of service providers, investors, evaluators or intermediaries. The Community Fund, Social Finance United Kingdom, Social Finance USA, Social Impact Investment Foundation, Collective Health, Mental Health and Employment Partnership, Social Finance Israel, Bridges Fund Management, Traverse, MaRS Centre for Impact Investing, SROI Network Japan and Instiglio were contacted.

Search strategy

Search terms were: 'social impact bond*', 'pay for success bond', 'pay for success', 'impact investing', 'health impact bond*', 'impact bond*', 'global health bond*', and the individual names of the SIBs for NCDs inductively induced from preliminary searching and a literature review in the early stages of research. These names were: Canada's Community Hypertension Prevention Initiative SIB, NSW's Resolve SIB, Fresno's AIM4Fresno SIB, Newcastle's Ways to Wellness SIB, Haringey Staffordshire and Tower Hamlets' Mental Health Employment Partnership SIB, Devon's Healthier Devon SIB, Netherlands' Cancer and Work SIB, Israel's SIB, Kobe's SIB, Auckland's SIB and Hachioji's SIB.

The key published and grey literature sources were identified through the search terms then screened via abstract and title for relevancy and their eligibility to the inclusion and exclusion criteria. The inclusion and exclusion criteria for the included studies and the approach used for data charting and extraction is presented in box 3.

To make the investments comparable across SIBs, initial capital extracted in local currency was converted to 2019 US dollar, via the Federal Reserve Bank's annual foreign exchange rates,²³ and adjusted for inflation via Consumer Price Index data from the World Bank.²⁴ The launch dates obtained from Social Finance UK's and University of Oxford Government Outcome Lab's databases, confirmed by a third data source (a report from the outcome payor or investor), was used as the base year in the calculation. Launch dates in historical order for the Fresno, Newcastle, Israel, Haringey Staffordshire

Box 3 Inclusion criteria, data charting and data extraction for the review

In order for inclusion in the review, papers or grey literature needed to focus on a social impact bond already implemented for financing non-communicable diseases (NCDs), as detailed in online supplemental appendix table 1. The NCDs or associated risk factors that were eligible for inclusion were: cardiovascular diseases, cancer, diabetes, respiratory diseases, mental health, hypertension, obesity/overweight, hyperglycaemia, hyperlipidaemia, poor diet, physical inactivity, tobacco and harmful use of alcohol. These factors were chosen because they were the leading behavioural and metabolic risk factors or main NCDs outlined by WHO.² Social impact bonds were defined as contracts where private investors provide the initial capital to fund an intervention, and governments reimburse those investors.¹¹

Exclusion criteria were social impact bonds still in a development phase, in the non-health sectors, without sufficient outcome or performance data, still in the early synthesis or advisory phase, or reported in languages other than in English. Grey literature types that were eligible were conference papers or presentations, reports, working papers, policy briefs, theses and affiliated webpages of intermediaries, service providers, investors, evaluators or outcome payers. We did not exclude any article or study based on methodology, in order to be comprehensive given the nascent field of social impact bonds (SIBs).²⁰ This scoping review excluded pay for success and development impact bonds due to their differences to SIBs. This scoping review included all SIBs for NCDs listed on both the two major SIB databases: Social Finance database and University of Oxford's Government Outcomes Lab, which tracks all SIBs implemented globally.

Data charting and extraction

Data were extracted from the databases to a Microsoft Word table with columns: name, cause and intervention, initial capital raised, investors, the outcome payer, financial terms (target outcomes tied to payment, rate of return for investors, maximum outcome payment, fixed coupon), service provider, intermediary, evaluator, performance against predefined outcomes, author and limitations.

For grey literature, data extracted were verified by two or more separate grey literature sources to ensure accuracy and decrease affiliation bias. Social impact bonds were categorised as 'meeting their targets' if their actual outcome achieved, based on the latest performance data, was higher or equal to the target outcome.

and Tower Hamlets, Canada, Auckland, NSW, Hachioji, Kobe, the Netherlands and Devon SIBs were, respectively, 1 November 2013, 1 March 2015, 28 March 2016, 1 April 2016, 28 October 2016, 1 February 2017, 1 May 2017, 1 May 2017, 3 July 2017, 1 November 2017 and 1 June 2018. Purchasing power parity, or converting to international dollars, was not used since the SIBs analysed were launched in HICs, therefore, have relatively stable local prices and are less likely to have an absence of local costing data, high rates of inflation, or fluctuating market exchange rates that might affect the conversion.²⁵ Using US dollars as the output currency is more widely understood and familiar with many individuals, including policy-makers who might be seeking to implement an SIB.²⁵

Critical appraisal

Grey literature was critically appraised via the authority, accuracy, coverage, objectivity, the date and significance

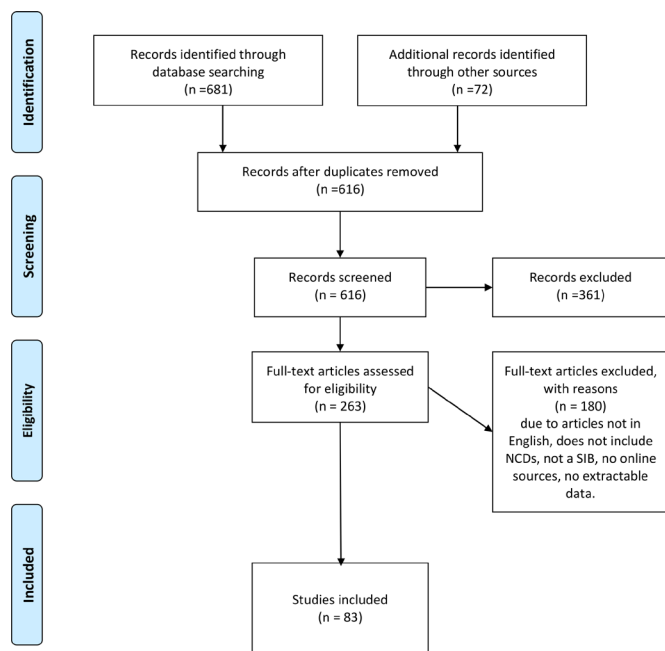


Figure 1 PRISMA flow diagram for the scoping review process.⁷⁸ SIB, social impact bonds; NCD, non-communicable disease; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

(AACODS) checklist, developed by Jessica Tyndall (Flinders University).²⁶ AACODS checklist is designed to evaluate authority, accuracy, coverage, objectivity, the date and significance of the grey literature sources.²⁶

The Joanna Briggs Institute Critical Appraisal Checklists (for Systematic Reviews and Research Syntheses, Qualitative Research, Quasi-Experimental Studies, Text and Opinion) were also used.²⁷

Synthesis of results

Based on past scoping reviews and methodology guides, data were synthesised in two ways. First, through basic numerical analysis and second through thematic organisation based on each key characteristic of the SIBs.

RESULTS

The selection of studies is shown in figure 1. From a pool of 681 articles from the databases of MEDLINE (Ovid), PubMed/NCBI, Elsevier (Scopus), Cochrane Library, WHO publications, OECD iLibrary and 72 articles obtained from Google and Google Scholar, 83 articles were included in the scoping review.

Characteristics of selected studies

There were 83 articles eligible for inclusion in the scoping review. From these, 16 articles were published/academic and 67 were unpublished/grey, which confirmed the appropriateness of the scoping methodology including both academic and grey literature searches. The articles covered 11 SIBs implemented, which were in alphabetic order: Auckland's Mental health and Employment, Canada's Community Hypertension Prevention Initiative

(CHPI), Devon's Healthier Devon, Fresno's AIM4Fresno, Hachioji's Bowel Cancer Screening, Haringey, Staffordshire and Tower Hamlets' Mental Health Employment Partnership (MHEP), Israel's Type 2 Diabetes Prevention, Kobe's Preventing Severe Diabetic Nephropathy, Newcastle's Ways to Wellness, Netherlands Cancer and Work, and New South Wales' (NSW) Resolve.

Of the published/academic sources, half (8/16) of articles were published in 2019 or 2020, reflecting the nascent field. Half of these were authored in the United States (4/16) and Italy (4/16), while the other half were authored in Japan, Australia, the UK and Canada. Newcastle's Ways to Wellness had the most published articles (7/16), behind Fresno's AIM4Fresno (6/16), Canada's CHPI (5/16), Israel (5/16), Haringey, Staffordshire and Tower Hamlets' MHEP (5/16), compared with NSW, Auckland and Hachioji SIBs which only had three articles each. While, Devon, Netherlands and Kobe SIBs only had one published article each. In terms of methodology in the published articles, half of all articles were reviews, two were qualitative analyses, two were quantitative analysis, two were perspectives, while there were only one book chapter and one conference paper published.

Of the unpublished/grey literature sources, the most common methodologies used were stakeholder reports (from intermediaries, evaluators, outcome payers, investors or commissioners of the SIBs) and online databases (Social Finance and University of Oxford's Government Outcome Lab). Brochures and websites of the stakeholders represented a fifth of unpublished sources (15/67), while news releases (5/67), presentations (3/67), briefs (3/67), fact sheets (3/67), a book chapter (1/67), a conference paper (1/67) and webinar (1/67) were less common unpublished sources.

Critical appraisal within sources of evidence

AACODS checklist²⁶: see online supplemental appendix.

Cause and interventions of SIBs for NCDs

A summary of the key characteristics of all the SIBs for NCDs is in table 1. All SIBs for NCDs were in high-income countries.

The SIBs for NCDs addressed a wide range of NCDs or associated risk factors; however, they all used a non-medical intervention which focused on prevention. Three SIBs focused on diabetes, two SIBs on mental health and two SIBs on cancer, while the rest of the SIBs had a different NCD focus including hypertension, asthma, long-term conditions and mental health. The majority were launched from 2016 to 2018 (9/11; 82%), however, all were launched from 2013 onwards. Canada, Kobe, Israel, Devon and Fresno's SIBs all used health education in their interventions to guide participants towards reducing their risk of hypertension, diabetic nephropathy, type 2 diabetes and asthma. Canada's SIB intervention involved an online health learning platform with support from dietitians and personal health coaches, membership to health and fitness centres and

Table 1 A summary of the key characteristics of all the SIBs for NCDs

Name	Cause	Intervention	Financial terms	Service provider	Intermediary	Outcome payer	Evaluator
Canada's Community Hypertension Prevention Initiative	Hypertension	Online health learning platform with support from dietitians, personal health coaches, membership to health and fitness centres.	6.7% return if targets are met. \$C4 million maximum outcome payment. Fixed coupon of \$C1 million.	Heart and Stroke Foundation	MaRS Centre for Impact Investing	Public Health Agency of Canada	Social Research and Demonstration Corporation
Fresno's Asthma Impact Model (AIM4Fresno)	Chronic asthma	In-home care initiatives and education to reduce exposure to indoor environmental asthma triggers.	8.2% return by 2015 return if targets are met. Undisclosed maximum outcome payment.	Central California Asthma Collaborative and Clinica Sierra Vista	Social Finance USA and Collective Health	Undisclosed.	Ian Duncan at The University of California, Santa Barbara
Newcastle's Ways to Wellness	Long-term conditions	Community-based social prescribing which included identifying health and well-being goals and increasing access to community and voluntary groups and resources with a non-medical link worker.	1.38 times the initial investment return if targets are met. £8.2 m maximum payment.	First Contact Clinical Mental Health Concerns, HealthWORKS Newcastle, Changing Lives.	Bridges Fund Management	Cabinet Office Social Outcomes Fund and the Newcastle West Clinical Commissioning Group (CCG).	The Institute of Health and Society at Newcastle University
Haringey, Staffordshire and Tower Hamlets' Mental Health Employment Partnership	Mental health	Individual placement support service model and principles, where an employment advisor is embedded in local mental health professional teams.	8% return return if targets are met. £ 2.9 million maximum outcome payment.	Twining Enterprise, Making Space, and Working Well Trust	Social Finance UK	Cabinet Office Social Outcomes Fund, Haringey Council and CCG, Tower Hamlets CCG, Staffordshire County Council and CCGs, and Commissioning Better Outcomes Fund	Commissioning Better Outcomes Fund Evaluation, by Ecorys and Answer the Question (ATQ) Consultants
New South Wales' (NSW) Resolve	Mental health	Recovery-based community support programme, encompassing intensive residential care and support at Resolve centres with peer-workers, collaboration with clinical services in Local Health Districts.	7.5% per annum return if targets are met. \$A23.9 million maximum outcome payment. 2% per annum fixed coupon	Flourish Australia (also known as RichmondPR).	Social Ventures Australia	Government of NSW, Ministry of Health acting through the Health Administration Corporation (HAC).	Urbis
Hachioji's SIB	Colorectal Cancer	Machine learning or artificial intelligence to make recommendation on Hachioji City residents to undergo colorectal cancer screened.	Undisclosed return. ¥9 762 000 maximum outcome payment.	Cancer Scan	k-three	Hachioji City	Tokyo Institute of Technology, Cancer Scan and University of Tokyo

Continued

Table 1 Continued

Name	Cause	Intervention	Financial terms	Service provider	Intermediary	Outcome payer	Evaluator
Kobe's SIB	Preventing severe diabetic nephropathy	A 6-month project on health and dietary guidance to high-risk individuals.	5% return if targets are met. ¥34.06 million maximum outcome payment.	Disease Prevention Program (DPP) Health Partners	Social Impact Investment Foundation	Kobe City	Institute for Future Engineering
Netherlands Cancer and Work Health Impact Bond	Cancer	Intensive programme of physical and mental exercise at home and at work.	Maximum outcome payment: €0.77M. 10% interest per year.	ArboNed (occupational health and safety service). Re-turn (reintegration agency)	Undisclosed	De Amersfoortse (insurer)	Organisation for Applied Scientific Research (TNO) and Tilburg University
Devon's Healthier Devon	Diabetes	A 2-year lifestyle behavioural change (exercise and diet/nutrition) programme for high-risk prediabetics.	Maximum outcome payment: £774 068 Total £657 068 to the National Lottery Community Fund. £117 000 to Devon County Council.	Westbank Community Health and Care (Devon based charity).	No intermediary, used Westbank for coordination.	Devon County Council and Commission Better Outcomes Fund	University of the West of England.
Israel	Diabetes	Personalised intervention of lifestyle changes (motivational, nutritional, technological and physical activity).	Maximum outcome payment: undisclosed.	B-well	Social Finance Israel	Israeli Health Maintenance Organisations (Clalit and Leumit) and the National Insurance Institute	Social Finance Israel
Auckland Mental Health SIB	Mental health	Holistic service for those with mental health conditions to find and sustain employment, through support and screenings.	9% maximum return for class A (lower risk), 17% for class B (higher risk).	Advanced Personal Management (APM) Workcare.	Undisclosed	New Zealand Ministry of Social Development.	Undisclosed

NCD, non-communicable disease; SIB, social impact bond.

'optimum points' (for groceries, retail, gas) to incentivise and reward healthy behaviours.²⁸ Fresno's SIB involved education alongside in-home care initiatives to reduce exposure to indoor environmental asthma triggers.^{29 30} These included cleaning carpets, removing dust, mould and pests, suggesting behavioural changes (not smoking), and monitoring medication compliance.^{31 32} Kobe's SIB used a 6-month project on health education and guidance to high-risk individuals, who had not attended medical check-ups or who had discontinued treatment for colorectal cancer.^{33–35} The Israel and Devon SIBs, both aiming to prevent type 2 diabetes, also used education on behavioural and lifestyle changes through exercise, diet, nutrition and motivation.^{36 37}

The number of participants in the SIBs for NCDs interventions was relatively small, with only a target of 100 participants in Kobe,^{38 39} 200 in Fresno's pilot stage (3000 for extension),²⁹ 450 in MHEP, 500 in Canada's pilot stage (7000 for total),^{28 40} 530 in NSW,^{41 42} 1200 in Hachioji,⁴³ 2259 in Israel,³⁸ 1700 in Auckland,^{38 44} 140 in the Netherlands⁴⁴ and a slightly larger target for Newcastle with 11 000 participants.⁴⁵ The number of participants in Devon's SIB was undisclosed. Although many articles and studies stated the justifications of the SIBs for NCDs, from government savings, prevalence, mortality, to costs of inaction; very few SIBs stated their evidence base for the effectiveness of their intervention and use of an SIB. Only three SIBs stated their interventions were evidence based: Newcastle using social prescribing, MHEP using Individual Placement Support, Fresno removing environmental triggers for asthma. Canada, NSW, Hachioji, the Netherlands, Auckland, Devon, Israel and Kobe's SIBs did not refer to any previous evidence for their interventions or SIB. All of these interventions were delivered by either not-for-profits (MHEP, Canada, NSW, Newcastle, Devon, Fresno) or private for-profit companies (Israel, Kobe, Netherlands, Auckland, Hachioji).

Initial capital and investors

Investment ranged from the lowest amount at US\$82 801 for Hachioji's SIB,^{38 43} to the highest at US\$5 500 493 for NSW's SIB.⁴¹ The average initial investment by private investors was US\$2015 456. Impact investment companies represented the most common type of investor (9/11), behind high worth individuals (4/11), foundations (3/11), philanthropic funds (3/11), major banks (3/11) and insurance companies (2/11). The specific names and types of investors are available in [table 2](#). Few investors were anonymous or undisclosed to the public (2/11). Kobe's investment amount was inconsistently reported in different source documents, with the University of Oxford's Government Outcome Lab stating ¥26 200 000,⁴⁶ published articles leaving the investment amount blank,⁴⁷ and SIIF indicating ¥31.15 million.³⁹ Therefore, a key informant had to be contacted to confirm the amount.

The total number of investors per SIB was more often unknown due to anonymity or disclosure. However, a single

investor providing the investment was not uncommon (4/11).^{48–51} The potential advantage of being a single investor of an SIB is explored in one published article as mitigating problems in contract management.¹⁷ According to this quantitative analysis, intuitional investors are more likely interested in SIBs that guarantee better financial conditions and a limited number of stakeholders.¹⁷

Financial terms

The target outcomes that trigger payment for the SIBs for NCDs were either health-based, service-based or participation-based outcomes. The majority of SIBs for NCDs used two or more target outcomes (9/11; 82%) while NSW only used one target outcome, a 25% cumulative reduction in health service use (National Weighted Activity Weights or NWAU) compared with control group which was used as a proxy for hospital admissions.^{41 42}

According to data extracted from grey literature articles, the internal rate of return for investors, maximum outcome payments, fixed coupon and structure of SIB is detailed in [table 3](#). The returns for meeting targets were stated as 5% (Kobe), 6.7% (Canada), 7.5% (NSW), 8% (MHEP), 8.2% (Fresno), 9%–17% (Auckland), 10% (Netherlands), 1.38 times the initial investment for Newcastle or undisclosed (Hachioji, Devon Israel). Although a higher return was possible for all if they had achieved higher performance. For instance, NSW investors could receive a 37.5% return for an 11.2% reduction of their outcome.⁴² However, no other SIB fully disclosed the return to investors when outcomes are lower or higher than the target amount. Similarly, MHEP's SIB was the only one that disclosed the direct cost of designing their SIB, which was £150 000 obtained by a grant from their outcome payer, Commissioning Better Outcomes Fund.^{52 53}

The structures of the SIBs were predominately direct (5/11; 45%), meaning the service provider contracted with the outcome payer; however, an intermediated structure (2/11) or undisclosed structure were also used (4/11). An intermediated structure uses a special purpose vehicle (SPV) like the two SIBs from the UK, (Newcastle and MHEP), which created Wellness Limited and Health and Employment Partnership, respectively, as their SPV.^{51 52} The SPVs operate as the prime contractor, supervising the service providers and become a subsidiary created by a parent company to isolate financial risk.

The local or state government was the outcome payer for 7 SIBs for NCDs out of the 11 analysed. Canada's CHPI and Auckland's SIB were the only ones analysed where a federal government was the sole outcome payer, through the Public Health Agency of Canada and New Zealand Ministry of Social Development, respectively.⁵⁴ MHEP, Newcastle and Israel SIBs were distinct in that they had multiple outcome payers.^{33 34 45 49 50 55} Moreover, the majority of SIBs had impact investment companies as intermediaries, with Social Finance representing three of these.^{29 34 35} However, Auckland and the Netherlands did not disclose their intermediaries.

Table 2 The investment of each SIBs for NCD, by type, name, amount in 2019 US dollars and local currency

SIB	Investor type	Investor names	Investment/initial capital (expressed in 2019 US dollars)	Investment/initial capital (expressed in local currency)
Canada's Community Hypertension Prevention Initiative	Foundations, individuals, institutional investors (insurance, investment, or venture capital companies)	QBE Insurance Group, RBC Generator, TELUS Ventures, Bealight Foundation, J.W. McConnell Family Foundation, Max Bell Foundation, Mindset Foundation, Catherine Donnelly Foundation, Doboto, Frederik Hyndman, Illumina Partners, Andrew Cockwell, Ian Cockwell, and Guy M. Beaudin. ^{28 38 79}	US\$2 308 224	\$C2 900 000. ^{68 79–81}
Fresno's Asthma Impact Model(AIM4Fresno)	Private foundation	California Endowment	US\$1 207 185 for the extension. US\$724 311 for the pilot	US\$1 100 000 for extension. ^{32 82} US\$660 000 for pilot. ^{30 82 83}
Newcastle's Ways to Wellness	Institutional investor (impact investment company)	Bridges Funds Management. ^{49–51}	US\$2 735 666	£1 650 000. ^{49 50}
Haringey, Staffordshire and Tower Hamlets' Mental Health Employment Partnership	Institutional investor (leading social investment company in the UK)	Big Issue Invest. ⁴⁸	US\$605 207	£400 000. ^{48 52 53}
New South Wales' (NSW) Resolve	High net worth individuals, foundations, institutional investors (superannuation companies)	NGS Super, Grosvenor Pirie Super, anonymous individuals and foundations. ^{41 42 84–86}	US\$5 500 493	\$A7 000 000. ^{41 42 84–86}
Hachioji	Institutional investors (impact investing company, venture capital firms, major bank)	Social Impact Investment Foundation (SIIF), Digisearch and Advertising and Mizuho Bank. ^{43 56}	US\$82 801	¥8874 000. ^{38 43}
Kobe	Institutional investors (impact investing company, major bank) and individual investors.	SIIF, Sumitomo Mitsui Banking Corporation and anonymous individual investors. ⁴⁶	US\$286 609	¥31 140 000
Netherland's Cancer and Work	Institutional investors (bank, venture philanthropy fund).	ABN AMRO Social Impact Fund. Start Foundation.	US\$775 513	€0.64 million capital raised
Devon	Institutional investor (impact investment company).	Bridges Fund Management	US\$1 421 209	£1.047 million
Israel	Intitutional investors (investment funds, bank, philanthropic funds), individuals, software technology company. All coordinated by the Union Bank of Switzerland (UBS Banking).	Bank Hapoalim; the family philanthropic fund of Copaxone inventor Professor Ruth Arnon and her husband, Dr Uriel Arnon; former Teva CEO Israel Makov; French fund Pharmadom; the Rashi Foundation; Gandy Investments; Vital Capital Investments LP; a Canadian investment fund; Beyond Family Office; Check Point Software Technologies (Nasdaq: CHKP) cofounder Marius Nacht's AMoon investment fund; Boaz Raam; and Alon Piltz.	US\$5 388 396	19.4 million Shekels
Auckland	Social care and employment organisation, pharmaceutical company, investment fund, private philanthropic fund	Advanced Personal Management (APM) Workcare. Janssen. Prospect Investment Management Limited. Wilberforce Foundation.	US\$1 134 402	N\$1.5 million. ⁸⁷

NCD, non-communicable disease; SIB, social impact bond.

Table 3 The financial terms of the SIBs for NCDs

SIB	IRR if targets are not met	IRR if targets are met	IRR if targets are exceeded	Max outcome payments (from outcome payer to service provider and to investor)	Fixed coupon	Type of social impact bond structure
Canada's Community Hypertension Prevention Initiative	Undisclosed.	6.7%	8.8%	\$C4 million. ^{54 79}	\$C1 million payment guarantee.	Direct.
Fresno's Asthma Impact Model (AIM4Fresno)	Undisclosed.	5.9% return by 18 months and 8.2% by 2015. ⁴⁶ US\$3M principal+interest repaid to bond investors. ⁸⁵	Undisclosed.	Undisclosed.	Undisclosed.	Undisclosed.
Newcastle's Ways to Wellness	Undisclosed, 'the multiple could be much lower and conceivably all investment could be lost.' ⁵⁰	The investor, Bridges Ventures will receive 1.38 times the initial investment. ⁵⁰	Undisclosed.	£8.2m. ⁵⁰	No.	Intermediated.
Haringey, Staffordshire and Tower Hamlets' Mental Health Employment Partnership	Undisclosed.	8%. ^{52 53}	Undisclosed.	£ 2.9 million. ^{52 53}	No.	Intermediated.
New South Wales' (NSW) Resolve	6.70%, 5.7%, 4.2%, or 0.3% for a 22.5%, 20%, 17.5% or 15% NWAU reduction respectively. <15% NWAU reduction means no ROI.	7.5% per annum. ⁴¹	Depends. 8.4%, 9.1%, 10%, 10.7% or 11.2% for a National Weighted Activity Unit (NWAU) reduction of 27.5%, 30%, 32.5%, 35%, or 37.5% respectively.	\$A23.9 million. ^{85 88}	2% per annum fixed coupon over the first 4.75 years of the bond. ⁴¹	Direct.
Hachioji's Colorectal Cancer Screening	Undisclosed.	Undisclosed.	Undisclosed.	¥9 762 000. ⁽³⁹⁾	No.	Direct. ⁴³
Kobe's Preventing severe diabetic nephropathy	Undisclosed.	5%. ³⁹	Undisclosed.	¥34.06 million. ⁸⁹	No.	Direct. ³⁹
Netherlands' Cancer and Work	Undisclosed.	10% interest per year. ⁹⁰	Undisclosed.	€0.77 million. ⁹⁰	Undisclosed.	Undisclosed.
Devon	Undisclosed.	Undisclosed.	Undisclosed.	£774 068 (£657 068 to the National Lottery Community Fund. £117 000 to Devon County Council.)	Undisclosed.	Undisclosed.
Israel	Undisclosed.	6.5%.	Undisclosed.	Undisclosed. ⁹¹	Undisclosed.	Direct. ⁸²
Auckland	Undisclosed.	9% maximum return for Class A (lower risk), 17% for class B (higher risk). ³³	Undisclosed.	Undisclosed. ⁹²	Undisclosed.	Undisclosed.

IRR, internal rate of return; NCD, non-communicable disease; ROI, return on investment; SIB, social impact bond.

Evaluation and measurement of performance

The evaluations of the SIBs were heterogeneous in terms of the methodologies used: validated administrative data (n=3), quasi-experimental using propensity score matching (n=2), randomised control trial (n=1), qualitative study (n=1) and four undisclosed. They were also heterogeneous with respect to the type of evaluator. Five used a university-based evaluator and four used a private or independent corporation while Israel and Auckland did not disclose their evaluator. However, notably, other than Hachioji,⁵⁶ no SIB for NCDs disclosed their evaluation study in the published literature. The performance of the target outcomes was scattered in the grey literature in stakeholder reports or media releases. For instance, Canada's results came from its service provider's website,⁵⁷ Newcastle's came from its service provider's news release,⁵⁸ Fresno's came from its intermediary webinar,^{59 60} MHEP's came from its investor's report,⁶¹ NSW's came from an investor and evaluator report^{41 42} and Kobe's and Hachioji's came from key respondents from the investor. However, even the published evaluation study in 2020 on Hachioji's SIB had several limitations. Namely, it analysed only one of its three outcomes, there was a conflict of interest of a researcher's previous employment with the service provider, and the performance data were inconsistent with the evidence of a key respondent from the investor. Furthermore, although Newcastle had a published study,⁶² it evaluated its intervention of using link workers to socially prescribe, and did not report SIB target outcomes. Therefore, results were obtained from the 'Ways to Wellness' media release.⁵⁸ The Netherlands, Auckland, Israel and Devon SIBs did not publicly disclose their performance.

As detailed in table 4, only 3 SIBs out of 11 (27%) are meeting all targets; Newcastle's Ways to Wellness,⁵⁸ Staffordshire's MHEP,^{33 61 63} and Fresno's AIM4Fresno.⁵⁹ While three other SIBs are only meeting some targets, one is well below target and four have not disclosed their performance. The common characteristics of the SIBs meeting target outcomes were: an evidence-based intervention, multiple service providers and an intermediated SIB structure. There was no clear relationship between the amount of investment and the SIBs meeting all their current target outcomes.^{48–50 52 53} Nonetheless, the majority of SIBs for NCDs are still ongoing projects and performance could change, so common characteristics should be considered tentative. For example, Canada's SIB performance is only from phase 1,⁵⁷ and NSW's is from the first and second year in a 7.75-year project, however, recent results have triggered a review for possible termination.⁴²

DISCUSSION

There are few studies on the use of SIBs for NCDs and this limits the ability to draw conclusions on their effectiveness due to limited sample size, limited amount and quality of studies, and methodology constraints.

The review identified several shared features of the SIB studies. First, the amount of private investment into the SIBs for NCDs was relatively small as a proportion of the total health expenditure on NCDs. Second, there was potential for high transaction costs stemming from administrative, intermediary, and legal costs which were borne solely by the service provider or government. This was particularly clear in Kobe's SIB, when the local government was burdened with the project's costs yet did not benefit from a reduction of medical expenditure. Third, the specific amounts of all costs of designing and implementing the SIBs were not present in any articles and studies analysed. Fourth, without any economic evaluation, return on investment analysis, and the disclosed full costs of implementation, the financial value of SIBs over traditional sources of funding could not be verified—a finding echoed by other studies on SIBs.^{51 64} Fifth, not all SIB related data were publicly available—a concern on lack of transparency also raised in earlier studies.^{65 66} The risk of gaming target outcomes to achieve financial incentives identified in previous studies,⁶⁷ also could not be ruled out due to the presence of self-reported outcomes, low rigour, incomparable evaluation metrics and limited public disclosure.

While innovative health financing has been previously suggested to offer the potential to contribute to financing global and national responses to fighting NCDs, our study suggested very limited use of SIBs with limited investment covering a small population. It has been previously noted that large scale expansion of SIBs has been impeded by the challenges 'of replicability across scale' and 'sustainability over time'.⁶⁸ Addressing the identified limitations of SIBs by lowering transaction costs, increasing private investment, choosing more appropriate health-based outcomes, increasing duration and size of the intervention, and increasing transparency could support a more convincing case and expanded the use of SIBs.

Overall, given the lack of public disclosure and limited evidence available of SIBs for NCDs, there is a need for more studies, particularly economic evaluations and qualitative studies. A robust evaluation of the use of SIBs to finance NCD prevention will require greater transparency from SIB stakeholders. Furthermore, the limited use of qualitative studies, (only one exists, for Newcastle's SIB), limits the potential for evaluating and improving the SIBs. For example, interviews of the target population, private investors, not-for-profit service providers and outcome payers could help understand the realities of implementation and how identified limitations could be alleviated or mitigated. It is highly likely that other factors may influence the target outcomes and the ability to attribute the outcomes to the service provision or intervention. These potential influences should be captured in future evaluations of SIBs. Furthermore, there is a need to develop suitable metrics to enable consistent measurement of the performance of SIBs. Independent and consistent evaluation could authenticate

Table 4 The performance of the SIBs for NCDs

Social impact bond	Evaluator	Type of evaluation or measurement	Target outcomes	Performance	Meeting/met targets?	Completed or ongoing?
Canada's Community Hypertension Prevention Initiative	Social Research and Demonstration	Undisclosed.	1. Blood pressure stabilisation 2. Intake volume of 7000 participants over the duration of the project. ^{40 57 80 93}	In phase 1: 1. Average 5 mm Hg reduction in systolic blood pressure. 2. 90% of 500 participants who completed the programme in phase 1. ⁵⁷	Some long-term participant volume outcome target not measured yet.	Ongoing.
Fresno's Asthma Impact Model (AIM4Fresno)	Ian Duncan at The University of California, Santa Barbara. ^{94 95}	Randomised control trial using Medicaid (Medi-Cal) insurance claims data. ^{94 95}	1. ≥30% reduction in asthma-related emergency department (ED) visits 2. ≥50% in hospitalisations. ⁹⁵	1. 81% reduction in asthma-related ED visits 2. asthma-related hospitalisations decreased by 70%. ⁵⁹	Yes Exceeded.	Completed.
Newcastle's Ways to Wellness	The Institute of Health and Society at Newcastle University. ⁶²	Qualitative study using semistructured interviews. ⁶²	1. Improved Well-being Star40 by 1.4 points (self-management of long-term health conditions leading to greater well-being, reduced social isolation and less GP visits) 2. Reduction in for secondary care acute costs by 22% compared with a comparison group. ⁵⁰	1. Average improvement of 3.4 points on the Well-being Star 2. Estimated 45% lower average annual hospital cost for patients compared with the comparison group. ⁵⁵	Yes Exceeded.	Ongoing.
Haringey, Staffordshire and Tower Hamlets' Mental Health Employment Partnership	Commissioning Better Outcomes Fund Evaluation, by Ecorys and Answer The Question (ATQ) Consultants. ^{52 53}	Validated administrative data. ^{52 53}	1. Successful engagement of 450 users (Staffordshire) 2. job entry outcomes (<16 hours/week and >16 hours/week) for 140 (Staffordshire) 3. Job sustainment outcomes (<16 hours/week and >16 hours/week) for 90 (Staffordshire). ⁶³	In 2016/2017 (year 1): 1. 599 individuals were engaged 2. 190 with severe mental illness had paid jobs 3. 91 had a sustained job for more than 6 weeks. ³³ In 2017/2018, 1. Not stated. 2. 172 had paid jobs. 3. Over 84 had a sustained job for more than 6 weeks, and over 40 had a sustained job for more than 6 months. ^{61 63}	Yes for Staffordshire. Undisclosed for Haringey and Tower Hamlets.	Completed.
New South Wales' (NSW) Resolve	Urbis. ^{41 42 96}	Quasi-experimental using propensity score Matching. ^{41 42}	1. 25% cumulative reduction in health service (National Activity Weighted Units/NWU) compared with control group. ^{41 42}	In 2018 (1st year): 1. 12% reduction in NWUAs compared with control group. ⁴¹ In 2019 (2 nd year): 1. 4% cumulative reduction in NWU compared with control group. ⁴²	No.	Ongoing. Under review for possible termination.
Hachioji's Colorectal Cancer Screening	Tokyo Institute of Technology, Cancer Scan and University of Tokyo. ⁵⁶	Validated administrative data. ⁵⁶	1. Increased rate of colorectal cancer screening in residents by 19%. ⁵⁶ 2. Increased rate of precision examination in residents by 87% 3. Increased number of early cancer detection by 11.	1. Cancer screening rate was 26.8%. ⁵⁶ Corrected to 27.2%. 2. Precision examination increased by 82.1% 3. Under investigation.	Some.	Ongoing.

Continued

Table 4 Continued

Social impact bond	Evaluator	Type of evaluation or measurement	Target outcomes	Performance	Meeting/met targets?	Completed or ongoing?
Kobe's Preventing severe diabetic nephropathy	Institute for Future Engineering. ^{93 97}	Questionnaire and quasi-experimental methods via propensity score matching. ^{39 46 97 98}	1. 80% rate of programme completion 2. 75% rate of lifestyle improvement; 3. 80% reduction of kidney function deterioration.	1. 100% rate of programme completion 2. 95% rate of lifestyle improvement 3. Under investigation.	Some.	Ongoing.
Netherlands' Cancer and Work	Organisation for Applied Scientific Research (TNO) and Tilburg University.	Undisclosed.	Undisclosed.	Undisclosed.	Undisclosed.	Ongoing.
Devon	University of the West of England.	Validated administrative data.	6 months Reductions in glyated haemoglobin (Hb1Ac) (1.2 mmol); waist size (2 cm); weight (2 kg reduction) 12 months Reductions in glyated haemoglobin (Hb1Ac) (2.4 mmol fall from baseline); waist size (4 cm fall from baseline); weight (3 kg fall from baseline) 24 months Reductions in glyated haemoglobin (Hb1Ac) (1.2 mmol less than baseline measure); waist size (1 cm smaller than baseline); weight (1.5 kg less than baseline). ⁹⁹	Undisclosed.	Undisclosed.	Ongoing.
Israel	Social Finance Israel will perform in-depth data analytics. ¹⁰⁰	Undisclosed.	1. The no of type 2 diabetes cases averted relative to control group as determined by periodic blood glucose tests. 2. The no of healthy states produced relative to control group	Undisclosed.	Undisclosed.	Ongoing.
Auckland	Undisclosed.	Undisclosed.	43% of people that enter employment, and the extent to which employment is sustained, compared with a success rate of 30% in other contracts the government operates. ⁴⁴	Undisclosed.	Undisclosed.	Ongoing.

GP, general practitioner; NCD, non-communicable disease; SIB, social impact bond.

the SIBs' performance and allow comparative analysis. For example, using dimensions proposed by the Taskforce on Innovative International Financing, such as analysing additionality, technical feasibility, sponsor support, fundraising potential and cost,^{69 70} in addition to health outcomes and economic returns could be a possibility.

Limitations

The study has several limitations. Due to the absence of published data, SIB performance was largely obtained from grey literature sources which are not subject to peer-reviewing and do not have the same rigour as published sources. Searching on Google via open text searches may limit reproducibility due to Google's method of filtering results based on location and search history. Grey literature sources were critically appraised via ACCODs checklist to mitigate the risk of bias. Some SIBs had limited transparency in relation to some characteristics, which could affect the validity of the results. The sources on Japan, Kobe, Hachioji, Israel and the Netherlands' SIBs were dependent on the number of English articles. This may offer a possible explanation to why there were slightly fewer articles for those SIBs. The common characteristics of the SIBs which achieved all their target outcomes, were derived from latest performance data. Therefore, a range of confounding or enabling characteristics not analysed in this study could also have contributed to the achievement of target outcomes and future performance could also alter the deduced common characteristics of SIBs meeting their targets. The key informants, who were SIB investors or intermediaries, may also represent a source of bias. However, while there is a risk, we deem it to be relatively low given they confirmed investment amounts which were already in the academic literature but needed to be confirmed by the stakeholders involved in implementing the SIBs. This was conducted to mitigate the lack of certainty and transparency in the SIB field and ensure investment amounts were extracted from multiple sources.

CONCLUSION

This scoping review identified few published studies on SIBs for NCDs. None of the published studies included a cost-effective analysis or comparative analysis to traditional financing sources. Just three of the seven SIBs used for financing NCDs were currently meeting all target outcomes. Conflicts of interest and lack of public disclosure were common issues. There is a need to develop suitable metrics to enable consistent measurement of performance and comparative evaluation of SIBs.

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