



Social and economic policy interventions to address household food insecurity in high-income countries (HIC) and the developing nations of Brazil, Russia, India, China and South Africa (BRICS)

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Social and economic policy interventions to address household food insecurity in high-income countries (HIC) and the developing nations of Brazil, Russia, India, China and South Africa (BRICS) (Protocol)

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[Intervention Protocol]

Social and economic policy interventions to address household food insecurity in high-income countries (HIC) and the developing nations of Brazil, Russia, India, China and South Africa (BRICS)

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ABSTRACT

Objectives

This is a protocol for a Cochrane Review (intervention). The objectives are as follows:

Primary objective

To assess the effects of social and economic policy interventions for reducing the prevalence or severity, or both, of household food insecurity in high-income countries (HIC) and the developing nations of Brazil, Russia, India, China, and South Africa (BRICS).

Secondary objective

To characterise the social and economic policy options, in terms of policy type, actors involved, settings, duration, and target populations.

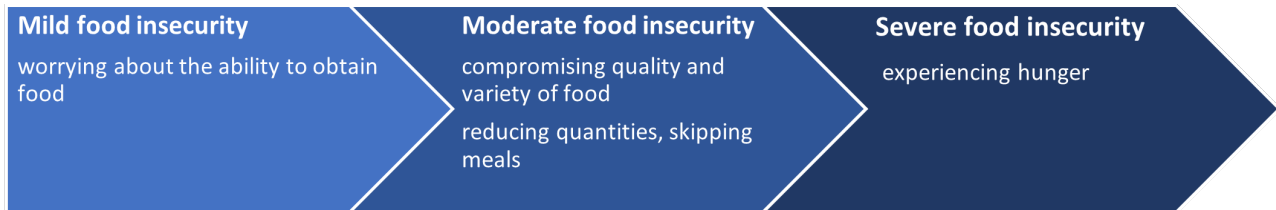
BACKGROUND

Description of the condition

Household food insecurity occurs when there is inadequate access to healthy and affordable food. This experience can include the following: limited dietary variety or inability to eat cultural or nutritious foods (qualitative deprivation); skipping meals or

running low on food (quantitative deprivation); anxiety about food sufficiency (psychological deprivation); and being unable to maintain socially prescribed food norms and behaviours (social deprivation) (Radimer 1990) (see also Figure 1). For many people affected by food insecurity, this experience occurs as a result of financial hardship or crisis; it may be temporary or chronic. In severe circumstances, adults and even children experience hunger in households.

Figure 1. Food Insecurity Experience Scale, adapted from the United Nations Food and Agriculture Organization



Populations that are known to be at an increased risk of household food insecurity in high-income countries includes First Nations peoples (FAO 2013); people seeking asylum and refugees (Mansour 2020); people experiencing homelessness (Easton 2022); remote communities (see Standing Committee on Indigenous Affairs 2020); single-parent families (McKenzie 2019); and people who are unemployed or living on low or insecure incomes, or both (Garratt 2020). Drivers of food insecurity in these populations are varied and can include colonisation, racial discrimination, health inequalities, poverty, and injustices within the modern food system.

The physical and mental health consequences of food insecurity are substantial, including increased risk of depression (Arenas 2019); cardiovascular disease (Vercammen 2019); and malnutrition in all its forms, including obesity (Thomas 2021). Food insecurity is a predictor of health care utilisation (Tarasuk 2015), and infants and children who are impacted experience adverse developmental (Oliveira 2020), educational, and health outcomes (Shankar 2017). The broader societal ramifications include reduced workforce productivity and increased healthcare expenditure, which underscores the need for policies that can drive down food insecurity rates. As the 2030 deadline for the United Nations Sustainable Development Goals approaches and the zero hunger target is not on track to be met (WWHHC 2018), there is a critical need for policies and programmes that effectively tackle food insecurity and help reduce the nutrition inequities that were made worse in the COVID-19 pandemic (HLPE 2020). Figure 1 displays the Food Insecurity Experience Scale, adapted from the United Nations Food and Agriculture Organization (Ballard 2013).

A spectrum of interventions addresses household food insecurity in high-income countries, and whilst these can be population-, setting-, and country-specific, with varied government and non-government actors, they can be broadly categorised as follows. Most obvious are the direct food-provision interventions, such as emergency food programmes, food assistance, and meals. These may be used as a crisis-response (such as natural disasters) or

to mitigate the impacts of chronic food insecurity (such as food pantries) (Bazerghi 2016). Schools and workplaces can provide free or low-cost meals (Cohen 2021), and fruit and vegetable incentive and voucher programmes make nutritious food more accessible (Bartlett 2014; Little 2021).

There are also nutrition-promotion interventions to build skills and confidence to support healthy behaviours, often delivered in healthcare, schools, or welfare settings (Butcher 2021; Holley 2019). Community food security programmes seek multiple and related outcomes (e.g. healthier, localised, and more equitable food systems) (Burns 2010). In some contexts, regional or national food policies also resource, co-ordinate, and monitor these types of food and nutrition interventions and can integrate them as part of larger health promotion or food system efforts, or both, with universal and targeted reach.

The social and economic interventions that affect the determinants of household food insecurity are possibly less obvious. These often sit outside the remit of the public health nutrition workforce and institutions, but are advocated for as mechanisms to address the root causes of food insecurity (Beacom 2021b). They are well-known for their role in addressing health inequities more broadly (WHO 2008), including nutrition inequities (Friel 2015; Nisbett 2022). Affordable housing, fair labour practices, and protective welfare policies affect people’s ability to access, obtain, and use food; it is these types of policy interventions, which are used by governments, that are of interest to the proposed Cochrane Review.

Description of the intervention

Food security is achieved "when all people, at all times, have physical, social and economic access to sufficient safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life" (FAO 2001). According to the United Nations Food and Agriculture Organization (FAO), and widely used elsewhere, food security is commonly described as having four dimensions: access (both physical and economic

access to food); availability (sufficient quantities of nutritious food are available at all times); utilisation (people have appropriate food skills, knowledge, and preparation/cooking facilities); and stability (across the three dimensions and over time).

Systematic reviews of interventions relevant to the dimensions of food security of households have, to date, overlooked the cross-cutting stability dimension. For example, Burns and colleagues are conducting a systematic review of community-level interventions in high-income settings, such as food vouchers and health-promoting food environments (relevant to the access and availability dimensions) (Burns 2010). And in low- and middle-income settings, Duraó and colleagues reviewed interventions to increase food-buying power, alter food prices, and address the social environment to again support access (Duraó 2020). The evidence base for improving food literacy is highly relevant to the utilisation dimension of household food security, and the following reviews evaluate interventions aimed at food insecure populations: Verghese 2019 (nutrition education interventions for supplemental nutrition assistance programme beneficiaries) and Iacovou 2013 (community kitchen programmes).

In terms of the stability dimension, as it is often conceptualised as a cross-cutting dimension, the evidence base, to our knowledge,

is not the subject of a dedicated review. For the purpose of this protocol, we propose that this dimension may be a logical place to organise and investigate social and economic conditions and interventions as determinants of stability, with implications for access, availability, and utilisation dimensions. We also acknowledge that other macro-conditions relevant to education, health, and food policy also contribute to the stability dimension and are vital in ensuring future food security for households and planetary health; however, they are beyond the scope of this review. Two new dimensions of food security, agency (the capacity of individuals and groups to exercise voice and make decisions about their food) and sustainability (the viability of the ecological and social bases of food systems for future generations), have recently been asserted as vital to the conceptualisation of this issue and policy responses (Clapp 2021). These dimensions are also affected by stability and its macro-determinants. The proposed conceptual basis to guide the review, adapted from the FAO's food security dimensions framework and including the two new dimensions, is presented in Figure 2 (the determinants that influence the stability of household food security with implications for dimensions of food access, utilisation, availability, sustainability, and agency).

Figure 2.

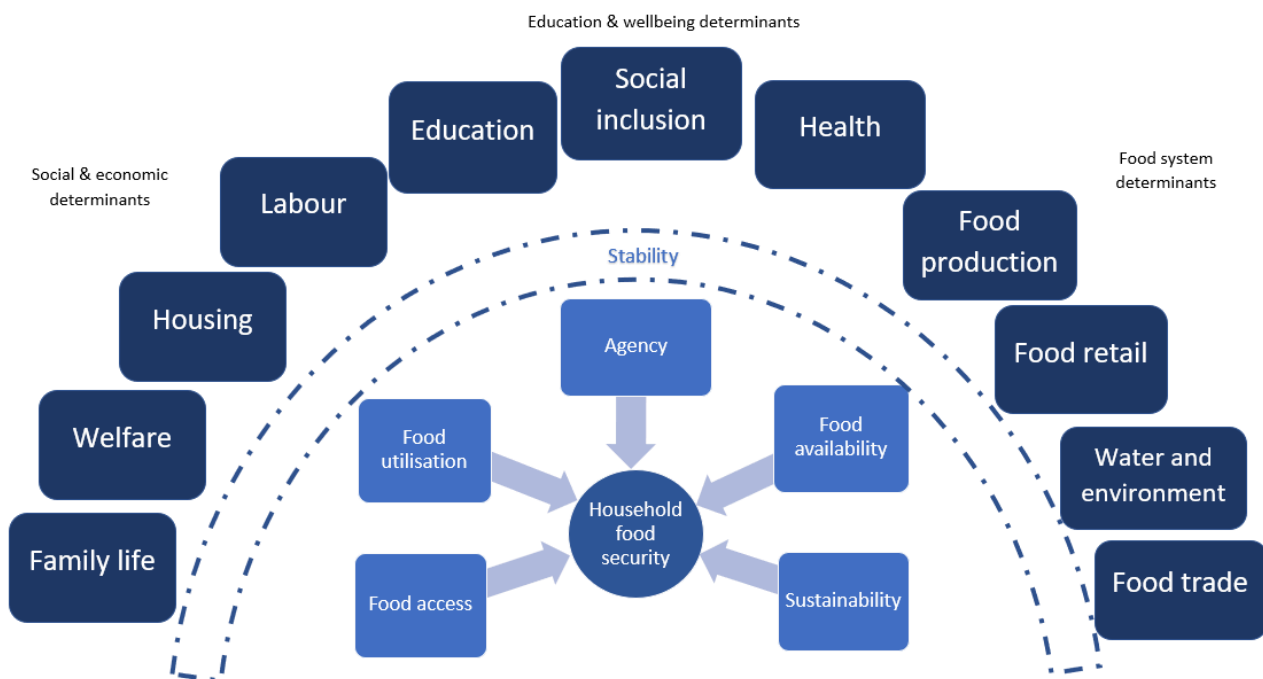


Figure 2. The determinants that influence the stability of household food security with implications for dimensions of food access, utilisation, availability, sustainability, and personal agency

This Cochrane Review will focus on government interventions that can affect the social and economic conditions of households (see Table 1: examples of social and economic policy interventions). These conditions, which promote or inhibit stability as shown in Figure 2, are then hypothesised to support food access,

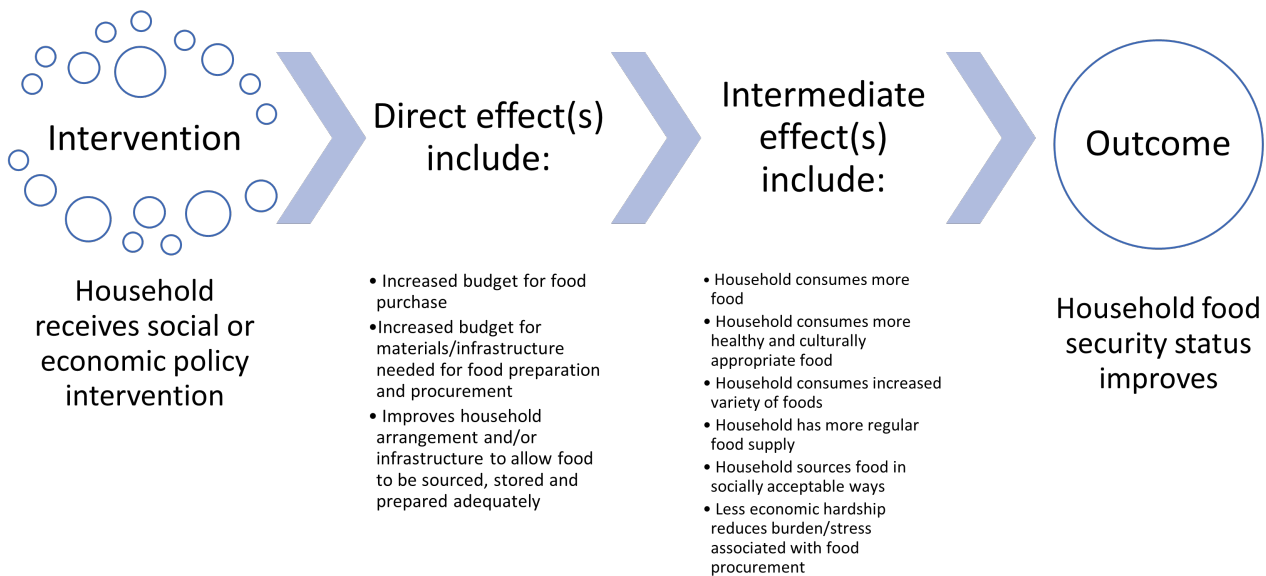
availability, utilisation, sustainability, and personal agency, which ultimately affect household food security status. They are sometimes referred to as nutrition-sensitive interventions and require more emphasis in research, policy, and practice (Friel 2015).

How the intervention might work

Primarily, the interventions affect work conditions and household behaviours, with various implications on health and well-being, including the amount and type of food available to purchase and consume, and thus, household food security (see [Figure 3](#): hypothesised impact pathways of social and economic interventions on household food security status). Labour or income-support interventions can, for example, set a living wage

or basic income, which has implications for the household food budget. Housing improvement or affordability interventions can help ensure adequate kitchen and running water facilities or the ability of people to store and grow food, or both. In short, the interventions would "seek to improve the inequities in the immediate conditions in which people are born, live, work and play, [rather than focussing] on changing individual behaviours in various settings" ([Friel 2015](#)), of which there is already a substantive amount of research.

Figure 3. Hypothesised impact pathways of social and economic interventions on food insecurity



Why it is important to do this review

According to a narrative review ([Loopstra 2018](#)), government-led and -implemented social-protection policy interventions that are both food (such as food stamps) and non-food (such as welfare, pensions, and affordable child care) show the most promise to effectively reduce household food insecurity in high-income settings, which has been a persistent problem for decades. Nutrition and social-protection policies have a long history in the USA, such as the Special Supplemental Nutrition Program for Women, Infants, and Children and the Supplemental Nutrition Assistance Program, and hence, they have been the focus of substantial reviews assessing effects, e.g. on dietary quality ([Andreyeva 2015](#); [Verghese 2019](#); [Zhang 2020](#)). However, as Li and colleagues state, "much less is known about the effects of social policy decisions on problems of food insecurity in welfare states without large-scale public investment in food assistance" ([Li 2016](#)). A systematic review of the evidence base on non-food policy interventions for their effects on household-level food security

has not yet been conducted in high-income and large economies; however, there is work on this from the global south ([Duraao 2020](#)). In the wake of the COVID-19 pandemic, where numbers of food-insecure households were estimated at 30.4 per cent globally (up from 26.6% in 2019 ([FAO 2021](#))), there is a more urgent need than ever to produce the evidence that can help reduce the prevalence and severity of this issue.

OBJECTIVES

Primary objective

To assess the effects of social and economic policy interventions for reducing the prevalence or severity, or both, of household food insecurity in high-income countries (HIC) and the developing nations of Brazil, Russia, India, China, and South Africa (BRICS).

Secondary objective

To characterise the social and economic policy options, in terms of policy type, actors involved, settings, duration, and target populations.

METHODS

Criteria for considering studies for this review

Types of studies

Because of the scale and scope of the interventions of interest (government policies that are typically administered at the population level), our review will include multiple types of study designs. The interventions of interest resemble, or are more akin to 'natural experiments', whereby assessment of the intervention's impact on food security will typically be based on national (or regional/provincial) data before and after the policy intervention. Similar policy reviews included interrupted time series designs, cohort studies, and controlled and uncontrolled before-after designs (McLaren 2016), although a recent food security review included 36 randomised controlled trials and 29 prospective controlled studies (Duraio 2020), so we expect a mix of designs through our search.

Therefore, in this review we will include the following types of studies.

- Randomised controlled trials (RCTs) and cluster-randomised control trials (cRCTs): these are experimental studies in which participants are allocated to different interventions using methods that are random. cRCTs involve randomising in groups (clusters), rather than randomising at the individual level.
- Non-randomised control trials (nRCTs): these are experimental studies that involve allocation of participants to different interventions using methods that are not random.
- Controlled before-after studies (CBAs): these are study designs that include observations made before and after an intervention has been implemented in the intervention and control groups. The investigators do not make the decisions about allocation to the different comparison groups.
- Prospective cohort studies: these are study designs that recruit participants into a cohort before exposure to an intervention occurs. Participants are then followed over a period of time, and outcomes are assessed.
- Interrupted time series (ITS) studies: these are study designs that observe the effects of an intervention at multiple time points before (with a clear point of intervention) and after an intervention. ITS studies will have three or more time points (both before and after the intervention) in order to be included, and the intervention effect will be measured against the pre-intervention trend.

In this review, we will not limit cRCTs, nRCTs, and CBAs to only those that have at least two intervention sites and two control sites. We will, however, note the number of included studies that do or do not comply with the study design inclusion/exclusion advice from the Cochrane Effective Practice and Organisation of Care group (EPOC 2017). Reviews of studies (narrative or systematic) and studies assessing policies that are yet to be implemented will be ineligible.

Types of participants

In this review, we will include all individuals or households exposed to the social or economic policy intervention. We will restrict this review to interventions conducted in high-income countries as informed by the World Bank's definition of high-income (data.worldbank.org/country/XD), and large economies: i.e. the BRICS group (Brazil, Russia, India, China, and South Africa) (datatopics.worldbank.org/world-development-indicators/stories/services-drive-economic-growth.html).

The BRICS group are important country settings to include in this review for several reasons. Many economists now reckon Brazil and China are part of the top ten economies by size. The World Bank predicts that the five BRICS countries will form the basis of global manufacturing and agricultural production by 2035. And due to the recent public health measures to contain the COVID-19 pandemic, countries such as South Africa, India, Brazil, and to a lesser extent, China introduced highly relevant social and economic interventions that merit potential inclusion in the review.

Types of interventions

This review will include interventions that are described broadly as 'social and economic policy interventions', and as Birkland and colleagues outline, these public policies have several common characteristics: i) the government decides whether to implement them or not; ii) they involve governmental and non-governmental actors; iii) they are motivated by public welfare; and iv) they are oriented towards a general goal, such as the solution of a social problem (Birkland 2015). There are various terms for policy, including government action plans, strategies, programmes, and initiatives.

As in Table 1, we can group these interventions as follows:

- income and labour policies that aim to provide fair work and employment conditions, helping people to meet the cost of living and taxation and cash policies that address income redistribution;
- housing policies that aim to reduce homelessness and ensure housing affordability;
- welfare or safety net policies that aim to provide financial and material support to reduce the effects of unemployment, underemployment, and non-participation in the workforce; and
- family policies that aim to support parental leave, children's well-being, and participation of parents in the labour force.

We will include interventions of a duration of three months or greater. We will organise studies into the four groups above, based on their department/organisation of origin and the stated policy aims. If, for example, an intervention includes both 'income and labour policies' and 'family policies', we will group the study into one of the intervention groups based on the majority of the intervention delivered and not considered multicomponent.

Comparators

We are interested in comparing the introduction of a new/novel eligible (economic and social policy) interventions with 'usual care' (defined in these circumstances as existing policies).

Types of outcome measures

Primary outcomes

The primary outcome of interest is household food security status.

The measurement of food security status for households commonly uses experiential indicators, which seek to capture how food insecurity is experienced in terms of behaviour and psychological response. Because of the multidimensional nature of household food security, no universal measure exists; however, best practice measures are validated for the local context, occur regularly to enable longitudinal monitoring, and are multi-item ([Beacom 2021](#)). The most commonly used methods that meet these best-practice criteria are the US Household Food Security Survey Module (HFSSM), the United Nations Food and Agriculture Organization (FAO) Food Insecurity Experience Scale Survey Module (FIES-SM), the Household Food Insecurity Access Scale (HFIAS), the European Union statistics on income and living conditions (EU-SILC) food-deprivation indicators ([Beacom 2021](#)), and the Community Childhood Hunger Identification Project (CHHIP) index ([Labadarios 2011](#)). We anticipate that the included studies will accept these measures and use them most commonly.

We will only include studies if they include measures of the primary outcome. If an included study provides multiple outcome measures for food security, we will select one measure for inclusion in the analysis by following this order of preference:

- one of the most commonly used measures (in order of preference as listed above);
- another measure that has been validated and is in common use (if more than one, we will choose the first reported);
- failing the above two, then the first listed outcome measure of the study.

As part of the data extraction process, we will extract and tabulate information on all eligible measures. We will highlight the outcome measures we select and extract data for those measures.

In cases where trials measured household food security at several time points, we will extract the data at the longest follow-up time point reported from all the included studies. We will then group these data (i.e. the single outcome data extracted) into short- (three to six months) and long-term data (seven months or greater) and conduct a subgroup analysis of time point.

Secondary outcomes

The secondary outcome of interest is adverse effects/unintentional consequences (e.g. self-perceived or reported stigma, or both).

We will extract all reported adverse effects/unintentional consequences and include them in the review.

Search methods for identification of studies

In order to inform the search terms, strategy, and choice of databases, co-authors supplied key articles (identified through an initial scoping review of policy interventions) to a health librarian (RW). We piloted and cross-checked the search within the authorship team and against key articles, which helped to finalise the approach.

Electronic searches

We will search the following electronic databases and trials registries for primary studies:

- Cochrane Central Register of Controlled Trials (CENTRAL) in the Cochrane Library, which includes the Cochrane Public Health Specialised Register;
- MEDLINE Ovid;
- Embase Ovid;
- Global Health (via EBSCO);
- Health Policy Reference Center (via EBSCO);
- SocINDEX with full text (via EBSCO);
- Academic Search Complete (via EBSCO);
- ABI/INFORM via ProQuest or EBSCO Host Business Source Complete;
- US National Institutes of Health Ongoing Trials Register ClinicalTrials.gov (www.clinicaltrials.gov); and
- World Health Organization International Clinical Trials Registry Platform (www.who.int/clinical-trials-registry-platform).

We will use and adapt the search terms and strategy for MEDLINE for optimisation in each search engine ([Appendix 1](#)). We will limit our search to publications published since 1990, which is the era that household food security measures began to emerge in high-income countries ([Radimer 1990](#)), and United Nations agencies began global food summits to progress food security multi-laterally.

Searching other resources

- We will handsearch the reference lists of studies included at the full-text stage.
- If we identify relevant systematic reviews, we will handsearch their reference lists for studies to include.
- We will use Scopus as a citation database to search all included studies (both references and citing documents).
- We will conduct a Google search, using 32 keywords and a date limit of since 2008 (i.e. to capture recent evidence post-global recession), to identify .gov/.govt sites (and similar sites). We will click on each link and screen the first 10 pages, 10 result per page, in line with recommendations from the Canadian Agency for Drugs and Technologies in Health (CADTH) for search engine use in systematic reviews ([CADTH 2018](#)).
- We will conduct searches, using keywords, of key websites, including the World Health Organization, the United Nations Food and Agriculture Organization, World Bank, International Labour Organization, Oxfam, and Special Rapporteurs on the Right to Food for the United Nations.

Data collection and analysis

Selection of studies

Given the breadth of policy intervention types, the various sources we will search, and our piloting of search terms to date, we expect to retrieve many results. Three authors (RL, AB, SM), with the assistance of Covidence review management software ([Covidence](#)), will independently screen the titles, abstracts, and full texts to determine eligibility against the inclusion criteria.

We will retrieve full-text copies of eligible titles and those for which eligibility is unclear. We will resolve any disagreements regarding

eligibility at any stage during screening through discussion with another author (KW). We will record our reasons for excluding studies and document inclusion decisions to complete a PRISMA flow chart (Moher 2009). A supplementary table will also report studies that initially met inclusion criteria and record why they were ultimately ineligible.

Data extraction and management

Two authors (RL, AB) will extract data independently using a template. A third author (ZM) will arbitrate any disagreements. We will pilot the data extraction template (n = five included studies) to ensure we capture information in a standard manner and that the template is fit for purpose.

We will extract the following data.

- **Study design:** classification of design type; recruitment and sampling of participants; enrolment start and end dates and follow up; information relevant to bias assessment (e.g. selection biases); methods for addressing missing data; statistical analysis (e.g. units of analysis, statistical method)
- **Participants:** setting; region; community; household; eligibility; characteristics of participants at beginning (and end where possible), including equity considerations articulated in PROGRESS-Plus (O'Neill 2014) (e.g. location, age)
- **Intervention:** policy type and main components; factors relevant to implementation (e.g. the social and economic policy environment that constitutes 'usual care'); actors involved; cost; population targeted; duration; macro-, meso-, or micro-level focus, or a combination
- **Outcomes:** at the household level and how they were measured; specific metric (e.g. change in food security status from baseline to post-intervention time point); method of aggregation; timing of outcome measurement; adverse outcome reporting (e.g. stigma)
- **Results:** number of participants included in analysis; number of withdrawals, lost to follow up, and excluded; results of the main outcome measure
- **Additional:** key conclusions of study; source of study funding; conflict of interest declaration; sponsorship of the interventions

Assessment of risk of bias in included studies

Two review authors (RL, KW) will independently assess the risk of bias for each study using the following criteria and tools. Discussion with a third author (ZM) will resolve any discrepancies between authors. The long-term outcome (> 6 to 12 months) will be the primary outcome; therefore, we will conduct the risk of bias assessments with this follow-up time point.

Randomised designs of interventions

We will use the Cochrane risk of bias tool (RoB 2) (Sterne 2019), informed by riskofbias.info, to assess the validity of the design of included studies. When assessing risk of bias, we will use the appropriate template to consider bias arising from the randomisation process; deviations from intended interventions (in terms of the 'intention-to-treat' effect); missing outcome data; measurement of the outcome; and selection of the reported result. For cluster-randomised control trials, we will use the version of RoB 2 designed for studies using cluster randomisation (Eldridge 2021). This has an added domain, 'bias rising from the identification or

recruitment of participants into clusters', and modified signalling questions in several other domains.

We will use the RoB 2 Microsoft Excel tool to manage the process and signalling questions to reach the judgement options for RoB 2 (high, some concerns, or low).

Non-randomised designs of interventions

For non-randomised designs (nRCT, CBA, ITS, and prospective cohort studies), we will use Cochrane's ROBINS-I (Sterne 2016), informed by riskofbias.info, to assess the validity of the design of included studies. The seven domains we will assess for bias include confounding and selection of participants, classification of the interventions, deviations from intended interventions, missing data, measurement of outcomes, and result reporting. The confounding domains relevant to all or most studies, based on our previous work, will be age, sex, household income, and educational attainment. The effect of interest is the effect of assignment (intention-to-treat).

We will use signalling questions to reach the judgement options for ROBINS-I (low, moderate, serious, and critical). We will exclude from any analysis studies that we judge to be at a critical risk of bias.

We will present the risk of bias assessment in the risk of bias table included with the 'Characteristics of included studies' table. We will also present a risk of bias graph and a summary figure. For blinding and incomplete outcome assessment, we will present the risk of bias separately for the primary outcome in these figures.

Measures of treatment effect

Dichotomous data

We will analyse these data as odds ratios (OR) and 95% confidence intervals (CI). Where reported as risk ratios (RR), we will convert these data to OR.

Continuous data

We will analyse these data as mean difference (MD) or standardised MD (SMD) and 95% CI.

Where applicable, we will:

- multiply by -1 reverse scaled means;
- pool individual study groups using the standard Cochrane approach;
- prioritise dichotomised data over continuous data; and
- prioritise intention-to-treat data over per-protocol data.

We will use SMD, MD, or OR as effect estimates. Reverse scaled means to be multiplied by -1. Where necessary, we will combine dichotomous and continuous outcomes in line with Cochrane recommendations (Deeks 2022).

Unit of analysis issues

Where cluster-randomised trials are present, we will check that any extracted measures of effect are appropriately adjusted for clustering. If not available through supplementary files or publicly accessible data, we will contact study authors for further information (sending one reminder after two weeks and assuming no response after four weeks). If the study authors have not taken the clustering effect into account in their analyses, we will request

individual participant data in order to calculate an intracluster correlation coefficient (ICC) and re-analyse the data appropriately. If the primary data are unavailable, we will find an appropriate ICC from the literature and adjust the sample size accordingly.

We will synthesise trials that provide data suitable for pooling in meta-analyses grouped by intervention type. For trials with multiple groups, we will include in the relevant meta-analysis all groups that meet the inclusion criteria. If there are more than two intervention or comparison groups, we will attempt to combine the relevant groups to make a single pairwise comparison. Alternatively, if this is not possible, we will make multiple pairwise comparisons between the relevant groups and divide the sample size accordingly, in order to prevent double-counting of participants.

Dealing with missing data

If there are unclear or missing data related to study methodology, participants lost to follow-up, outcome data, or statistics, we will contact the study's author via email, and follow up once if there is no reply (with one further follow up if there is no reply after two weeks). We will note all missing outcome data in the data extraction template and in the risk of bias. If we receive no response within four weeks of initial contact, we will mark data as missing in the database. Where data are missing, we will work with the statistician available at the institution of the lead authors to devise appropriate methods for data imputation.

Assessment of heterogeneity

We will assess heterogeneity, or the variability amongst the studies included in a meta-analysis, by assessing statistical heterogeneity using Cochran's Q test and the I^2 statistic (an I^2 of 75% and above will indicate substantial heterogeneity).

If a meta-analysis is not possible, we will summarise in the tables that orders results by study design and intervention types as an informal method of assessing heterogeneity, in line with Synthesis Without Meta-analysis (SWiM) guidelines (Campbell 2020).

Assessment of reporting biases

We will consider reporting bias in relation to studies where there are missing data (that we could not resolve via contact with the study authors as described above) or in terms of studies with unpublished results (publication bias that we have identified by searching clinical trial registries). We will provide a summary of study characteristics of those studies with missing data or unpublished results. We will consider the potential impact of the missingness on the synthesis of study results. If we can include 10 or more studies in a meta-analysis, we can investigate the likelihood of reporting bias with funnel plots and assess the plots visually for sources of asymmetry, such as publication bias or small-study effects (Page 2019). If it is likely that small-study effects caused asymmetry, we will use a sensitivity analysis to explore how this affects the results and conclusions of the meta-analysis.

Data synthesis

We will conduct synthesis according to study design (RCTs, cRCTs, nRCT, CBA, ITS, and cohort studies) and intervention type, and for meta-analysis, we will consider comparability of outcome data and effect size measures (risk estimates, such as OR or RR, versus continuous measures).

Meta-analysis

We will only conduct meta-analysis when there are least two comparable studies (Deeks 2019). We will convert alternative measures of central tendency (e.g. median) and spread (e.g. standard error, upper and lower 95% confidence intervals) to mean and standard deviation via established formulae. We will conduct all statistical analyses in Stata (v17, StataCorp 2021), and we will adopt an alpha of 0.05 for all analyses.

For dichotomous outcome data, we will use OR. For continuous outcomes, we will use MD or SMD (Hedges' g). We will perform pairwise random-effects meta-analysis with the restricted maximum likelihood estimator to assess between-study variance. We will employ the Hartung-Knapp-Sidik-Jonkman method where less than five individual studies are present in any pairwise analysis. We will assess statistical heterogeneity using the I^2 statistic. We will assess publication bias via funnel plots and Egger's test. We will explore trim and fill methods if we deem it appropriate.

For cluster-RCTs, we will adjust for clustering using the intracluster correlation coefficients (ICC). If a study report does not present the ICC and we cannot obtain it from the study authors, we will use a conservative ICC of 0.001, based on estimates from another cluster-RCT examining social and economic policy-based interventions to improve household food and nutrition outcomes (Grellety 2017).

For ITS studies, random-effects meta-analysis will adopt a two-stage approach and examine both immediate level change and slope change for completeness. Re-analysis of ITS studies, via segmented time series regression (autoregressive integrated moving average: ARIMA) in line with EPOC 2017 recommendations, will occur only if the study analysis was not sufficient (i.e. if not analysed as ITS, or if autocorrelation is not considered in the analysis) and if data are available. If data are not published, we will contact the authors to provide the data as per methods described elsewhere in the protocol. We will consider post-interruption time points from three months onwards as per other study designs, and we will standardise/convert data using different timescales so that it is comparable. We will conduct standardisation of effect measures to account for different timescales. We will only use controlled ITS studies in meta-analysis where effect measures are comparable.

Synthesis without meta-analysis

Where we are unable to meta-analyse data because the required data are not available from the included studies (e.g. no measures of variance or no estimates of effect), we will use alternative data synthesis methods as recommended in the *Cochrane Handbook for Systematic Reviews of Interventions* (McKenzie 2022), e.g. vote counting based on the direction of effect. If these synthesis methods are not possible, we will summarise individual study results. We will report results in line with SWiM guidelines (Campbell 2020).

We will categorise interventions according to the four groups as described in *Types of interventions*. Where data are available, we will compare each type of intervention to "no intervention", i.e. usual care.

Subgroup analysis and investigation of heterogeneity

We will conduct data synthesis according to study design and intervention type; we will apply meta-analysis or alternative synthesis methods according to the methods described above.

We will conduct subgroup analyses where there at least two studies in each subgroup. Informed by the PROGRESS equity framework (O'Neill 2014), we will include (where possible) the following subgroups to help further investigate the determinants of food security:

- geographic location (e.g. urban versus rural/remote);
- sex (male versus female);
- age (e.g. infants: 0 to < 6 years, children: 6 to < 18 years, adults: 18 to < 65 years, elderly: 65 years and over); and
- Indigenous status (First nations Peoples versus non-Indigenous Peoples).

We will assess differences among subgroups by using the formal statistical test outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* (Deeks 2022). Should the studies allow, we will analyse by setting (high-income countries versus BRICS countries).

Sensitivity analysis

To evaluate the robustness of analyses, we propose the following sensitivity analyses.

- Bias: excluding trials at overall high risk of bias
- Attrition: excluding studies with dropout rate of 30% or above
- Missing data: excluding studies where review authors imputed missing data for meta-analysis
- Multiple time points: re-run analyses using earlier follow-up data if two time points were within a follow-up timeframe

Summary of findings and assessment of the certainty of the evidence

In order to draw overall conclusions about the certainty of the evidence, we will use GRADE (Guyatt 2008), facilitated by GRADEPro (software).

Randomised designs of interventions

In the application of GRADE, we will assess the following five domains: risk of bias, inconsistency, indirectness, imprecision, and publication bias.

Non-randomised designs of interventions

In the application of GRADE, we will assess the following five domains: risk of bias, inconsistency, indirectness, imprecision, and publication bias. We will also consider the following three domains for upgrading evidence from non-randomised studies: large effect, dose response, opposing plausible residual bias and confounding.

Two authors (RL, KW) will assess the certainty of the evidence. In line with GRADE instructions (Ryan 2016; Schünemann 2019), we will initially consider the certainty of the evidence from randomised and non-randomised studies to be high and will downgrade based on five criteria. There is also the potential that we will upgrade the certainty of the evidence from non-randomised studies using an additional three criteria.

Two authors will reach a consensus view of the certainty of the evidence for each outcome, with a third author (ZM) available to arbitrate. Based on our assessments, we will decide on a final level of evidence for each outcome, including both meta-analysed and narratively synthesised outcomes. We will use this to assign a value for the certainty of the evidence.

We will apply GRADE to each data synthesis group (as described above) and where meta-analysis is available or alternative synthesis methods.

We will consider statistical heterogeneity to be 'high' when the I^2 value is > 75% (i.e. we will downgrade by one level per GRADE recommendations).

We will include a summary of findings table for the primary and adverse outcomes of this review. This table will include the number of participants and studies for the outcome, a summary of the intervention, and a measure of the certainty of the evidence for the single primary outcome according to GRADE considerations.

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ADDITIONAL TABLES

Table 1. Examples of social and economic policy interventions

Social and economic determinants				
	Welfare	Housing	Labour	Family life
Examples of government-initiated and -implemented social and economic policies	Birth or maternity grants A one-time or short-term grant given when a child is born, to help with the costs associated with having a child.	Universal basic income A minimum income provided to all, ensuring an adequate standard of living.	Rental assistance Income provided to households to meet costs of private rental accommodation.	Living wage Income set at a level that ensures basic needs are met and an adequate standard of living.
Policies may be means tested or universal	Financial support for households with children Cash benefits, rebates, and subsidies, which may differ for number or age of children, or both, and may be used generally or applied to specific costs (e.g. childcare, school).	Financial assistance for older adults Cash benefits, rebates, and subsidies.	Public or social housing Short- or long-term access to housing that is affordable and reliable.	Income tax credits Provide subsidies to working families and households.
		Financial assistance for people who are unemployed Cash benefits, rebates, and subsidies.	Utilities subsidies Reduced costs of gas, electricity, water, and similar.	Minimum wage Legal minimum wage that employers must pay employees.

APPENDICES

Appendix 1. Search strategy in MEDLINE Ovid

Ovid MEDLINE(R) and In-Process, In-Data-Review & Other Non-Indexed Citations

#	Query	Results from 17 Nov 2022
1	food insecur*.tw,kf.	6,791
2	food secur*.tw,kf.	11,406
3	food poverty.tw,kf.	93
4	hungry.tw,kf.	2,538

(Continued)

5	hunger.tw,kf.	11,319
6	food stress*.tw,kf.	149
7	food deprivation.tw,kf.	3,777
8	material deprivation.tw,kf.	612
9	food access*.tw,kf.	1,455
10	food swamp*.tw,kf.	38
11	food desert*.tw,kf.	312
12	((inadequate or insufficien* or insecure or "lacking adequate" or "lacking se- cure") adj4 food).tw,kf.	3,159
13	(afford* adj4 food).tw,kf.	587
14	nutrition insecurity.tw,kf.	108
15	food justice.tw,kf.	36
16	nutrition recession.tw,kf.	0
17	food equity.tw,kf.	10
18	dietary injustice.tw,kf.	0
19	exp Food Insecurity/ or Food Security/	1,592
20	Hunger/	5,936
21	Food Deprivation/	8,723
22	food deserts/	30
23	Social Justice/	13,711
24	or/1-23	56,602
25	(child* adj2 benefit?).tw,kf.	3,321
26	child transfer*.tw,kf.	32
27	carer payment*.tw,kf.	2
28	parenting payment*.tw,kf.	3
29	income supplement*.tw,kf.	73
30	welfare benefit*.tw,kf.	593
31	welfare income.tw,kf.	18
32	social assistance.tw,kf.	914

(Continued)

33	benefit program*.tw,kf.	438
34	income transfer*.tw,kf.	111
35	social protection.tw,kf.	1,536
36	income benefit*.tw,kf.	69
37	universal basic income.tw,kf.	37
38	basic minimum income.tw,kf.	0
39	income redistribution.tw,kf.	78
40	social security.tw,kf.	10,233
41	newstart allowance*.tw,kf.	1
42	social benefit*.tw,kf.	1,891
43	income security program*.tw,kf.	7
44	state pension*.tw,kf.	88
45	cash transfer*.tw,kf.	987
46	old age security.tw,kf.	319
47	cash assistance.tw,kf.	132
48	government housing subsid*.tw,kf.	2
49	social housing.tw,kf.	565
50	rental assistance.tw,kf.	39
51	social program*.tw,kf.	810
52	policy intervention*.tw,kf.	2,689
53	(social policy or social policies).tw,kf.	8,030
54	poverty reduction program*.tw,kf.	33
55	safety net program*.tw,kf.	202
56	tax benefit*.tw,kf.	112
57	tax rebate*.tw,kf.	27
58	(community shop or community shops).tw,kf.	5
59	social voucher*.tw,kf.	0
60	(federal policy or federal policies).tw,kf.	927

(Continued)

61	(government policy or government policies).tw,kf.	3,494
62	minimum income standard*.tw,kf.	5
63	guaranteed minimum income.tw,kf.	9
64	living wage*.tw,kf.	85
65	"minimum essential standard of living".tw,kf.	0
66	(employment policy or employment policies).tw,kf.	234
67	gig economy.tw,kf.	62
68	homelessness.tw,kf.	6,442
69	microfinance.tw,kf.	273
70	public-private partnership*.tw,kf.	2,035
71	discount*.tw,kf.	14,453
72	voucher*.tw,kf.	2,595
73	subsid*.tw,kf.	28,567
74	welfare capitalism.tw,kf.	7
75	(intervention* or program* or policy or policies).ti.	459,341
76	public assistance/ or food assistance/ or old age assistance/ or exp social security/	13,241
77	Pensions/	4,191
78	Public Housing/	1,576
79	Public Policy/	33,237
80	exp Homeless Persons/	10,764
81	Public-Private Sector Partnerships/	2,450
82	or/25-81	577,270
83	Andorra*.tw,kf.	102
84	Antigua*.tw,kf.	306
85	Barbuda*.tw,kf.	97
86	Aruba*.tw,kf.	257
87	Australia*.tw,kf.	163,935
88	Austria*.tw,kf.	19,572

(Continued)

89	Baham*.tw,kf.	1,042
90	Bahrain*.tw,kf.	1,295
91	(Barbados or barbadian? or bajan?).tw,kf.	1,117
92	Belgi*.tw,kf.	25,374
93	Bermud*.tw,kf.	1,787
94	Virgin Island*.tw,kf.	642
95	Brunei*.tw,kf.	558
96	Canad*.tw,kf.	151,858
97	Cayman Island*.tw,kf.	123
98	Channel Island*.tw,kf.	217
99	Chile*.tw,kf.	21,040
100	Croatia*.tw,kf.	9,291
101	Curacao*.tw,kf.	496
102	(Cyprus or cypriot*).tw,kf.	2,770
103	Czech*.tw,kf.	19,069
104	(Denmark or Dane? or Danish).tw,kf.	56,074
105	(England or english).tw,kf.	185,475
106	Estonia*.tw,kf.	3,770
107	(Faroe* or Faero*).tw,kf.	793
108	(Finland or finn*).tw,kf.	46,022
109	(France or french).tw,kf.	135,468
110	Polynesia*.tw,kf.	2,814
111	German*.tw,kf.	162,068
112	Gibraltar*.tw,kf.	430
113	(Greece or greek?).tw,kf.	28,000
114	Greenland*.tw,kf.	4,275
115	Hong Kong*.tw,kf.	22,877
116	Iceland*.tw,kf.	7,076

(Continued)

117	(Ireland or irish).tw,kf.	31,024
118	("Isle of Man" or manx).tw,kf.	307
119	Guam*.tw,kf.	1,542
120	Israel*.tw,kf.	35,424
121	(Italy or italian*).tw,kf.	121,127
122	Japan*.tw,kf.	247,500
123	South Korea*.tw,kf.	18,107
124	Kuwait*.tw,kf.	4,781
125	Latvia*.tw,kf.	2,059
126	Liechtenstein*.tw,kf.	370
127	Lithuania*.tw,kf.	4,273
128	Luxembourg*.tw,kf.	1,271
129	(Macao* or Macau* or Macanese or Taiwan*).tw,kf.	56,301
130	(Malta or maltese).tw,kf.	2,291
131	(Monac* or monegasque*).tw,kf.	1,699
132	Nauru*.tw,kf.	195
133	(Netherlands or Dutch).tw,kf.	85,223
134	New Caledonia*.tw,kf.	1,883
135	New Zealand*.tw,kf.	60,867
136	Northern Ireland.tw,kf.	5,516
137	Northern Mariana Island*.tw,kf.	152
138	(Norway or norwegian*).tw,kf.	34,575
139	Oman*.tw,kf.	4,128
140	Palau*.tw,kf.	548
141	(Poland or polish or pole?).tw,kf.	79,241
142	(Portugal or portuguese*).tw,kf.	26,803
143	(Puerto Rico or puerto rican* or boricua*).tw,kf.	9,745
144	Qatar*.tw,kf.	3,035

(Continued)

145	(San Marin* or sammarinese*).tw,kf.	115
146	Saudi*.tw,kf.	28,182
147	(Scotland or scot? or scottish).tw,kf.	30,325
148	Seychell*.tw,kf.	919
149	Singapore*.tw,kf.	19,196
150	Sint Maarten*.tw,kf.	28
151	Slovak*.tw,kf.	6,101
152	Slovenia*.tw,kf.	4,989
153	(Spain or spanish or spaniard*).tw,kf.	109,424
154	("St Kitts and Nevis" or Kittitian* or Nevisian*).tw,kf.	64
155	(St Martin* or Saint Martin*).tw,kf.	213
156	(Swede* or swedish).tw,kf.	82,382
157	(Switzerland or swiss).tw,kf.	58,441
158	Trinidad*.tw,kf.	2,889
159	Tobago*.tw,kf.	1,153
160	"Turks and Caicos Island*".tw,kf.	32
161	emirat*.tw,kf.	3,695
162	(United Kingdom or british or Britain or UK or "U.K.").tw,kf.	224,459
163	(United States or America* or USA or "U.S.").tw,kf.	1,335,537
164	Uruguay*.tw,kf.	3,689
165	(Wales or welsh).tw,kf.	28,009
166	Brazil*.tw,kf.	134,147
167	Russia*.tw,kf.	40,886
168	India*.tw,kf.	193,364
169	(China or chinese).tw,kf.	496,770
170	South Africa*.tw,kf.	51,664
171	((developed or high income or industrial?ed) adj (countr* or nation? or econom*)).tw,kf.	76,476
172	Developed Countries/	21,237

(Continued)

173	europa/ or andorra/ or austria/ or belgium/ or estonia/ or latvia/ or lithuania/ or croatia/ or czech republic/ or hungary/ or poland/ or exp russia/ or slovakia/ or slovenia/ or exp france/ or exp germany/ or gibraltar/ or exp united kingdom/ or greece/ or ireland/ or exp italy/ or liechtenstein/ or luxembourg/ or cyprus/ or malta/ or monaco/ or netherlands/ or portugal/ or san marino/ or denmark/ or greenland/ or finland/ or iceland/ or exp norway/ or sweden/ or spain/ or switzerland/ or exp australia/ or seychelles/ or macau/ or new zealand/	1,631,843
174	exp "Scandinavian and Nordic Countries"/ or exp Baltic States/	225,452
175	aruba/ or curacao/ or sint maarten/ or "antigua and barbuda"/ or bahamas/ or barbados/ or british virgin islands/ or "saint kitts and nevis"/ or "trinidad and tobago"/ or united states virgin islands/	3,583
176	bahrain/ or israel/ or kuwait/ or oman/ or qatar/ or saudi arabia/ or united arab emirates/	57,989
177	Bermuda/	194
178	brunei/ or singapore/	15,571
179	(Hungary or hungarian*).tw,kf.	17,347
180	exp Canada/	177,764
181	brazil/ or chile/ or uruguay/	129,993
182	new caledonia/ or guam/ or palau/	1,917
183	exp China/	257,937
184	exp japan/ or exp "republic of korea"/ or taiwan/	234,795
185	Puerto Rico/	6,966
186	south africa/ or exp india/	163,766
187	exp United States/	1,445,092
188	North America/	22,289
189	or/83-188	6,196,253
190	24 and 82 and 189	3,340
191	limit 190 to yr="1990 -Current"	3,126

CONTRIBUTIONS OF AUTHORS

RL led the development of the protocol. KW assisted with methods, particularly risk of bias tools and GRADE. AB led the advisory group consultation. AB and RL conducted the initial scoping review of the literature. RW devised the search strategy. SF assisted with outcome measures. ZM assisted with grey literature searching, data synthesis and methods, and membership of the advisory group. MC assisted with conceptualisation/rationalisation of the study and establishing the author team. PO assisted with the meta-analysis and systematic review methods. SM assisted with conceptualisation/rationalisation of the study, data synthesis and methods, membership of the advisory

group, and establishing the author team. All authors reviewed and provided feedback on the protocol and hence had input into all aspects of the study.

DECLARATIONS OF INTEREST

RL: discloses authoring published opinions in journals, the public press, broadcast, and social media relevant to the interventions in the protocol. RL also declares obtaining grants, consultations, and having (unpaid) leadership roles in areas relevant to the interventions in the protocol.

KW: declares that she is a member of not-for-profit organisations that advocate for policies that promote food security in Australia.

AB: has declared that they have no conflict of interest.

RW: has declared that they have no conflict of interest.

MC: discloses authoring published opinions in journals, the public press, broadcast, and social media relevant to the interventions in the protocol.

ZM: has declared that they have no conflict of interest.

SF: declares recently providing comment to the trade journal, *The Grocer*, by way of an invited contribution to the letters page on the income crisis and need for cash-first approaches and a fit-for-purpose benefits system to ameliorate food insecurity and poverty. SF also declares she is an unpaid trustee of the Independent Food Aid Network and a board member of the Consumer Council for Northern Ireland.

PO: has declared that they have no conflict of interest.

SM: declares paid employment, obtaining grants, fellowships, and having leadership and advisory roles in areas relevant to the interventions in the protocol.

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