

# WHICH POLICIES AND INTERVENTIONS WORK TO INFLUENCE THE SCHOOL FOOD ENVIRONMENT? A SYSTEMATIC REVIEW

Solange Durão<sup>1</sup>, Maryke Wilkinson<sup>1,2</sup>, Eugene L Davids<sup>1,3</sup>, Annette Gerritsen<sup>1</sup>, Tamara Kredó<sup>1,4</sup>

<sup>1</sup>Cochrane South Africa, South African Medical Research Council, Cape Town, South Africa. | <sup>2</sup>Better Health Programme South Africa, Mott MacDonald, Cape Town, South Africa | <sup>3</sup>Division of Child and Adolescent Psychiatry, Faculty of Health Science, University of Cape Town, Cape Town, South Africa | <sup>4</sup>Division of Clinical Pharmacology, Department of Medicine and Division of Epidemiology and Biostatistics, Department of Global Health, Faculty of Medicine and Health Sciences, Stellenbosch University, Tygerberg, South Africa

## BACKGROUND

Globally, one in three children under five years is undernourished or overweight, and half suffer from hidden hunger due to nutrient deficiencies.<sup>1</sup> As children spend considerable time at school, school-based policies aiming to improve children's dietary intake may help address this double burden of malnutrition.<sup>2,3</sup>

## OBJECTIVE

To assess the effects of implementing policies and interventions that influence the school food environment on children's health and non-health outcomes, to inform a WHO guideline on school food and nutrition policies.

## METHODS

- Searched 11 databases
- Date of last search: April/May 2020
- WHO called for data in June 2020

## ELIGIBILITY CRITERIA

- Study designs: individually and cluster randomized controlled trials (RCTs), interrupted time-series (ITS) studies, and prospective controlled studies (PCS).
- Participants: Children two years or older, attending pre-, primary-, or secondary school.
- Interventions - Policies/interventions that influence the school food environment, including:
  - Nutrition standards/ rules that determine the quality of food served or sold in and around schools,
  - Marketing restrictions of unhealthy food and non-alcoholic beverages (FNABs) in and around schools,
  - Nudging interventions promoting healthy food behaviour (e.g. changing food presentation),
  - Pricing policies to promote healthier alternatives (e.g. healthy food subsidies; higher cost of unhealthy options),
  - Direct food provision (e.g. meal or vegetable and fruit distribution programmes).

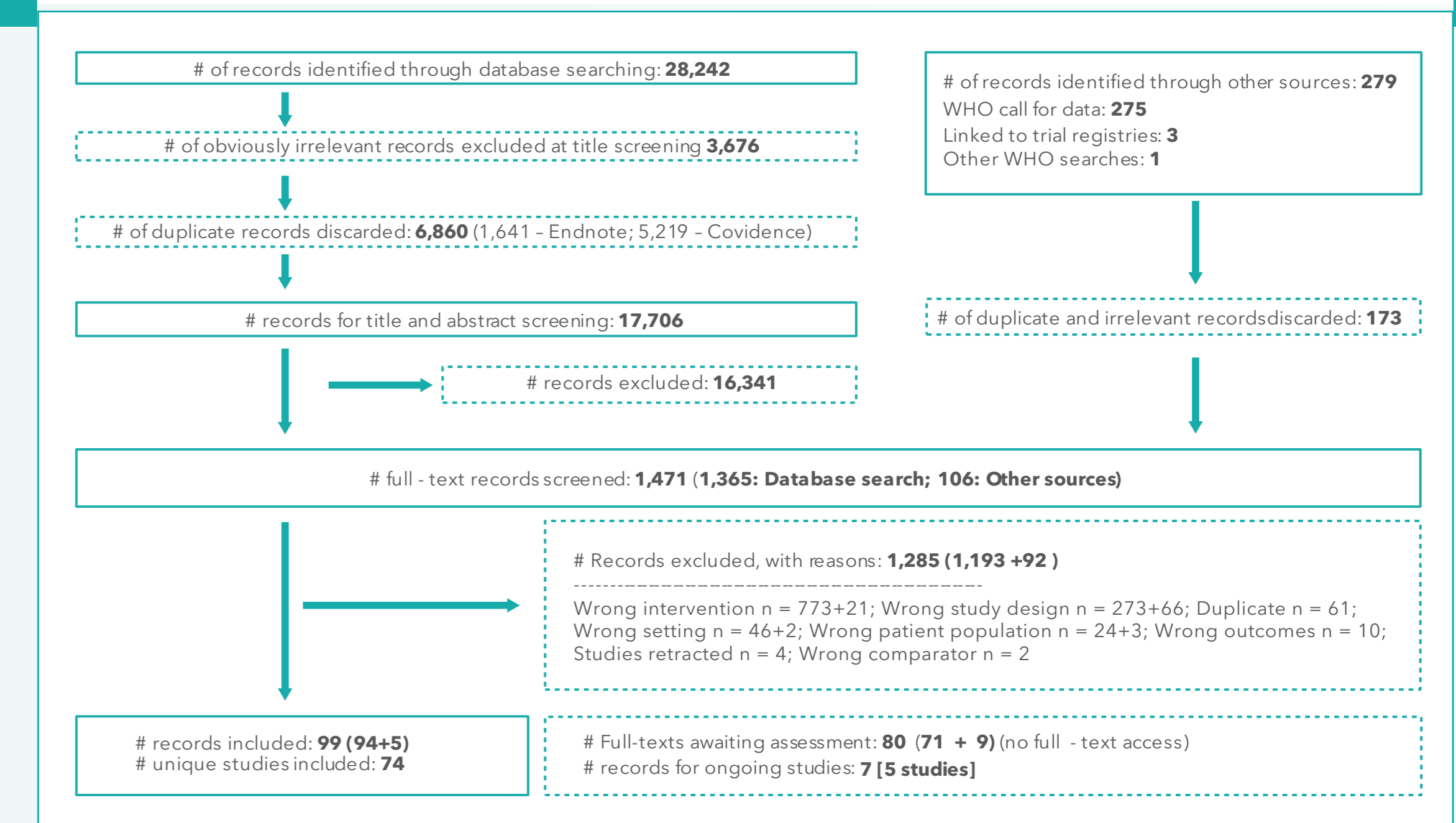
## DATA COLLECTION AND ANALYSIS

- Two authors screened all titles and abstracts against the eligibility criteria and full-texts of potentially eligible records were screened by one reviewer, with all excluded records checked by a second reviewer.
- Data extraction and risk of bias assessment were done by one reviewer and checked by another.
- We assessed risk of bias of all included studies using the Cochrane Effective Practice and Organization of Care (EPOC) risk of bias tool for studies with a separate control group.
- We synthesised the data using vote counting based on effect direction. We conducted random-effects meta-analysis for sub-sets of the data, if there were at least two studies in the same intervention category reporting the same outcome measure and these were sufficiently homogeneous.
- The certainty of the evidence was assessed using the GRADE approach.

## SEARCH RESULTS

- We included 74 unique studies:
  - 32 PCS
  - 34 cluster RCTs
  - 3 RCTs
  - 5 ITS studies
- Studies included between 23 to 24,291 participants and one to 235 schools
- Most studies were conducted in high-income countries

Figure 1. PRISMA flowchart of study selection



## EFFECTS OF INTERVENTIONS

### 1. NUTRITION STANDARDS

#### 1a. Nutrition standards increasing the availability of healthy foods in school (2 Cluster RCTs, 5 ITS studies, 1 PCS)

- may increase the consumption healthy foods and beverages and may reduce the consumption of unhealthy foods and beverages (low certainty evidence);
- may reduce energy intake slightly (low certainty evidence);
- may result in little to no difference to the proportion of children selecting target healthy foods (low certainty evidence);
- effects on obesity trends are very uncertain (very low certainty).

#### 1b. Nutrition standards increasing the availability of healthy beverages in school (1 PCS)

- may make little to no difference in the consumption of sugar-sweetened beverages (low certainty evidence).

Critical outcome [certainty of the evidence]	Favors control	Unclear effect; potentially favors control	No difference in effect	Unclear effect; potentially favors intervention	Favors intervention
Consumption of healthy FNABs ●○○○					7
Consumption of discretionary FNABs ●○○○					7
Diet: energy intake ●○○○					1
Purchasing behavior/sales data ●○○○		3	8	2	
Nutrient/calorie content of food					
Exposure to marketing of FNABs					
Anthropometry (overweight/obesity)			5 6		4

#### Nutrition standards re availability of healthy food

Study	Outcome
1. Johnson 2016	monthly energy density
2. Kocken 2012	proportion of favourable products sold
3. Cullen 2006 %	weekly sales for fruit/ juice/ vegetables
4. Corvalan 2008	early Obesity trends
5. Corvalan 2008	middle Obesity trends
6. Corvalan 2008	late Obesity trends
7. Schwartz 2009	consumption of salty snacks meeting nutrition standards; consumption of salty snacks excluded by nutrition standards
8. Bartholomew 2006	selection low-fat entrees

### 2. NUDGING INTERVENTIONS

#### 2a. Changes to food presentation (7 cluster RCTs)

- may increase intake of healthy foods (low certainty evidence);
- may increase the selection of target foods (low certainty evidence);
- effect on energy intake is very uncertain (very low certainty evidence).

#### 2b. Changes in food positioning (2 cluster RCTs, 3 PCS)

- may increase the consumption of water (low certainty evidence);
- may increase the selection of target foods (low certainty evidence).

#### 2c. Reduction of portion sizes served (5 cluster RCTs)

- may reduce energy intake slightly (low certainty evidence).

#### 2d. Multiple nudging strategies (3 cluster RCTs, 2 PCS)

- likely makes little to no difference to vegetable intake (moderate certainty evidence);
- probably reduces energy intake (moderate certainty evidence);
- may make little to no difference to selecting vegetables (low certainty evidence).

Critical outcome [certainty of the evidence]	Favors control	Unclear effect; potentially favors control	No difference in effect	Unclear effect; potentially favors intervention	Favors intervention
Consumption of healthy FNABs ●○○○			1 3	2	
Consumption of discretionary FNABs ●○○○					
Diet: energy intake ●○○○			1		4
Purchasing behavior/sales data ●○○○				2 3 5	
Nutrient/calorie content of food					
Exposure to marketing of FNABs					
Anthropometry (overweight/obesity)					

#### Multiple nudging strategies

Study	Outcome
1. Marcano-Olivier 2019	vegetable intake; energy intake/ meal
2. Greene 2017	units of vegetables consumed/ tray; vegetables selection
3. Quinn 2018	proportion students consuming any vegetables; vegetables selection
4. Delaney 2019	energy intake/meal
5. Ensaif 2015	proportion selecting FV or salads

### 3. FOOD PROVISION

#### 3a. Provision of fruits/vegetables at school (5 cluster RCTs, 11 PCS)

- may increase intake of fruits/vegetables slightly (low certainty evidence);
- likely makes little to no difference to the consumption of unhealthy foods or to energy intake (moderate certainty evidence);
- may increase BMI slightly (low certainty evidence).

#### 3b. Provision of school meals (11 cluster RCTs, 1 RCT, 13 PCS)

- likely makes little to no difference to consuming healthy items at breakfast to consuming unhealthy items or to BMI (moderate certainty evidence);
- effects on energy intake are very uncertain (very low certainty evidence).

#### 3c. Provision of milk at school (1 cluster RCT, 1 RCT)

- likely increases selection of milk (moderate certainty evidence).

Critical outcome [certainty of the evidence]	Favors control	Unclear effect; potentially favors control	No difference in effect	Unclear effect; potentially favors intervention	Favors intervention
Consumption of healthy FNABs ●○○○			1 3 14	4 9	2 5 6 7 8 11 12 13
Consumption of discretionary FNABs ●○○○			3	11	
Diet: energy intake ●○○○		11			
Purchasing behavior/sales data ●○○○					
Nutrient/calorie content of food					
Exposure to marketing of FNABs					
Anthropometry (overweight/obesity) ●○○○	1	10			

#### Direct school meal provision

Study	Outcome
1. Chellappah 2015	total vegetable intake score; BMI
2. Ashfield-Watt 2009	portions fruit/school day
3. Moore 2008	portions fruit/school day; servings sweets/chocolates/ biscuits
4. He 2009	portions of FV/day
5. Fogarty 2007	% per school eating fruit everyday
6. Jamelske 2012	proportion eating vegetables at snack time
7. Hass 2018	frequency FV intake/day
8. Methner 2017	frequency FV intake/day
9. Verdonschot 2020	g FV /day
10. Mongwa 2005	BMIZ
11. Bartlett 2013	cups of FV consumed daily; consumption of cookies, cakes; kcal consumed/day
12. Bica 2012	FV intake
13. Reinaerts 2008	FV intake
14. Eriksen 2003	FV intake

## KEY

### CERTAINTY OF THE EVIDENCE

●○○○ Very low ●●○○ Low ●●●○ Moderate ●●●● High

### STUDY DESIGN

● RCT ● Prospective controlled study ● Interrupted time series study

### NOTES

Each bar represents one study | The number in each bar corresponds to the number of the study in the list above | The grey shaded area is characterized by uncertainty regarding the effect (e.g. a RR of 1.02, with a 95% CI of 0.91 to 1.15 will be found under 'Unclear effect; favors intervention'. However, based on the 95% CI we can see that this intervention could also be harmful. | The darker grey column in the centre indicates the 95% CI crosses the null and is narrow

## CONCLUSION

The body of evidence indicates that interventions that address the school food environment may have modest beneficial effects on certain key outcomes. Implementation of these interventions should consider the local context and factors that would enable or limit implementation. Most of the evidence currently included in the review is from high-income countries and it would therefore be important to take this into consideration when making decisions about implementation of these interventions in lower-income settings

## ADVOCACY MESSAGE

A number of school food interventions have been evaluated and can positively impact the key outcomes in children. Implementation of these interventions should consider the evidence from this systematic review alongside local context and factors that would enable or limit implementation.