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

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BACKGROUND

Globally, one in three children under five years is undernourished or overweight, and half suffer from hidden hunger due to nutrient deficiencies.¹ 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.^{2,3}

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

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 foo
- 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	Nutrition stand healthy food Study
Consumption of healthy FNABs					7	 Johnson 2016 Kocken 2012
Consumption of discretionary FNABs					7	 Cullen 2006 % Corvalan 2008
Diet: energy intake					1	 Corvalan 2008 Corvalan 2008 Corvalan 2008
Purchasing behavior/sales data ●○○○		3	8	2		7. Schwartz 2009
Nutrient/calorie content of food						
Exposure to marketing of FNABs						8. Bartholomew 2006
Anthropometry (overweight/ obesity)			5 6		4	

KEY

CERTAINTY OF THE EVIDENCE

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

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

References

- ¹ UNICEF 2019. The State of the World's Children 2019. Children, Food and Nutrition: Growing well in a changing world. New York: UNICEF.
- ² WELKER, E., LOTT, M. & STORY, M. 2016. The School Food Environment and Obesity Prevention: Progress Over the Last Decade. Current Obesity Reports, 5, 145-155. ³ WORLD HEALTH ORGANIZATION 2018. Global nutrition policy review 2016-2017: country progress in creating enabling policy environments for promoting healthy diets and nutrition. Geneva: World Health
- Organization, Licence: CC BY-NC-SA 3.0 IGO.

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:
 - 1) Nutrition standards/ rules that determine the quality of food served or sold in and around schools, 2) 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),
 - 4) Pricing policies to promote healthier alternatives (e.g. healthy food subsidies; higher cost of unhealthy options),
 - 5) 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.

bds and beverages (low	 2a. Changes to food may increase effect on end 2b. Changes in food may increase evidence); may increase evidence). 	presentati e intake of e the selec ergy intake positionin se the con e the selec	ion (7 cluster RCTs) healthy foods (low of tion of target foods is very uncertain (ver g (2 cluster RCTs, 3 sumption of water tion of target foods	certainty evider (low certainty e y low certainty e PCS) (low certainty (low certainty	20 evidence); 20 evidence).	Reduction of may reduction of may reduction of the may reduced of the may reduced of the may certa of t
ards re availability of Outcome monthly energy density proportion of favourable products sold weekly sales for fruit/ juice/ vegetables early Obesity trends middle Obesity trends late Obesity trends	Critical outcome [certainty of the evidence]Consumption of healthy FNABsOOConsumption of discretionary FNABsDiet: energy intakeOOPurchasing bobavior/salos data	Favors control	Unclear effect; potentially favors control	No difference in effect 1 3	Unclear effect potentially fav intervention	et; Favor ors interven
standards; consumption of salty snacks excluded by nutrition standards selection low-fat entrees	 Nutrient/calorie content of food Exposure to marketing of FNABs Anthropometry (overweight/ obesity) 					
ective controlled study Inte	errupted time series study	NOTES • Each b	par represents one st	udy • The nur the num	mber in each ba	ar correspond in the list abo

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.

SEARCH RESULTS Figure 1. PRISMA flowchart of study select • We included 74 unique studies: # of records identified through data 32 PCS - 34 cluster RCTs # of obviously irrelevant records exclude - 3 RCTs 5 ITS studies • Studies included between 23 to 24,291 # of duplicate records discarded: 6,860 (1,0 participants and one to 235 schools • Most studies were conducted in high-income # records for title and abstrac countries # full - text reco # records included: 99 (94+5) # unique studies included: 74

of portion sizes served (5 cluster RCTs) reduce energy intake slightly (low certainty evidence). nudging strategies (3 cluster RCTs, 2 PCS) / makes little to no difference to vegetable intake (moderate

ainty evidence); bably reduces energy intake (moderate certainty evidence); make little to no difference to selecting vegetables (low ainty evidence).

	Study	Outcome
1.	Marcano-	vegetable intake; energy intake/
	Olivier 2019	meal
2.	Greene 2017	units of vegetables consumed/tra
		vegetables selection
3.	Quinn 2018	proportion students consuming a
		vegetables; vegetables selection
4.	Delaney 2019	energy intake/meal
5.	Ensaff 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) 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).

Letrainty of rule evidence) Control control Determining control Determining intervention Determining intervention Determining intervention Determining control Determining control <thde< th=""><th></th><th>Favors</th><th>Unclear effect;</th><th>No difference</th><th>Unclear effect;</th><th>Favors</th><th>Dir</th><th>ect school mea</th><th></th></thde<>		Favors	Unclear effect;	No difference	Unclear effect;	Favors	Dir	ect school mea	
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14. Eriksen 2003 FV Intake	obesity)						13.	Reinaerts 2008	FV intake
							14.	Eriksen 2003	FV Intake

ds to • 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 • The darker grey column in the centre indicates the 95% CI crosses the 'Unclear effect; favors intervention'. However, based on the 95% CI we can see that this intervention could also be harmful.

/OCACY MESSAGE



ion	
base searching: 28,242	# of records identified through other sources: 279
ed at title screening 3,676	WHO call for data: 275 Linked to trial registries: 3 Other WHO searches: 1
- Endnote; 5,219 - Covidence)	
screening: 17,706	# of duplicate and irrelevant recordsdiscarded: 173
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# records excluded: 16,341 ds screened: 1,471 (1,365: Data # Records excluded, with	base search; 106: Other sources) reasons: 1,285 (1,193 +92)
# records excluded: 16,341 ds screened: 1,471 (1,365: Data # Records excluded, with Wrong intervention n = 7 Wrong setting n = 46+2; Studies retracted n = 4; V	base search; 106: Other sources) reasons: 1,285 (1,193 +92) 73+21; Wrong study design n = 273+66; Duplicate n = 61; Wrong patient population n = 24+3; Wrong outcomes n = 10; Vrong comparator n = 2

• likely makes little to no difference to consuming healthy items at breakfast to consuming unhealthy items or to BMI (moderate certainty



