



**Breast Cancer Prevention Educational Interventions in Young Women: A  
Systematic Review**

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**Trabajo presentado como requisito para optar por el  
título de Magíster en Actividad Física y Salud**

**Universidad Del Rosario**

**Bogotá, 2019**

## **TESIS**

**Título: Breast Cancer Prevention Educational Interventions in Young Women:  
A Systematic Review**

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## **BREAST CANCER PREVENTION EDUCATIONAL INTERVENTIONS IN YOUNG WOMEN: A SYSTEMATIC REVIEW**

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## **ABSTRACT**

**Objective:** To determine the effectiveness of educational interventions on young women's knowledge and lifestyles for breast cancer prevention.

**Methods:** We searched CENTRAL, the Cochrane Library, MEDLINE, EMBASE, PsycINFO, and trial registers to identify experimental studies published between 2000 and 2018. Two reviewers independently selected the studies, appraised methodological quality, and rated the quality of the evidence using the GRADE approach.

**Results:** We included (900 women). One randomized-controlled trial (RCT) from Canada (745 women) and one uncontrolled trial from Colombia (N=155). Both studies were conducted in scholar settings. The Canadian RCT (START study) had low methodological quality, while the Colombian study was rated as very low quality. Very low-quality evidence suggested educational interventions might improve women's knowledge about the role of physical activity, vegetables and fruit consumption, and alcohol consumption for breast cancer prevention. We have very little confidence in the effects of educational interventions on adolescent women's behaviours, such as of physical activity, alcohol consumption, and vegetables and fruit consumption in the context of breast cancer prevention (Very low-quality evidence). Our confidence in the effect of educational interventions delivered via web messages for increasing women's knowledge about the role of smoking for breast cancer prevention is limited (Low quality evidence). Similarly, low-quality evidence was identified for the effects of educational interventions to reduce women's smoking behavior.

**Conclusion:** Firm statements on the effects of educational interventions on young women's knowledge and lifestyles for breast cancer prevention are precluded due to the very low-to-low quality of the available evidence. Further well-conducted RCTs with larger samples, more standardized methodologies, and better-reported interventions are warranted.

## **BACKGROUND**

Cancer is a public health problem which burden is rising. The Global Burden of Diseases reported around 10 million cancer deaths in 2017 (1). Breast cancer (BC) is the most common type of cancer among women worldwide with more than half million deaths in 2015, which is expected to increase a 70% by 2030 (2). BC diagnoses among adolescents and young women has increased in the last decades, accounting for 7% of the cancers in this population (3). Most of these diagnoses are attributed to modifiable risk factors, such as sedentarism, alcohol consumption, smoking, and obesity (4). It is widely known that at least half of all cancers can be prevented through the adoption of a healthy lifestyle (5,6). In 2019, Wanqin Chen et al., reported that around 45% of cancer death in China could have been prevented through educational interventions targeting modifiable risk factors, such as sedentarism, smoking, alcohol consumption, and dietary factors (7). In Colombia, the National Plan for Cancer Control 2012-2020 indicates that the proportion of deaths attributed to lifestyle factors varies from 69% to 91%, suggesting that its adequate control may significantly reduce overall cancer mortality (8).

The World Health Organization (WHO), the National Cancer Institute (NCI) and the Center for Disease Control and Prevention (CDC) among others recognize smoking, excessive alcohol consumption and obesity as modifiable risk factors for developing BC (9,10). Other terms such as “protective factors” are used when referring to the role of physical activity and fruits and vegetables consumption for BC prevention (11–13). In 2009, the Million Women study showed that the relative risk of BC increases between 9% and 14% for every 10g of alcohol consumed per day (14). Other studies have also estimated that physically inactive women have a 25% greater risk of the disease than active women (15,16), whereas smoking may increase the risk of BC in 24%, and 61% when acquired before the first menstrual period (17). A recent cohort study showed that women who did adhere a Mediterranean diet had a 40% lower risk of BC than those who did not (18). According to The Third Expert Report 2018 of World Cancer Research Fund and American Institute for Cancer research, there is strong evidence that undertaking

vigorous physical activity and no consuming alcoholic drinks decreases the risk of premenopausal breast cancer. (19–21)

In spite of compelling evidence about the relevance of healthy lifestyles for BC prevention (22), numerous studies have showed young women's knowledge on this regard is very low (23–27). This leads to recognize public health interventions as a crucial element for cancer control programs, as they might facilitate behavior change among young women. (28) To date most of the research on educational interventions in this field have focused on either breast health or breast self-examination (29)(30). Thus, current research about the effects of educational interventions for young women has focused on breast self-examination and on the role of non-modifiable risk factors for breast cancer, whereas the effects for raising young women's knowledge on modifiable lifestyles risk factors for BC remain unknown.

## **METHODS**

This systematic review was conducted according to the recommendations published by the Cochrane Collaboration (31) and reported in line with the PRISMA statement (32). The research protocol was registered in PROSPERO (registration number: CRD42017077668).

### **Selection criteria**

The selection criteria were defined according to the PICO acronym (i.e., population, intervention, comparison, outcomes and study design), as follows:

#### *Type of studies*

Based on the guidance from the Cochrane EPOC group (the Effective Practice and Organization of Care) we included randomized controlled clinical trials (RCTs), non-randomized controlled clinical trials, and interrupted time series. (33) See glossary in [appendix 1](#).

### *Types of participants*

Women (aged from 13-24) (34) who referred themselves to be healthy and free from previous cancer diagnoses.

### *Type of Intervention*

Educational interventions aiming to increase knowledge in young women about both risk factors and lifestyles for breast cancer prevention. These interventions were defined as any structured process aiming to promote dialogue among women, and that facilitates learning processes (35). Interventions must have included topics on risk factors for breast cancer, early detection, and the role of lifestyles in BC prevention (e.g., physical activity and fruits and vegetables intake, smoking and alcohol consumption). Any delivery format was accepted for inclusion (e.g., written, oral, or online). Studies that evaluated at least one educational session, in which the outcome of interest was measured or previously informed through validated instruments. (36)

### *Setting*

We did not limit neither setting nor delivery format for the educational interventions.

### *Comparison*

Inactive control groups (e.g., no intervention) as well as parallel active interventions, such as physical exercise, diet, and any other education intervention.

We excluded studies involving different types of cancer and not exclusively to BC. Studies focusing on BSE? were also excluded.

### **Outcome measures**

### *Primary outcomes*

1. Women's knowledge about behavioural risk factors for breast cancer evaluated through the use of validated scales (e.g., Breast Cancer Awareness Measure (BCAM)). (37)
2. Behavioural change (e.g., physical activity, alcohol consumption, smoking, and vegetables and fruit consumption). Both objectives and subjective measures were considered for inclusion.

### *Secondary outcomes*

1. Women's motivation and intention towards breast cancer prevention measures.
2. Adverse effects of either receiving the educational intervention or related to false positive results of any symptom, such as increased anxiety.

## **Search Methods**

### *Electronic Search*

A research librarian (LN) formulated, tested, and run a systematic literature search in the following databases: The Cochrane Central Register of Controlled Trial (CENTRAL), MEDLINE (OVID), EMBASE (OVID), PsycINFO. The search was restricted to studies published between 2000 and July 2018), in Spanish, English and Portuguese. One reviewer updated the search strategy in MEDLINE during April 2019 but found no additional references. The search strategy is presented in [Appendix 2](#).

A reviewer (SB) searched for ongoing studies in the following registries:

- The Clinical Trials Search Portal (ICTRP)
- National Institute of Health clinical trials database
- International Register of Controlled Trials

## **Study selection and data extraction**



The references identified in the literature searches were exported to Rayyan (<https://rayyan.qcri.org>). Two independent (SB and NCG) reviewers screened the titles and abstracts and the full text of the studies against the inclusion criteria. We followed the data extraction form suggested by the Cochrane (38) to gather relevant information from each study, including characteristics of participants, characteristics of the interventions, comparisons, study design and results. A reviewer (SB) extracted data from the included studies and a second reviewer (JM) checked the information for accuracy. The discrepancies in these two processes between reviewers were resolved by discussion or by involving a third reviewer.

### **Risk of bias assessment**

Two reviewers (SB and JM) independently assessed the risk of bias of the included studies. The risk of bias of RCTs was systematically appraised using the Cochrane risk of bias tool, taking into account the selection, performance, attrition, reporting, and other bias (39). Non-randomized uncontrolled trials, were appraised with the Quality Assessment Tool for Before-After Studies with No Control Group of the National Heart, Lung, And Blood Institute (40). Any disagreement was resolved by consensus or, if needed, by consulting a third reviewer.

### **Data Synthesis**

Due to both the limited amount of data and the heterogeneity in the included studies, we decided to provide a narrative synthesis of the main findings. No meta-analysis was conducted.

### **Quality of evidence**

Two independent reviewers (SB, JM) applied the GRADE approach (Grading of recommendations, assessment, development, and evaluation) to evaluate the quality of the evidence (41). To rate the quality of evidence GRADE consider the following factors (42): limitations in the design and implementation of the study (risk of bias), inconsistency of results, indirectness of evidence, imprecision, and

publication bias. We ....Evidence profiles were generated using GRADEpro software (43). The following ratings were used:

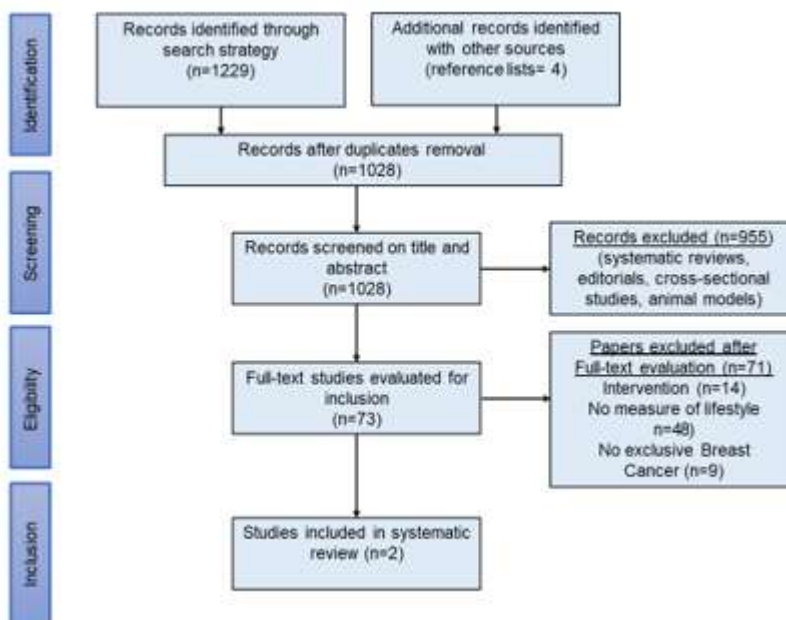
- *High quality evidence*: We are very confident that the true effect lies close to that of the estimate of the effect.
- *Moderate quality evidence*: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
- *Low quality evidence*: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect.
- *Very Low-quality evidence*: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect.

## **RESULTS**

### **Search results**

The search procedures yielded 1,233 references. After duplicates removal, 1,028 references were read at title and abstract. A total of 73 references were evaluated in full-text, two studies being finally included. The two included studies were a Canadian RCT named START (Supporting Tailored Approaches to Reducing Tobacco) (44), and a Colombian uncontrolled before and after study (45). The flow diagram is presented in Figure 1. The main reason for exclusion was the lack of reporting of primary outcomes, followed by the inclusion of older women in the post-menopausal period. See appendix 3.

**Figure 1: PRISMA flow diagram**



## Included Studies

### *Participants*

The START study (45) involved 745 adolescent women (mean age 14) from 74 Canadian schools. Six hundred.... participants completed the follow-up after six months (retention rate of 83.0%). Of the 127 participants who dropped out of the study, 59 (46.5%) belonged to the control group and 68 (53.5%) to the intervention group. In Colombia, Masso et al. 2016 (44) conducted an uncontrolled clinical trial on 155 adolescent women from a public school in Bogota [mean age 13.72 years  $\pm$  1.9 standard deviation (SD)]. All participants completed follow-up periods at one, three- and six-months post-intervention.

Both studies reported on the socioeconomic characteristics of the participants. The Colombian study (44) included adolescents from low-income families, whereas about 85% of the participants in the START study were from families with a regular income equal to or below the average. Moreover, about eight percent of the participants in the START study (45) identified themselves as aboriginal. Finally, Masso et al. 2016 (44) excluded adolescents who reported

pregnancy or breast-feeding; while the START study (45) did not report its exclusion criteria, except for non-smoking behavior.

### *Intervention*

Three educational interventions aiming to increase knowledge about the behavioral risk factors for breast cancer were evaluated in the two included studies (44,45). The START (45) study facilitated two active interventions, the first one consisted of an educational intervention using material created by the study authors, which was defined as sensitive to the aboriginal status of the participants. The advertising messages alluded to smoking as a risk factor of breast cancer. This intervention is defined as the “intervention group” in this systematic review. On the other hand, the second intervention (treated as control group) delivered the same message but followed educational material produced by the Canadian government. Both interventions provided the educational material in a single session (i.e., web message), after that the adolescent girls answered “yes” to be interested in receiving information about the link between smoking and breast cancer.

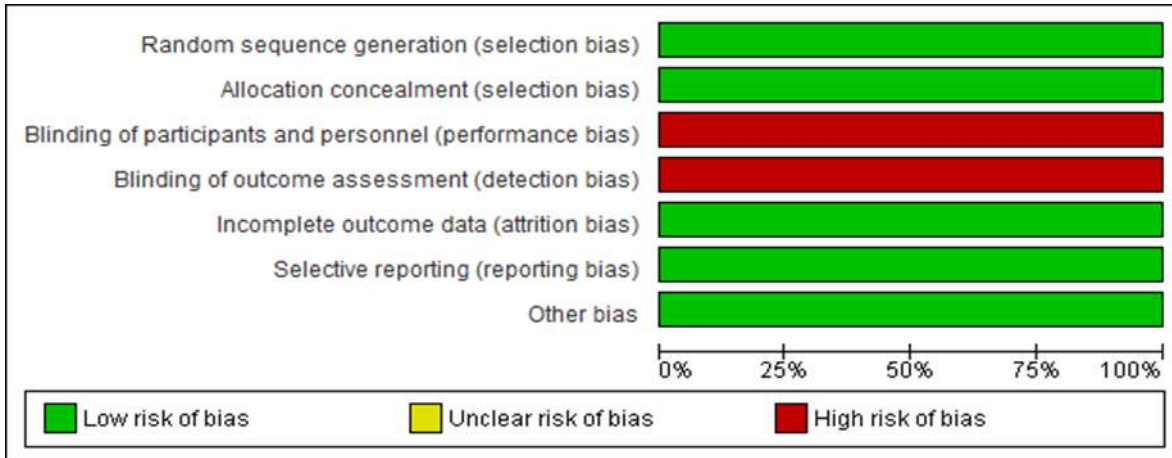
The Colombian study (44) evaluated an school-based intervention, which aimed to raise knowledge about healthy practices and behaviors related to breast cancer prevention in adolescent women. The educational intervention was developed in accordance with the national guidelines for educational communication in the framework of cancer control in Colombia (35). The authors articulated the intervention contents to the school curriculum and facilitated two 90-minute educational sessions, in which authors used different resources such as videos, presentations and open discussions. Only the study by Masso et al. 2016 (44) included in its educational content other lifestyle risk factors associated with breast cancer, such as fruit and vegetable consumption, alcohol consumption, and sedentary lifestyle.

### **Risk of bias of the included studies**

The START study (45) showed a high risk of performance and detection bias due to the lack of blinding of participants, personnel and outcome assessors (see Figure

2). In the Colombian study (44), two out of the twelve items were rated as bad (i.e., high risk of bias): small sample size and blinding outcome assessors (see table 1).

**Figure 2: Risk of bias of the START study (45)**



**Table 1: Risk of Bias of the Colombian Study (44)**

| Criteria                                                                                                                                                              | Qualification |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Was the study question or objective clearly stated?                                                                                                                   | Good          |
| Were eligibility/selection criteria for the study population pre-specified and clearly described?                                                                     | Good          |
| Were the participants in the study representative of those who would be eligible for the test/service/intervention in the general or clinical population of interest? | Good          |
| Were all eligible participants that met the pre-specified entry criteria enrolled?                                                                                    | Good          |
| Was the sample size sufficiently large to provide confidence in the findings?                                                                                         | Bad           |

| <b>Criteria</b>                                                                                                                                                                                                         | <b>Qualification</b> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| Was the test/service/intervention clearly described and delivered consistently across the study population?                                                                                                             | Good                 |
| Were the outcome measures pre-specified, clearly defined, valid, reliable, and assessed consistently across all study participants?                                                                                     | Good                 |
| Were the people assessing the outcomes blinded to the participants' exposures/interventions?                                                                                                                            | Bad                  |
| Was the loss to follow-up after baseline 20% or less? Were those lost to follow-up accounted for in the analysis?                                                                                                       | Good                 |
| Did the statistical methods examine changes in outcome measures from before to after the intervention? Were statistical tests done that provided p values for the pre-to-post changes?                                  | Good                 |
| Were outcome measures of interest taken multiple times before the intervention and multiple times after the intervention (i.e., did they use an interrupted time-series design)?                                        | Good                 |
| If the intervention was conducted at a group level (e.g., a whole hospital, a community, etc.) did the statistical analysis take into account the use of individual-level data to determine effects at the group level? | Not applicable       |

## **Effect of interventions on outcome measures**

### **Primary outcome measures**

Data were not available for all primary outcome measures. In Colombia, Masso et al. (44) reported on women's knowledge about three behavioral risk factors for breast cancer: physical activity, alcohol consumption and vegetables and fruit consumption. In Canada, the START study (45) reported on women's knowledge about the link between smoking and breast cancer.

## **Women's knowledge about behavioral lifestyle risk factors**

### *Smoking*

The START study (45) reported that the number of adolescent women who identified smoking as a risk factor for breast cancer was higher in the intervention group relative to those in the control group (Intervention 96/242 (39.7%) vs. Control 107/376 (28.5%)). Furthermore, the authors found an increase in women's knowledge about the risk associated to second-hand cigarette smoke exposure four both groups (Intervention 199 (88.8%) vs. Control 252 (80.3%)) .

### *Physical activity*

In Colombia, Masso et al. 2016 (44) reported statistically significant increases in women's knowledge about the role of physical activity as a protective factor for breast cancer (i.e., about forty percent of the participants acknowledged that not reaching at least 150 minutes per week of physical activity was a risk of developing breast cancer). Hence, women's knowledge increased by 76.7 % at the first month follow-up, by 76.1 % at third month follow-up and by 92.9% at six months' follow-up.

### *Vegetables and fruit consumption*

Masso et al. 2016 (44) reported that women's knowledge about low? consumption vegetable and fruits increased by 49% at the first month follow-up, by 78% at third month follow-up and by 91.6% at six months' follow-up ( $p < 0.05$ ).

## **Behavioral change measures**

Both studies reported on smoking as a measure of women's lifestyle. Only the Colombian study (44) provided data about measures of physical activity, alcohol consumption, smoking, and vegetables and fruit consumption.

### *Smoking*

The START study (45) found that the intervention group (i.e., educational message created by the authors) reported less smoking than peers in the control

group (government preventive material) (Adjusted Risk Relative (ARR): 1.14 (95%CI, 0.48-2.69)). In addition, authors observed a reduction for secondhand smoke exposure (Intervention 161/196 (82.1%) vs Control 241/296 (81.4%)). In the Colombian study, Masso et al. (44) reported on women's smoking behavior with no differences at 3- and 6-months post-intervention ( $p > 0.05$ ).

#### *Alcohol consumption*

The Colombian study (44) reported that the educational intervention led to statistically significant reductions in the number of adolescents who reported weekly alcohol consumption throughout the three follow-up periods (pre intervention 27 (17.4%) vs at 6 months post-intervention 18 (11.6%)).

#### *Vegetables and fruit consumption*

The Colombian study (44) reported statistically significant increases by 40% in vegetable consumption at six months follow-up, whereas no significant changes were reported for fruit consumption.

#### *Physical Activity*

The Colombian study (44), the levels of physical activity increased by 9.1 % at the first month follow-up, by 67.7 % at third month follow-up, and up to 85.1% at six months follow-up. These increases reached statistical significance.

### **Secondary outcome measures**

Scarce data were available for secondary outcome measures (44,45). None of the two studies reported on adverse effects. The START study reported women's motivation and intention towards breast cancer prevention.

#### ***Women's motivation towards behavioural change***

The START study (45) reported that the number of adolescent women referred no intentions to try smoking in the future increased at six months follow-up (Intervention 180/231 (77.9%) vs Control 279/354 (78.8%)).



## Quality of evidence

We found low quality evidence for the effects of educational interventions for increasing women's knowledge about the role of smoking as a breast cancer risk factor. Similar quality was found on the change of smoking behavior among adolescents. Very low-quality from an observational study.... evidence was found about effects on both women's knowledge and behavior change about the following behavioral factors: physical activity, alcohol, vegetables and fruit consumption. See Table 2.

**Table 2: Evidence profile**

| Certainty Assessment                                                                                                                                                            |                             |                          |                          |                          |                           | Certainty        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|--------------------------|--------------------------|--------------------------|---------------------------|------------------|
| No of studies                                                                                                                                                                   | Study design                | Risk of bias             | Inconsistency            | Indirectness             | Imprecision               |                  |
| Women's knowledge about behavioural risk factors for breast cancer related to lifestyle (smoking) for BC (assessed with: surveys)                                               |                             |                          |                          |                          |                           |                  |
| 1 <sup>a</sup>                                                                                                                                                                  | Randomized controlled trial | Not serious <sup>c</sup> | Not serious <sup>d</sup> | Not serious <sup>e</sup> | Very serious <sup>f</sup> | ⊕⊕○○<br>LOW      |
| Women's knowledge about behavioural risk factors for breast cancer related to lifestyle (physical activity, alcohol, vegetables and fruit consumption) (assessed with: surveys) |                             |                          |                          |                          |                           |                  |
| 1 <sup>b</sup>                                                                                                                                                                  | Observational studies       | Not serious <sup>g</sup> | Not serious              | Not serious <sup>e</sup> | Very serious <sup>f</sup> | ⊕○○○<br>VERY LOW |

| Certainty Assessment                                                                                                                         |                                    |                          |                          |                          |                           | Certainty        |
|----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--------------------------|--------------------------|--------------------------|---------------------------|------------------|
| No of studies                                                                                                                                | Study design                       | Risk of bias             | Inconsistency            | Indirectness             | Imprecision               |                  |
| Behavioural change measures related to lifestyle: smoking (assessed with: surveys)                                                           |                                    |                          |                          |                          |                           |                  |
| 1 <sup>a</sup>                                                                                                                               | Randomized trials <sup>b</sup>     | Not serious <sup>c</sup> | Not serious <sup>d</sup> | Not serious <sup>e</sup> | Very serious <sup>f</sup> | ⊕⊕○○<br>LOW      |
| Behavioural change measures related to lifestyle (physical activity, alcohol, and vegetables and fruit consumption) (assessed with: surveys) |                                    |                          |                          |                          |                           |                  |
| 1 <sup>a</sup>                                                                                                                               | Observational studies <sup>a</sup> | Not serious <sup>g</sup> | Not serious              | Not serious <sup>e</sup> | Very serious <sup>f</sup> | ⊕○○○<br>VERY LOW |

- a. The START Study (45)
- b. The Masso 2016 et.al study (44) also provides information on this result; its design is an uncontrolled before-and-after trial.
- c. Risk of bias was "not serious". No blinding of neither participants nor outcome assessors.
- d. There is no heterogeneity between the study groups and the effect sizes are expected.
- e. The studies fully answer the PICO question of this systematic review.
- f. Limited number of studies.

- g. No major methodological concerns. Overall risk of bias assessment was " Good"

## **DISCUSSION**

### **Main findings**

This systematic review summarized experimental evidence on the effectiveness of educational interventions on young women's knowledge and lifestyles for breast cancer prevention. Two experimental studies that involved 900 young women were included in the analysis. The studies were conducted in Colombia and Canada (44,45). The Colombian study included four measures of women's knowledge and behavioral change (i.e., physical activity, alcohol consumption, smoking and vegetables and fruits consumption), whereas the START study measured only knowledge and changes on adolescents' smoking behavior and second-hand exposure.

The START study (45) reported significant improvements in adolescents' knowledge about the role of smoking and second-hand smoke exposure as risk factors for breast cancer. Similar effects were reported in the Colombian study (44) for the role of physical activity and fruits and vegetables consumption. Regarding behavior change, the START study (45) found that an educational intervention reduced the prevalence of smoking and secondhand exposure in adolescent women, whereas the Colombian study (44) found no significant effects on this outcome. On the contrary, the Colombian study (44) reported favorable changes in adolescents' behaviors for alcohol, fruits and vegetables consumption, and physical activity.

### **Strengthens and weaknesses**

The main strength of this systematic review is the focus on adolescents' knowledge about the risk factors for breast cancer, which goes beyond the traditional focus on BSE in this field. In addition, this systematic review was conducted following the most accepted methodological standards, such as the Cochrane standards for

systematic reviews of interventions (39). Further, the use of the GRADE approach for evaluating the quality of the evidence is highlighted as strength in terms of the methodological rigor.

It is possible that studies published in languages other than English, Spanish or Portuguese might contribute to the lack of studies reflected in the imprecision of the results. However, this statement might be counteracted by the limited number of studies. In spite of the differences in the study designs between the two studies, both of them responded to the research question formulated in this systematic review. The external validity of our findings is also constrained due to the limited number of studies available. The two studies included different populations, especially with regard to sociodemographic variables, such as income and ethnicity. In addition, the generalizability of our findings will depend on the context in which the interventions are carried out; the Colombian study delivered the educational intervention in a face-to-face manner, whereas the Canadian study used web messages. Therefore, more uniform methodological procedures are warranted.

### **Comparison with previous research**

We did not find other systematic reviews that evaluated the effects of educational interventions on adolescent women's knowledge and lifestyles for breast cancer prevention. None of the systematic reviews addressed the role of lifestyles for breast cancer prevention in their educational interventions. In 2017, a Cochrane review concluded that brief educational interventions might improve women awareness on breast cancer symptoms and the frequency of BSE (31). In the same year, Anastasi and Lusher found that educational interventions increased the frequency of BSE and the likelihood of screening behaviors, such as mammogram. (46)

### **Implications for practice and further research**

Our findings might serve as a mean to encourage further studies that articulate the role of behavioral risk factors for breast cancer with the practice of BSE

in public health campaigns and other interventions. In light of this, behavioral risk factors, women's knowledge on breast cancer, and BSE should be prioritized as key elements for the empowerment of adolescents towards a comprehensive control of breast cancer risk. Furthermore, cultural factors and socioeconomic determinants must also be taken into account in further studies.

Further research must prioritize the study of behavioral risk factors such as a diet and physical activity, as stated by the World Cancer Research Fund and American Institute for Cancer research in the Third Expert Report 2018 (15). Finally, further studies should adhere international methodological standards such as the CONSORT statement (47) and the TIDieR checklist when reporting their interventions. (48)

## **CONCLUSION**

Based on the results from two experimental studies, a RCT from Canada and an uncontrolled before-and-after study from Colombia, it is uncertain to determine whether educational interventions can increase women's knowledge about behavioural risk factors for the prevention breast cancer. We identified very low quality evidence for the effects of educational interventions on women's knowledge about the role of physical activity, vegetables and fruit consumption, and alcohol consumption for breast cancer prevention. Our confidence in the effect of educational interventions delivered via web messages for increasing women's knowledge about the role of smoking for breast cancer prevention is limited (Low quality evidence). We have very little confidence in the effects of educational interventions on adolescent women's behaviours, such as of physical activity, alcohol consumption, and vegetables and fruit consumption in the context of breast cancer prevention (Very low-quality evidence). Low evidence was identified for the effects of educational interventions to reduce women's smoking behavior. Further well-conducted RCTs including larger sample size, more standardized methodologies, and better-reported interventions are warranted.

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Income Area in Bogota, Colombia. *J Cancer Educ Off J Am Assoc Cancer Educ.* 2018;33(3):673-9.

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## APPENDIX

### Appendix 1. Glossary

**Randomized trials:** Randomization ensures that participants in each comparison group should differ only in their exposure to the intervention. All other factors that might affect the outcomes of interest should be distributed equally, provided there is a large enough sample size – whether they are known and measured or not (33).

**Non-randomized trials:** These are trials where the investigators allocated participants to the different groups that are being compared using a method that is not random. These studies have a greater risk of bias than randomized trials (33)

**Controlled before-after studies:** In controlled before-after studies, decisions about allocation to the different comparison groups are not made by the investigators. Outcomes of interest are measured in both intervention and control groups before the intervention is introduced and again after the intervention has been introduced (33).

**Interrupted time series:** studies Interrupted time series studies can provide a method of measuring the effect of an intervention when randomization or identification of a control group are impractical (33).

## Appendix 2. Search strategy

### MEDLINE

- 1 exp Breast Neoplasms/ (262387)
- 2 (breast? adj3 (cancer or neoplasm? or tumor? or tumour?)).tw. (251786)
- 3 1 or 2 (332771)
- 4 exp health promotion/ (68135)
- 5 health education/ (58586)
- 6 consumer health information/ (2939)
- 7 ((health\* or wellness or nutrition\* or diet\* or weight\* or exercis\* or physical\*  
activ\* or alcohol\* or smok\* or tobacco\*) adj3 (promotion\* or campaign\* or  
program\* or education\*)).tw. (159182)
- 8 or 5 or 6 or 7 (246145)
- 9 Child/ (1565031)
- 10 Adolescent/ (1862278)
- 11 Youth/ (1862278)
- 12 Minors/ (2494)
- 13 Young Adult/ (620208)
- 14 (adolescen\* or child\* or girl? or pubescen\* or teenager? or teen? or preteen? or  
pre-teen? or underage\* or under-age\* or youngster? or youth or young wom?n  
or young people or young person?).tw. (1483761)
- 15 9 or 10 or 11 or 12 or 13 or 14 (3416347)
- 16 3 and 8 and 15 (611)
- 17 Animals/ (6177131)
- 18 Humans/ (17043893)
- 19 not (17 and 18) (4407309)
- 20 (news or editorial or comment).pt. (1179682)
- 21 16 not (19 or 20) (608)
- 22 remove duplicates from 21 (544)

## **Cochrane Library (CDSR, DARE, CENTRAL, HTA)**

- #1 [mh "Breast Neoplasms"] 10218
- #2 (breast\* near/3 (cancer or neoplasm\* or tumor\* or tumour\*)):ti,ab,kw  
24533
- #3 #1 or #2 24539
- #4 [mh "health promotion"] 5542
- #5 [mh ^"health education"] 3551
- #6 [mh ^"consumer health information"] 121
- #7 ((health\* or wellness or nutrition\* or diet\* or weight\* or exercis\* or physical\*  
next activ\* or alcohol\* or smok\* or tobacco\*) near/3 (promotion\* or campaign\* or  
program\* or education\*)):ti,ab,kw 32769
- #8 {or #4-#7} 32845
- #9 [mh ^child] 215
- #10 [mh ^adolescent] 90800
- #11 [mh ^minors] 9
- #12 [mh ^youth] 90800
- #13 [mh ^"young adult"] 279
- #14 (adolescen\* or child\* or girl or girls or pubescen\* or teenager\* or teen or  
teens or preteen or preteens or pre-teen or pre-teens or underage\* or under-age\*  
or youngster or youngsters or youth or "young woman" or "young women" or  
"young people" or "young person" or "young persons"):ti,ab,kw 181893
- #15 {or #9-#14} 181992
- #16 #3 and #8 and #15 in Trials 65
- #17 (breast\* near/3 (cancer or neoplasm\* or tumor\* or tumour\*)) 25627

#18 #1 or #17 2563

#19 ((health\* or wellness or nutrition\* or diet\* or weight\* or exercis\* or physical\* next activ\* or alcohol\* or smok\* or tobacco\*) near/3 (promotion\* or campaign\* or program\* or education\*)) 38396

#20 {or #4-#6, #19} 38469

#21 (adolescen\* or child\* or girl or girls or pubescen\* or teenager\* or teen or teens or preteen or preteens or pre-teen or pre-teens or underage\* or under-age\* or youngster or youngsters or youth or "young woman" or "young women" or "young people" or "young person" or "young persons") 199135

#22 {or #9-#13, #21} 199234

#23 #18 and #20 and #22 in Other Reviews and Technology Assessments  
16

#24 #16 or #23 81

## **EMBASE**

1 exp breast cancer/ (382207)

2 (breast? adj3 (cancer or neoplasm? or tumor? or tumour?)).tw. (338983)

3 1 or 2 (461844)

4 health promotion/ (83953)

5 health education/ (89266)

6 nutrition education/ (3787)

7 consumer health information/ (3210)

8 ((health\* or wellness or nutrition\* or diet\* or weight\* or exercis\* or physical\* activ\* or alcohol\* or smok\* or tobacco\*) adj3 (promotion\* or campaign\* or program\* or education\*)).tw. (188026)

9 4 or 5 or 6 or 7 or 8 (304764)

10 child/ (1547419)

11 adolescent/ (1432681)

- 12 "minor (person)"/ (436)
- 13 young adult/ (190834)
- 14 (adolescen\* or child\* or girl? or pubescen\* or teenager? or teen? or preteen? or pre-teen? or underage\*or under-age\* or youngster? or youth or young wom?n or young people or young person?).tw. (1804732)
- 15 10 or 11 or 12 or 13 or 14 (3135297)
- 16 3 and 9 and 15 (549)
- 17 limit 16 to embase (265)
- 18 remove duplicates from 17 (259)

## **LILACS**

- 1 breast cancer
- 2 Breast
- 3 #1 OR #2
- 4 knowledge, attitudes, practice
- 5 awareness
- 6 breast self-examination
- 7 sedentary lifestyle
- 8 physical activity
- 9 exercise
- 10 smoking
- 11 alcohol
- 12 diet\*
- 13 #4 OR -12
- 14 #3 AND 13
- 15 educa\*
- 16 health promotion
- 17 #15 OR 16
- 18 adolesc\*
- 19 teenag\*
- 20 young\*
- 21 #18 OR #19 OR #19



22 #14 AND #17 AND #21

### **Clinicaltrials.gov**

- 1 Interventions for breast cancer preventing in Young women
- 2 Breast cancer preventing AND intervention\*
- 3 Breast cancer AND education
- 4 Breast cancer AND knowledge
- 5 Breast cancer AND Healthy life Style

### **PSYCINFO**

- 1 breast neoplasms/ (8526)
- 2 (breast? adj3 (cancer or neoplasm? or tumor? or tumour?)).tw. (11323)
- 3 1 or 2 (11573)
- 4 health promotion/ (21185)
- 5 health education/ (11787)
- 6 ((health\* or wellness or nutrition\* or diet\* or weight\* or exercis\* or physical\* activ\* or alcohol\* or smok\* or tobacco\*) adj3 (promotion\* or campaign\* or program\* or education\*)).tw. (67836)
- 7 4 or 5 or 6 (79241)
- 8 ("100" or "200" or "320").af. (1402815)
- 9 (adolescen\* or child\* or girl? or pubescen\* or teenager? or teen? or preteen? or pre-teen? or underage\* or under-age\* or youngster? or youth or young wom?n or young people or young person?).tw. (838659)
- 10 8 or 9 (1671166)
- 11 3 and 7 and 10 (345)

### **Open Single**

- 1 (breast cancer OR Breast)

2 AND (knowledge OR breast cancer awareness OR breast self-examination OR sedentary lifestyle OR physical activity OR smoking OR alcohol OR diet) AND (Educati\* OR health promotion)

### Appendix 3. Excluded studies and reasons for exclusion

| Reference                                                                                                                                                                                                                                                                                     | Reason for Exclusion                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| <p>Akhtari-Zavare M, Juni MH, Said SM, Ismail IZ, Latiff LA, Eshkoo SA. Result of randomized control trial to increase breast health awareness among young females in Malaysia. BMC public health. 2016;16(1):738.</p>                                                                        | <p>Breast self-examination as primary outcome</p>                      |
| <p>Alcoe SY, Gilbey VJ, McDermot RS, Wallace DG. The effects of teaching breast self-examination: reported confidence and frequency of practise over a six-year period. Patient Educ Couns. 1994;23(1):13–21.</p>                                                                             | <p>Breast self-examination as primary outcome and wrong population</p> |
| <p>Alsaraireh A, Darawad MW. Impact of a Breast Cancer Educational Program on Female University Students' Knowledge, Attitudes, and Practices. Journal of Cancer Education. 2017;1–8.</p>                                                                                                     | <p>Breast self-examination as primary outcome</p>                      |
| <p>Arredondo EM, Haughton J, Ayala GX, Slymen DJ, Sallis JF, Burke K, et al. Fe en Accion/Faith in Action: design and implementation of a church-based randomized trial to promote physical activity and cancer screening among churchgoing Latinas. Contemp Clin Trials. 2015;45:404–15.</p> | <p>Different types of cancer</p>                                       |

|                                                                                                                                                                                                                                                        |                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| Assaf AR, Cummings KM, Graham S, Mettlin C, Marshall JR. Comparison of three methods of teaching women how to perform breast self-examination. <i>Health Education Quarterly</i> . 1985;12(3):259–72.                                                  | Wrong population                           |
| Bartle-Haring S. Living in the context of poverty and trajectories of breast cancer worry, knowledge, and perceived risk after a breast cancer risk education session. <i>Womens Health Issues</i> . 2010;20(6):406–13.                                | Wrong population                           |
| Bernat JK, Hullmann SE, Sparks GG. Communicating breast cancer risk information to young adult women: A pilot study. <i>Journal of Psychosocial Oncology</i> . 2017;35(3):249–59.                                                                      | Wrong intervention                         |
| Bloom JR, Stewart SL, Chang S, You M. Effects of a telephone counseling intervention on sisters of young women with breast cancer. <i>PrevMed</i> . 2006;43(5):379–84.                                                                                 | Wrong population                           |
| Bowen DJ, Powers D. Effects of a mail and telephone intervention on breast health behaviors. <i>Health Education &amp; Behavior</i> . 2010;37(4):479–89.                                                                                               | Wrong population                           |
| Carstenson R, O’Grady LF. A breast self-examination program for high school students. <i>American Journal of Public Health</i> . 1980;70(12):1293–4.                                                                                                   | Breast self-examination as primary outcome |
| Chan SS, Chow DM, Loh EK, Wong DC, Cheng KK, Fung WY, et al. Using a community-based outreach program to improve breast health awareness among women in Hong Kong. <i>Public Health Nursing</i> . 2007;24(3):265–73.                                   | Breast self-examination as primary outcome |
| Chigbu CO, Onyebuchi AK, Onyeka TC, Odugu BU, Dim CC. The impact of community health educators on uptake of cervical and breast cancer prevention services in Nigeria. <i>International Journal of Gynecology and Obstetrics</i> . 2017;137(3):319–24. | Different types of cancer                  |

|                                                                                                                                                                                                                                        |                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| <p>Clark JK, Sauter M, Kotecki JE. Adolescent girls' knowledge of and attitudes toward breast self-examination: evaluating an outreach education program. <i>Journal of Cancer Education</i>. 2000;15(4):228–31.</p>                   | <p>Breast self-examination as primary outcome</p> |
| <p>Craun AM, Deffenbacher JL. The effects of information, behavioral rehearsal, and prompting on breast self-exams. <i>Journal of Behavioral Medicine</i>. 1987;10(4):351–65.</p>                                                      | <p>Wrong intervention</p>                         |
| <p>Crombie K, Hancock K, Chang E, Vardanega L, Wonghongkul T, Chanakok A, et al. Breast screening education at Australian and Thai worksites: a comparison of program effectiveness. <i>Contemporary Nurse</i>. 2005;19(1):181–96.</p> | <p>Breast self-examination as primary outcome</p> |
| <p>Cromer BA, Frankel ME, Hayes J, Brown RT. Compliance with breast self-examination instruction in high school students. <i>Clinical Pediatrics</i>. 1992;31(4):215–20.</p>                                                           | <p>Breast self-examination as primary outcome</p> |
| <p>Devi R, Singh MM, Kumar R, Walia I. An effective manual on breast self-examination. <i>World health forum</i>. 1998;19(4):388–9.</p>                                                                                                | <p>Breast self-examination as primary outcome</p> |
| <p>Dopierala S. CoppaFeel!: On a mission to educate young people about breast cancer. <i>Perspectives in Public Health</i>. 2015;135(4):170–1.</p>                                                                                     | <p>Breast self-examination as primary outcome</p> |
| <p>Ehmann JL. BSE Rap: intergenerational ties to save lives. <i>Oncology Nursing Forum</i>. 1993;20(8):1255–9.</p>                                                                                                                     | <p>Breast self-examination as</p>                 |

|                                                                                                                                                                                                                                                          |                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
|                                                                                                                                                                                                                                                          | primary outcome                                                 |
| Fatohy IM, Mounir GM, Mahdy NH, El-Deghedi BM. Improving students' knowledge, attitude and practice towards cancer prevention through a health education program. Part II. Journal of the Egyptian Public Health Association. 1998;73(5):755–85.         | Different types of cancer                                       |
| Fernandez ME, Gonzales A, Tortolero-Luna G, Partida S, Bartholomew LK. Using intervention mapping to develop a breast and cervical cancer screening program for Hispanic farmworkers: Cultivando La Salud. Health Promotion Practice. 2005;6(4):394–404. | Different types of cancer                                       |
| Ferris DG, Golden NH, Petry LJ, Litaker MS, Nackenson M, Woodward LD. Effectiveness of breast self-examination prompts on oral contraceptive packaging. Journal of Family Practice. 1996;42(1):43–8.                                                     | Breast self-examination as primary outcome                      |
| Fitzgibbon ML, Gapstur SM, Knight SJ. Mujeres Felices por ser Saludables: a breast cancer risk reduction program for Latino women. Preventive Medicine: An International Journal Devoted to Practice and Theory. 2003;36(5):536–46.                      | Wrong population                                                |
| Fry RB, Prentice-Dunn S. Effects of a psychosocial intervention on breast self-examination attitudes and behaviors. Health Educ Res. 2006;21(2):287–95.                                                                                                  | Wrong population                                                |
| Fry RB. Effects of a psychosocial intervention on breast self-examination attitudes and behaviors. Dissertation Abstracts International: Section B: The Sciences and Engineering. 2006;67(1):541.                                                        | Breast self-examination as primary outcome and wrong population |

|                                                                                                                                                                                                                                                                               |                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| <p>Gandeh MB, Milaat WA. Effect of a breast cancer health education program on the awareness and practice of jeddah female secondary school students. <i>J Family Community Med.</i> 2000;7(1):31–6.</p>                                                                      | <p>Breast self-examination as primary outcome</p> |
| <p>Guclu S, Tabak RS. Impact of health education on improving women’s knowledge and awareness of breast cancer and breast self examination. <i>Meme Sagligi Dergisi / Journal of Breast Health.</i> 2013;9(1):18–22.</p>                                                      | <p>Different types of cancer</p>                  |
| <p>Gutnik L, Moses A, Stanley C, Tembo T, Lee C, Gopal S. From Community Laywomen to Breast Health Workers: A Pilot Training Model to Implement Clinical Breast Exam Screening in Malawi. <i>PLoS ONE [Electronic Resource].</i> 2016;11(3):e0151389.</p>                     | <p>Breast self-examination as primary outcome</p> |
| <p>Hajian S, Vakilian K, Najabadi KM, Hosseini J, Mirzaei HR. Effects of education based on the health belief model on screening behavior in high risk women for breast cancer, Tehran, Iran. <i>Asian Pacific Journal of Cancer Prevention: Apjcp.</i> 2011;12(1):49–54.</p> | <p>Wrong population</p>                           |
| <p>Horton JA. Teaching breast health to adolescent females in high school: Comparing interactive teaching with traditional didactic methods. <i>Dissertation Abstracts International Section A: Humanities and Social Sciences.</i> 2012;72(8):2697.</p>                      | <p>Wrong intervention</p>                         |
| <p>Jones JA, Eckhardt LE, Mayer JA, Bartholomew S, Malcarne VL, Hovell MF, et al. The effects of an instructional audiotape on breast self-examination proficiency. <i>Journal of Behavioral Medicine.</i> 1993;16(2):225–35.</p>                                             | <p>Breast self-examination as primary outcome</p> |
| <p>Jones RM, Wallace IJ, Westerberg A, Hoy KN, Quillin JM, Danish SJ. Getting youth to Check it Out!: a new approach to teaching self-screening. <i>American Journal of Health Behavior.</i> 2015;39(2):197–204.</p>                                                          | <p>Breast self-examination as primary</p>         |

|                                                                                                                                                                                                                                                 |                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
|                                                                                                                                                                                                                                                 | outcome and wrong population                                    |
| Kalichman SC, Williams E, Nachimson D. Randomized community trial of a breast self-examination skills-building intervention for inner-city African-American women. <i>Journal of the American Medical Association</i> (1972). 2000;55(1):47–50. | Breast self-examination as primary outcome and wrong population |
| Karayurt O, Dicle A, Tuna Malak A. Effects of peer and group education on knowledge, beliefs and breast self-examination practice among university Students in Turkey. <i>Turkish Journal of Medical Sciences</i> . 2009;39(1):59–66.           | Breast self-examination as primary outcome and wrong population |
| Katic M, Lang S, Budak A. Evaluation of the general practice program of women education for breast self-examination. <i>Acta Medica Croatica</i> . 1996;50(4):185–91.                                                                           | Breast self-examination as primary outcome and wrong population |
| Kenney E, Hovell MF, Mewborn CR, Dockter B, Chin L. Breast self-examination: the effects of prescribed frequency on adherence, accuracy, and detection ability. <i>American Journal of Preventive Medicine</i> . 1988;4(3):140–5.               | Breast self-examination as primary outcome                      |



|                                                                                                                                                                                                                                                                                           |                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| <p>Khokher S, Qureshi MU, Fatima W, Mahmood S, Saleem A. Impact of a Breast Health Awareness Activity on the Knowledge Level of the Participants and its Association with Socio- Demographic Features. <i>Asian Pacific Journal of Cancer Prevention: Apjcp</i>. 2015;16(14):5817–22.</p> | <p>Breast self-examination as primary outcome-Population</p>           |
| <p>Kwok C, Koo FK, D'Abrew N, White K, Roydhouse JK. East meets West: a brief report of a culturally sensitive breast health education program for Chinese-Australian women. <i>Journal of Cancer Education</i>. 2011;26(3):540–6.</p>                                                    | <p>Breast self-examination as primary outcome and wrong population</p> |
| <p>Leslie NS, Roche BG. Evaluation of a breast examination facilitation device. <i>Journal of Advanced Nursing</i>. 1995;21(1):28–33.</p>                                                                                                                                                 | <p>Breast self-examination as primary outcome-Wrong population</p>     |
| <p>Ludwick R, Gaczkowski T. Breast self-exams by teenagers: outcome of a teaching program. <i>Cancer Nursing</i>. 2001;24(4):315–9.</p>                                                                                                                                                   | <p>Breast self-examination as primary outcome</p>                      |
| <p>Luther SL, Sroka S, Goormastic M, Montie JE. Teaching breast and testicular self-exams: evaluation of a high school curriculum pilot project. <i>Health Education</i>. 1985;16(1):40–3.</p>                                                                                            | <p>Different types of cancer</p>                                       |
| <p>Mabiso A, Williams KP, Todem D, Templin TN. Longitudinal analysis of domain-level breast cancer literacy among African-American women. <i>Health Education Research</i>. 2010;25(1):151–61.</p>                                                                                        | <p>Wrong intervention</p>                                              |

|                                                                                                                                                                                                                                                                      |                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| <p>Malak AT, Bektash M, Turgay AS, Tuna A, Genc RE. Effects of peer education, social support and self esteem on breast self examination performance and knowledge level. Asian Pacific Journal of Cancer Prevention: Apjcp. 2009;10(4):605–8.</p>                   | <p>Breast self-examination as primary outcome</p> |
| <p>Malak AT, Dicle A. Assessing the efficacy of a peer education model in teaching breast self-examination to university students. Asian Pacific Journal of Cancer Prevention: Apjcp. 2007;8(4):481–4.</p>                                                           | <p>Breast self-examination as primary outcome</p> |
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## **CONTRIBUTIONS**

1. Research protocol: JM, SB
2. Literature search: LNG
3. Study selection: JM, SB, NCG
4. Data extraction: JM, SB
5. Data analysis and rating the certainty of evidence: JM, SB, PAC, CCN
6. Risk of bias assessment: JM, SB, NCG
7. Writing up the first draft: JM, SB
8. All authors provided feedback and approved the final version of the document

## **Conflict of interests**

None to declare

## **FUENTES DE SOPORTE**

Silvia Betancur is a student of the Master's Program in Physical Activity and Health at CES University in Medellin, Colombia. This systematic review serves as a degree work for the aforementioned academic program. No financial support was received.

### External sources

José Meneses and Lien Nguyen are officials of the Norwegian Institute of Public Health. . Pablo Alonso-Coello and Carlos Canelo are officials of the Ibero-American Cochrane Center in Barcelona, Spain. No financial support has been received from these institutions.