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Do social protection programmes affect the burden of breast and cervical cancer? A systematic review

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A R T I C L E I N F O

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A B S T R A C T

Background: Socioeconomic conditions are strongly associated with breast and cervical cancer incidence and mortality patterns; therefore, social protection programmes (SPPs) might impact these cancers. This study aimed to evaluate the effect of SPPs on breast and cervical cancer outcomes and their risk/protective factors.
Methods: Five databases were searched for articles that assessed participation in PPS and the incidence, survival, mortality (primary outcomes), screening, staging at diagnosis and risk/protective factors (secondary outcomes) for these cancers. Only peer-reviewed quantitative studies of women receiving SPPs compared to eligible women not receiving benefits were included. Independent reviewers selected articles, assessed eligibility, extracted data, and assessed the risk of bias. A harvest plot represents the included studies and shows the direction of effect, sample size and risk of bias.
Findings: Of 17,080 documents retrieved, 43 studies were included in the review. No studies evaluated the primary outcomes. They all examined the relationship between SPPs and screening, as well as risk and protective factors. The harvest plot showed that in lower risk of bias studies, participants of SPPs had lower weight and fertility, were older at sexual debut, and breastfed their infants for longer.
Interpretation: No studies have yet assessed the effect of SPPs on breast and cervical cancer incidence, survival, or mortality; nevertheless, the existing evidence suggests positive impacts on risk and protective factors.

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1. Introduction

Women are disproportionally more likely than men to die from cancer at a young age, particularly from breast and cervical cancer, which are potentially preventable if diagnosed and treated early [1]. These two types of cancer are closely associated with socioeconomic conditions. While breast cancer is more common in women with better life conditions, cervical cancer is more common among the poorest, those with little schooling and poorer access to healthcare [2]. However, when it affects poorer women, breast cancer is more lethal, probably due to their difficulty in accessing healthcare services [3]. The reduction in mortality from both of these types of cancer in high-income countries over recent decades is the result of earlier diagnosis in symptomatic women and the availability of organised, population-based screening programmes for asymptomatic women, with consequent earlier diagnosis and treatment at initial stages of the diseases [3–5].

In various parts of the world, social protection programmes (SPPs), in addition to breaking the intergenerational reproduction of poverty in families, have reduced poverty and improved participants' education and health [6]. The United Nations' definition of poverty is "about not having enough money to meet basic needs including food, clothing and shelter" [7]. The World Health Organization was more specific and defined poverty in absolute terms of low income – less than US$2 a day, for example [8]. SPPs, in general, accepted eligible families with earned income that was below the cut-off of the poverty line of each country, in absolute terms. Nevertheless, SPPs are surrounded by controversies, some of them of ethical nature. When programs are not universal, the definition of who will receive the benefits can lead to distortions in communities with characteristics of generalised poverty, drawing a line between beneficiaries and non-beneficiaries that may not make sense to the target populations. Another issue is the duration of the programs and how to prepare populations to exit them, especially when there is a cash transfer and financial support ceases [9]. Conditional cash transfer programmes – when compliance with certain actions usually related to health or education are required to receive benefits – or even without conditionalities have had a positive effect on nutrition, health, education and cognitive development [10,11]. The requirement of conditionalities itself has its ethical issues highlighted. They have been considered paternalistic, inefficient, stigmatising and barriers to granting the benefit, among other problems. Furthermore, it tends to impose a burden of obligations on women, which results in the use of a large part of their time to comply with them [9,10,12]. Despite this debate, the potential socioeconomic benefits of SPPs justified their adoption. Furthermore, they have been related to improvements in the health levels of populations, with positive results in several health indicators. Better life conditions resulting from these programmes might alter risk factors for breast and cervical cancer. Changes in reproductive patterns – delaying childbearing, increasing contraceptive use, reducing family size and breastfeeding [13] – and weight increase [14] might lead to a rise in the incidence of breast cancer in women participating in SPPs. Conversely, delaying the age of sexual debut and reducing family size might reduce the risk of cervical cancer [15]. Evidence has shown that resources received from income transfer programmes, irrespective of conditionalities, are not particularly spent on alcohol or tobacco [6], both risk factors for breast and cervical cancer, respectively [16,17].

The increased use of healthcare services in general [10] and conditionalities involving sexual and reproductive healthcare in some programmes might encourage women to undergo screening for these types of cancer and to comply with the vaccination schedule for children, including vaccination against human papillomavirus (HPV) and potentially protecting against the future occurrence of cervical cancer [18,19].

Previous reading of the literature on the topic to build our research protocol did not find articles that showed direct or indirect effects of SPPs on chronic noncommunicable diseases, particularly cervical and breast cancer, the most common forms of cancer in women.

In this study, a systematic review was performed on the effect of social protection programmes on breast and cervical cancer outcomes and their risk and protective factors.

2. Methods

This systematic review included original, quantitative, peer-reviewed studies published up to May 27, 2022, with no initial time limit, that investigated women (population) receiving benefits from SPPs (exposure/intervention), comparing them to women with similar socioeconomic conditions who were eligible for the programmes but were not receiving benefits (comparison). The primary outcomes were the incidence of breast and cervical cancer and the respective mortality rates. Secondary outcomes were the use of screening services, staging at diagnosis, and risk or protective factors for breast cancer (age at menarche, age at birth of first child, fertility, breastfeeding, hormonal contraception use, alcohol use, sedentary lifestyle, obesity, and hormone replacement therapy use). For cervical cancer, secondary outcomes were HPV infection and vaccination, smoking, use of hormonal contraceptives, age at sexual debut, and number of sexual partners.

SPPs were defined as programmes aimed primarily at reducing poverty. Conditional and unconditional SPPs, food subsidies, housing benefits, microcredit, and water subsidy programmes were of interest. A search was made of five databases: PubMed, CINAHL, LILACS, Web of Science, and Google Scholar, with no limitations regarding geographical location or date. LILACS and Google Scholar were used to search for relevant grey literature. References in the included studies were screened (backward searching). Articles written in Portuguese, English, Spanish, French, German, and Italian were considered for inclusion.

Four searches were conducted, two for each of the two types of cancer evaluated here, based on population, exposure or intervention, and primary and secondary outcomes. Searches related the SPP to each type of cancer and to the primary and secondary outcomes (Appendix A). This strategy was structured for use with PubMed and adapted for the other databases using the Systematic Review Accelerator (Institute for Evidence-Based Healthcare, Bond University, https://sr-accelerator.com/#/polyglot). This systematic review was registered at PROSPERO, reference CRD42020202197.

2.1. Study selection and data extraction

The following inclusion criteria were adopted: i) original, quantitative, peer-reviewed studies; ii) studies on women; iii) studies in which the effects of at least one SPP were analysed; and iv) studies that evaluated outcomes associated with breast or cervical cancer or their respective risk or protective factors. The following were excluded: i) studies in which comparison groups were not eligible for SPPs; ii) studies whose outcomes involved only social determinants; iii) studies that evaluated medical, surgical, behavioural, or mental health-related interventions or programmes aimed at subsidizing the purchase of pharmaceutical drugs; and iv) studies written in languages other than those specified. Exclusions, performed by independent pairs of investigators, occurred at every step in the review, with any differences being settled by a third reviewer.

Records retrieved from databases and manual searches were stored in Mendeley Reference Manager, where any duplicates were eliminated, with the initial selection beginning with titles and abstracts. Subsequently, the articles were assessed for eligibility, followed by a complete reading of the texts to extract relevant information (Appendix B).

2.2. Analysis

2.2.1. Evaluation of risk of bias

The Study Quality Assessment Tools developed by the National Heart, Lung, and Blood Institute of the National Institutes of Health (USA) were used to assess the risk of bias, with different instruments

developed for each study design [20]. These instruments contain questions that evaluate possible failings in the study methodology or operationalization, with possible answers being "yes", "no", "cannot determine", "not applicable" and "not reported". In the present study, three evaluators scored each article as a sum of the positive responses. The mean of these scores was used to calculate tertiles establishing a low, moderate or high risk of bias (Tables S1 and S2) [21]. Stata, version 17.0 (StataCorp LLC, College Station, Texas, USA) was used to calculate tertiles.

2.2.2. Harvest plot

A harvest plot was constructed representing studies grouped according to outcomes and separated according to the direction of effect (decreased or increased) or whether no effect was found. It was chosen because it is a vote-counting method, one of the recommended methods for visual display and transparent presentation of data in non-*meta*-analytic reviews, that shows the direction of the effect found in each study [22,23]. In addition, colours were used to identify the established risk of bias: green, yellow, or red – low, moderate, or high risk of bias, respectively. The harvest plot was built using the R program, version 4.0.0 (R Core Team, 2021).

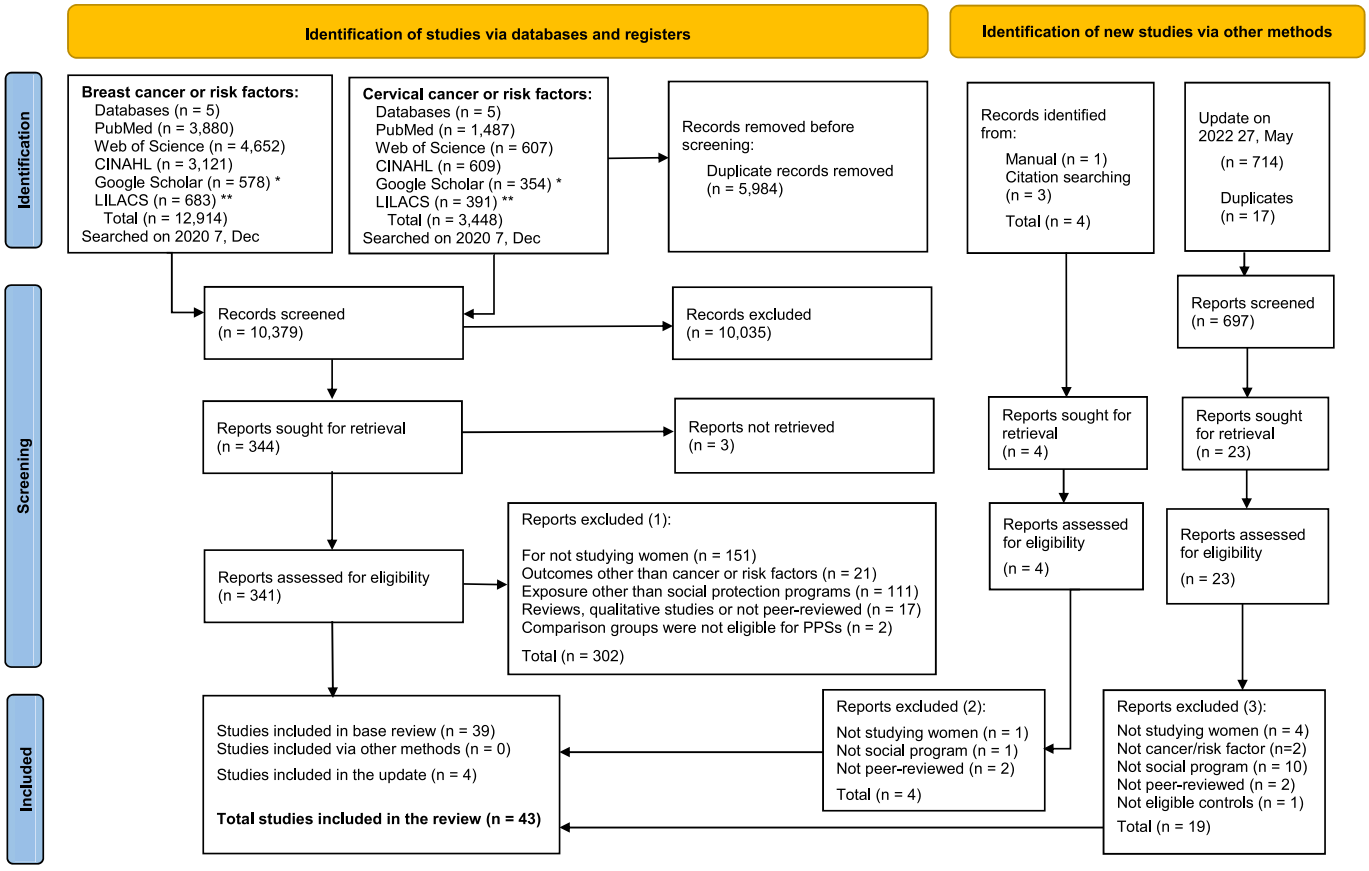
2.2.3. Ethical aspects

This systematic review did not require approval from the local Ethics Committee, as it brought together previously published studies. However, some ethical aspects of the included articles were observed, such as review and approval by the institution's ethics committees, individual informed consent to build up used databases, or benefits distributed at some point to the study and control communities. Studies with census data, intercensal surveys or the use of social programmes's administrative data were accepted without evaluation by the institution's review board. Working papers commissioned by interested parties, such as governments or financing banks, were not included, even because they did not meet the inclusion criteria of being peer-reviewed.

3. Results

Of 17,080 hits screened, 41 papers from journals, one thesis, and one dissertation were selected (Fig. 1). Sixteen studies (37·2%) were conducted in Latin America [24–39], fifteen (34·9%) in North America [40–54], nine (20·9%) in Africa [55–63] and three (7·0%) in Asia [64–66]. All the North American studies evaluated unconditional food stamp programmes except for one on tax credits [50]. Conversely, 13/16 Latin American articles evaluated conditional cash transfer programmes and three evaluated food assistance programmes [28,30,31]. Eight of the nine African articles evaluated unconditional programmes, while the other referred to a programme that conditioned receipt of the benefit to children's attendance at school [55]. Two of the three Asian studies involved programmes of microcredit and the other evaluated a conditional cash transfer programme [66] (Fig. 2). All studies retrieved in the electronic search had titles or abstracts in English. Since screening in the first round of the review was performed according to the title or abstract, it was, therefore, possible to evaluate all of them, with no language restriction. All studies included were published between 1994 and 2021.

No studies were found regarding the effect of SPPs on the incidence, survival, and mortality patterns associated with breast and cervical cancer, with the only articles available referring to the secondary outcomes. Two articles evaluated the effect of SPPs on cervical cancer



* The Google Scholar search was made up to the third page of results. To include theses and dissertations, a new search was performed in this database with the same keywords plus the expressions "thesis" and "dissertation". ** Theses and dissertations were also retrieved from the LILACS database.

Fig. 1. PRISMA's flow diagram of study selection.

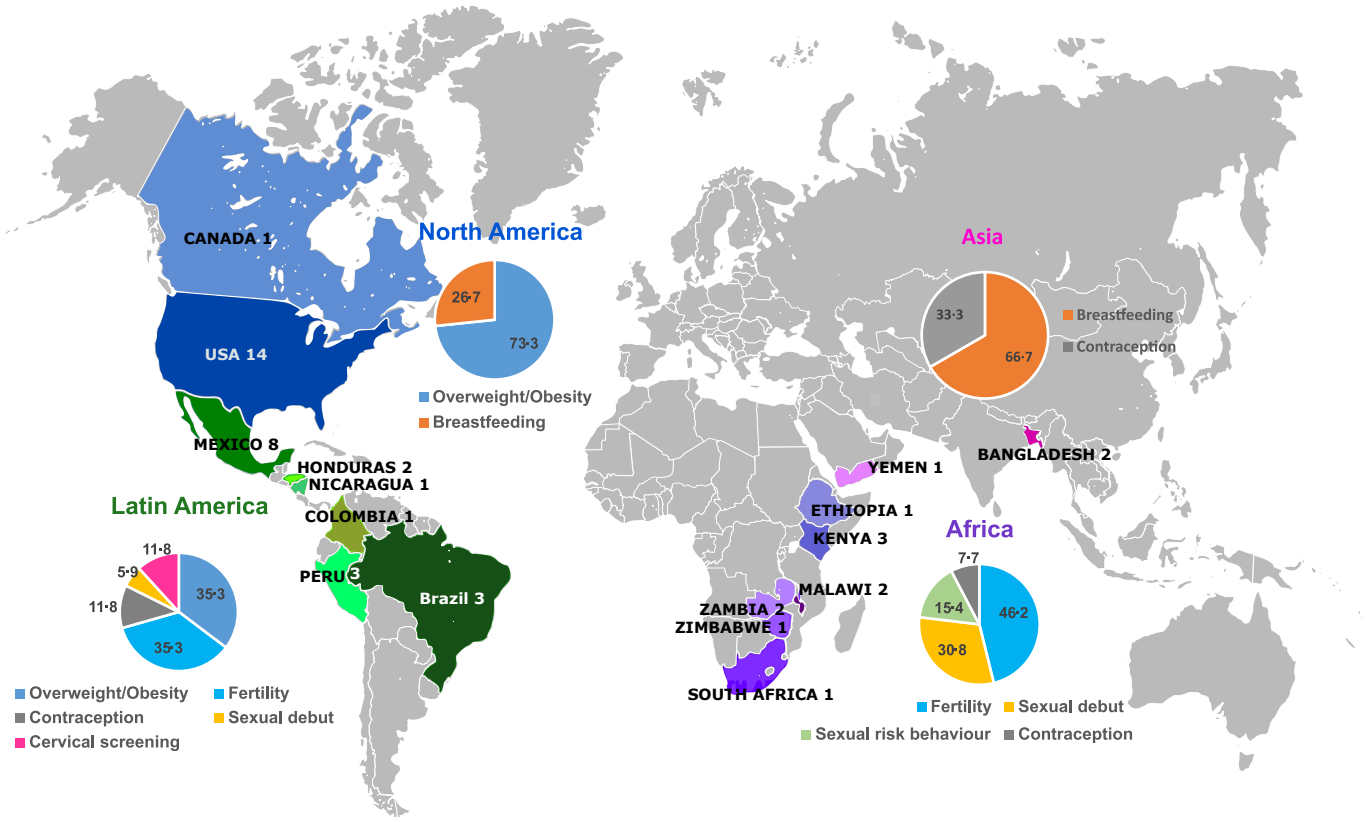


Fig. 2.

screening, one in Brazilian women and one in Mexican women [34,38]. The first one showed that women receiving benefits through the PBF had better access to Papanicolaou screening (PR: 1·26; 95 %CI: 1·13-1·40) and were better informed regarding the performance and results of the test (PR: 1·13; 95 %CI: 1·07-1·19) [34]. The second article, a cluster randomised trial evaluated the Programa *de Educación, Salud y Alimentación* (PROGRESA), a Mexican conditional cash transfer programme that required women to undergo Papanicolaou testing to receive the benefits. Those investigators assessed the demand for cervical screening among women not participating in the programme but who lived at the treatment sites. During the programme, the likelihood of these women undergoing screening was 4·9% (p = 0·029) greater compared to control locations. This indirect effect corresponded to 12 % of the screening rate among SPP-ineligible households in control locations before the implementation of the programme [38]. Nevertheless, the risk of bias was high in these three studies.

The other articles linked the receipt of benefits to risk or protective factors for breast and cervical cancer. Of these, seventeen evaluated effects on body mass index (BMI), overweight (BMI > 25) and obesity (BMI > 30) [27,28,30,31,35,40–46,48,52–54], while fifteen evaluated fertility [24–26,29,32,36,37,39,55,57–59,61,62,65], six evaluated age at sexual debut [26,55,56,58,60,63] five evaluated breastfeeding [47,49–51,66], five evaluated contraceptive use [25,29,59,64,65], two evaluated sexual risk behaviour[56,63], and one evaluated tobacco and alcohol use [63] (Table 1). Note that some of the studies evaluated more than one factor.

3.1. BMI, overweight and obesity

Eight articles analysed BMI and obesity as outcomes [27,40,41,43,46,48,53,54], three BMI alone [35,45,52], three only obesity [31,42,44], two overweight and obesity together [30,33], and one evaluated weight gain in kilograms [28]. Nine studies were longitudinal, seven were cross-sectional and one used both strategies (Table 1). Of the 17 studies, nine concluded that women who received SPP benefits gained weight and became obese [27,28,30,31,40–42,45,46], while four failed to find any effect [43,44,48,52]. Only four studies concluded that women receiving social benefits lost weight [33,35,53,54], and in all of these the risk of bias was lower, while the quality of those reporting weight gain or no effect was variable (Fig. 3).

3.2. Fertility

Of the 15 studies that evaluated the effect of SPP on fertility, eight were intervention studies [24,26,32,55,58,59,61,62], four were longitudinal [25,29,37,57], one was quasi-experimental [65], and two were cross-sectional [36,39]. Women and adolescents of 10 to 50 years of age were evaluated and compared regarding whether they lived in urban or rural settings [36], their school situation [55,58], time of exposure to the SPP [26,29], parity progression [26,32], and the programmes' characteristics [39]. Some studies evaluated the effect of SPP on fertility in specific countries [24,59]. Twelve of the 15 studies had a lower risk of bias and found no effect on the fertility of participants [24,25,29,32,55,59,61,65], or a decrease in family size [36,58,62], a delay in first pregnancy [26,58] or greater birth spacing [26,57] (Fig. 3). One study evaluated three countries (Mexico, Nicaragua, and Honduras) and found an increase in fertility only in the latter [24].

3.3. Sexual debut

Six studies evaluated the effect of SPP on sexual debut [26,55,56,58,60,63]. All these cluster randomised trials reported an increase in age at sexual debut in adolescents and women of 12 to 29 years of age except for one study that found no effect whatsoever [63]. These studies evaluated this outcome from different aspects: sexual risk

Table 1
Characteristics of the included studies.

Author/year	Country	Study design	Period	Sample size	Age (years)	Social programme	Control group	Outcomes	Analysis
Schuler and Hashemi, 1994 [64]	Bangladesh	Longitudinal	1991–1992	1305	< 50	Grameen Bank BRAC	Women from the same rural area who did not join the program usually for family constraint reasons	Contraception	Logistic regression
Pitt et al., 1999 [65]	Bangladesh	Quasi-experimental (cross-sectional)	1991–1992	1733	14 – 50	Grameen Bank BRAC BRDB	Women from the same rural area who did not join the program usually for family constraint reasons	Contraception Fertility	Limited information maximum likelihood
Gibson, 2003 [40]	USA	Longitudinal	1985–1996	3574	20 – 40	Food Stamp Program	Nonparticipants with a total family income −to-needs ratio ≤ 2	BMI Obesity	Ordinary Least Squares Logistic regression
Chen et al., 2005 [41]	USA	Cross-sectional	1994–1996	1039	≥ 15	Food Stamp Program	Eligible nonparticipants with gross annual income < 130 % of the FPL	BMI Obesity	Bivariate probit models
Gibson, 2006 [42]	USA	Longitudinal	1986–2000	2520	32·4 (mean)	Food Stamp Program	FSP-nonparticipants drawn from the NLSY79's women who had children from 1986 onwards	Obesity	Ordinary Least Squares Pearson $\chi 2$
Stecklov et al., 2007 [24]	Honduras Nicaragua Mexico	Cluster-randomised controlled trial	1997–2002	35,196	12 – 47	PRAF RPS PROGRESA	Control group randomly assigned from a set of communities eligible for the programme	Fertility	Ordinary Least Squares Probit regressions
Ver Ploeg et al., 2007 [43]	USA	Cross-sectional	1976–2002	34,457	≥ 20	Food Stamp Program	Income-eligible but do not receive food stamps (PIR< = 130 %)	Overweight Obesity	Linear regression logit models
Meyerhoefer and Pylypchuk, 2008 [44]	USA	Cross-sectional	2000–2003	3772	18 – 64	Food Stamp Program (FSP)	A sample that results from applying all three FSP eligibility tests but did not participate in the programme	Overweight Obesity	Discrete Factor model Ordered probit
Zagorsky and Smith, 2009 [45]	USA	Longitudinal	1981–2002	22,569	38·4 (mean)	Food Stamp Program	People who never reported receiving food stamps in 13 rounds of NLSY1979 with income < 150 % of the FPL	BMI	Linear generalized estimating equation
Feldman et al., 2009 [25]	Mexico	Longitudinal	1997–2003	8568	15 – 49	*Oportunidades*	Group of eligible communities that initially did not receive benefits from the programme	Contraception Birth spacing	Logistic regression Cox proportional models Generalized estimating equations
Gulemetova-Swan, 2009 [26]	Mexico	Longitudinal	2002–2004	2746	13 – 19	*Oportunidades*	Sample of households in high-poverty urban areas where the programme was not yet available	Fertility Marriage Sexual debut	Multistate semi-parametric hazard modelling
Ziol-Guest and Hernandez, 2010 [47]	USA	Cross-sectional	2001–2002	4450	28·7 (mean)	WIC	Women who reported not participating in WIC even with household income ≤ 185 % of the FPL or who reported using	Breastfeeding	Weighted multivariate logistic regression

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Table 1 (*continued*)

Author/year	Country	Study design	Period	Sample size	Age (years)	Social programme	Control group	Outcomes	Analysis
							Medicaid for antenatal care		
Baird et al., 2010 [55]	Malawi	Cluster-randomised controlled trial	2007–2009	2692	13 – 22	Zomba Cash Transfer Program	Eligible communities not randomised to receive benefits	Fertility Sexual debut	Ordinary Least Squares
Leung and Villamor, 2011 [46]	USA	Cross-sectional	2007–2008	5142	≥ 18	SSI CalWork SNAP	Women from households with income ≤ 130 % of the FLP who self-reported not participating in one of these programmes	BMI Obesity	Linear regression models
Forde et al., 2012 [27]	Colombia	Longitudinal	2002–2006	2073	18 – 65	*Familias en Acción*	Eligible areas not randomised for programme implementation	BMI Overweight Obesity	Ordinary Least Squares Logistic regression models
Han et al., 2012 [48]	USA	Cross-sectional	1999–2003	2391	18 – 65	SNAP	Self-declared nonparticipants with per capita household income ≤ 130 % of the FPL	BMI Obesity	Regression coefficients from cross-sectional and longitudinal models
Leroy et al., 2013 [28]	Mexico	Longitudinal	2003–2005	3010	18 – 49	*Programa de Apoio Alimentário*	Eligible communities not randomised to receive benefits	Weight gain (kg)	Maximum likelihood estimates Huber Sandwich estimator
Darney et al., 2013 [29]	Mexico	Longitudinal	1992, 2006 and 2009	3654	15 – 54	*Oportunidades*	Coarsened exact matching technique was used to balance key covariates among women exposed and not exposed	Fertility Contraception	Multivariable logistic regression analysis
Chaparro et al., 2014 30	Peru	Cross-sectional	2003–2006 2008–2010	43,390	30·3 (mean)	Glass of Milk Comm. Kitchen *Cuna Mas* PANTBC	Women exposed and not exposed to the programmes were compared to those living in households with similar poverty indicators	Overweight Obesity	Poisson regression model
Handa et al., 2014 [56]	Kenya	Cluster-randomised controlled trial	2007–2011	2210	15–25	CT-OVC	Randomised, delayed-entry controls	Sexual debut Sex risk behaviour	Multivariate logistic regression analysis
Metallinos-Katsaras et al., 2015 [49]	USA	Longitudinal	2001–2009	122,506	26 (mean)	WIC	All were WIC participants. Controls were Controls were women with late entry to WIC – postpartum or, during the second or third trimester, compared to the first	Breastfeeding	Multivariate logistic regression analysis
Rosenberg et al., 2015 [57]	South Africa	Longitudinal	1998–2008	4845	22 (median)	CSG	People who did not report participation in CGS in the HDSS and ACDIS surveys, both covering poor, rural communities	Fertility	Cox regression models
Hamad and Rehkopf, 2015 [50]	USA	Quasi-experimental (longitudinal)	1986–2000	2985	28·7 (mean)	EITC	EITC-eligible women with household income < US $100,000 who did not receive the tax credit	Breastfeeding	Multivariable linear regressions

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Table 1 (*continued*)

Author/year	Country	Study design	Period	Sample size	Age (years)	Social programme	Control group	Outcomes	Analysis
Handa et al., 2015 [58]	Kenya	Cluster-randomised controlled trial	2007–2011	1549	12 – 24	CT-OVC	Eligible locations not randomised to receive benefits	Fertility Early marriage Sexual debut	Probit regression models
Palermo et al., 2016 [59]	Zambia	Cluster-randomised controlled trial	2010–2014	2675	12 – 49	CGP	Randomised, delayed-entry controls	Fertility	Poisson and linear regression
Gregory et al., 2016 [51]	USA	Quasi-experimental (cross-sectional)	2005–2007	743	28·7 (mean)	WIC	Group of income-eligible nonparticipants	Breastfeeding	Logistic regression model
Carrillo-Larco et al., 2016 [31]	Peru	Longitudinal	2006–2007 2009–2010	1949	31·1 (mean)	Comm. Kitchens	Group of income-eligible nonparticipants	Overweight Obesity	Generalized linear models
Li, 2016 [32]	Honduras	Cluster-randomised controlled trial	2000–2006	7034	31 (mean)	PRAF-II	Randomised control group	Fertility	Ordinary Least Squares
Pérez-Lu et al., 2017 [33]	Peru	Cross-sectional	2009–2012	7155	15 – 49	*Juntos*	Eligible respondents who were not enrolled in the programme	Overweight Obesity	Logistic regression models
Handa et al., 2017 [60]	Kenya	Cluster-randomised controlled trial	2007–2011	1429	15 – 25	CT-OVC	Randomised, delayed-entry controls	Sexual debut	Multivariate probit regression models
Rigdon et al., 2017 [52]	USA	Cross-sectional	2012–2013	5017	..	SNAP	Eligible non-participants household incomes < 185 % of the FPL	BMI	Ordinary Least Squares Two-stage least squares
Barcelos et al., 2017 [34]	Brazil	Cross-sectional	2012	35,844	25 – 64	*Programa Bolsa Família* (PBF)	People who did not report PBF participation in the survey about the PMAC	Papanicolaou	Poisson Regression
Almada and Tchernis, 2018 [53]	USA	Quasi-experimental (longitudinal)	1985–2008	3862	40·8 (mean)	SNAP	Income-eligible women who report not receiving SNAP benefits	BMI Obesity	Linear probability model
Dake et al., 2018 [61]	Zambia Malawi	Cluster-randomised controlled trial	2011–2013 2013–2015	2093	14 – 21	SCTP	Randomised control group	Fertility	ANCOVA
Nunez-Medina and Jimenez-Acevedo, 2018 [39]	Mexico	Cross-sectional (Spatial analysis)	2015	..	10 – 19	*Prospera* *Seguro Popular*	Municipalities with a low proportion of households with government support and women enrolled in the *Seguro Popular*	Fertility	Spatial linear regression
Levasseur, 2019 [35]	Mexico	Longitudinal	2002–2012	4814	18 – 65	*Oportunidades*	Eligible nonparticipant households and leavers	BMI WtHR	Average treatment effect
Lebihan and Takongmo, 2019 [54]	Canada	Longitudinal	2001–2014	119,936	25 – 49	UCCB	Parents whose youngest child is aged 6 to 11 and individuals who are part of a couple but do not have children	BMI Overweight Obesity	Ordinary Least Squares probit models
Olson et al., 2019 [36]	Brazil	Cross-sectional	2009–2013	40,135	15 – 18	*Programa Bolsa Família*	Adolescents with family income above the PBF limit but under $45 per capita	Fertility	Triple difference regressions
Hoddinott and Mekasha, 2020 [62]	Ethiopia	Cluster-randomised controlled trial	2006–2012	2438	..	PSNP	Households that did not receive a PSNP public work or direct support payment matched to the treatment batches	Fertility	Probit and linear probability models

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Table 1 (*continued*)

Author/year	Country	Study design	Period	Sample size	Age (years)	Social programme	Control group	Outcomes	Analysis
Schaefer et al., 2020 [63]	Zimbabwe	Cluster-randomised controlled trial	2009–2011	22,525	15 – 54	HSCT	Randomised control group	Sexual debut Sex risk behaviour	Average treatment effect
Kurdi et al., 2020 [66]	Yemen	Cluster-randomised controlled trial	2015–2017	1945	27·8 / 28·3 (mean T/C)	YCN	Randomised control group	Breastfeeding	Ordinary Least Squares
Avitabile, 2021 [38]	Mexico	Cluster-randomised controlled trial	1997–1999	15,005	36 (mean)	PROGRESA	Randomised, delayed-entry controls	Papanicolaou	Ordinary Least Squares
Soares and Lima, 2021 [37]	Brazil	Longitudinal	2004–2010	2,332,775	25 – 29	*Programa Bolsa Família*	Eligible respondents who were not enrolled in the programme	Fertility	Average treatment effect

BRAC – Bangladesh Rural Advancement Committee; BRDB – Bangladesh Rural Development Board's; BMI – Body mass index; FPL – Federal poverty line; NLSY79 – National Longitudinal Survey of Youth 1979; PRAF – Family Allowance Programme; RPS – Social Protection Network; PROGRESA – Education, Health and Nutrition Program; PIR – Poverty income ratio; WIC – Special Supplemental Nutrition Program for Women, Infants and Children; SSI – Supplemental Security Income; CalWork – California Work Opportunities and Responsibilities to Kids; SNAP – Supplemental Nutrition Assistance Program; PANTBC – Nutrition Program for Tuberculosis Patients and Their Families; CT-OVC – Cash Transfers for Orphans and Vulnerable Children; CSG – Child Support Grant; EITC – Earned Income Tax Credit; CGP – Child Grant Programme; PRAF-II – Family Allowance Programme – II; PMAC – Program for Improving Access and Quality of the Primary Care; WtHR – Waist-to-hip ratio; SCTP – Social Cash Transfer Program; MCTG – Multiple Category Targeted Grant; UCCB – Universal Child Care Benefit; PSNP –Productive Safety Net Program; HSCT – Harmonised Social Cash Transfer; YCN – Yemen Cash for Nutrition; ZCCB – Zomba Cash Transfer Program.

behaviour (defined by the authors as condom use, recent sex, transactional sex, and multiple sexual partners) [56,63], school enrolment or attendance [55,58], and marriage < 18 years of age [58], using socioeconomic, psychosocial and school-related indicators [60]. School situation was analysed in almost all these studies as a mediator of the principal effect [55,58,60]. The studies that showed the effects on delaying sexual debut had a low and moderate risk of bias [26,55,56,58,60]. (Fig. 3).

3.4. Health behaviours and risky behaviours for sexually transmitted diseases

Two articles were found on the effect of SPP on sexual risk behaviour [56,63]. measured by the authors as condom use, multiple sexual partners, transactional sex and unprotected sexual intercourse [56], recent sex, and school enrolment and attendance [63]. One of these articles evaluated young women of 15 to 25 years of age from families receiving benefits, and only the variable "multiple sexual partners" was found to be significantly associated, albeit with little robustness [56]. The other found a reduction in sexual activity in young women and an increase in condom use, with no increase in tobacco or alcohol consumption or drug use [63]. (Fig. 3).

3.5. Hormonal contraceptive use

The five studies that evaluated the effect of SPPs on contraceptive use failed to specify whether the contraceptive method used was hormonal [25,29,59,64,65]. Two studies analysed the current use of modern contraceptives, defined as condoms, oral or injectable contraceptives, intrauterine devices, and male and female sterilization [25,29]. Another article evaluated the use of modern contraceptive methods without defining the methods [59]. A fourth study reported that 60 % of contraceptive users used pills and 10 % used injectables, but did not evaluate the programme's effect according to the method used [65]. The final study evaluated the current use of any contraceptive method, traditional or modern [64]. Only one study reported an increase in contraceptive use among women receiving benefits; however, whether the method was hormonal was not specified [25]. The other studies found no effect (Fig. 3).

3.6. Breastfeeding

Five studies were found on the effect of SPP on breastfeeding: one cluster randomised trial [66], two quasi-experimental studies [50,51], one longitudinal study [49], and one cross-sectional study [47]. One evaluated breastfeeding rates according to the amount invested [50]. Two articles evaluated exclusive breastfeeding [47,66] and another assessed breastfeeding only up to the third month of life [51]. The studies with a low risk of bias showed a greater likelihood of initiating breastfeeding and of breastfeeding for longer [49,66] in users of SPPs, particularly when benefits began in the first trimester of pregnancy [49] (Fig. 3).

Considering the heterogeneity of the results of the included articles for the same risk or protective factor regarding the variety of outcomes, age ranges, methods of analysis, or treatment of confounding factors, the *meta*-analysis did not prove to be a viable option

4. Discussion

This is the first systematic review to evaluate the effect of SPPs on breast and cervical cancer, with no limitations on time or language and involving a search of the five most widely used databases. The principal finding was the complete lack of studies evaluating the effect of SPPs on the incidence, survival and mortality patterns of breast and cervical cancer, as has been reported for other chronic non-communicable diseases [67].

This review evaluated the quality of the studies using tools adapted to the design of each study, with greater emphasis being given to the results of articles or theses with a lower risk of bias. Many of the articles included referred to community-based randomised trials, resulting in greater consistency in the results and more robust conclusions. Nevertheless, the substantial differences in methodology (definition of age groups, exposures and outcomes, and analysis techniques) made the comparison and synthesis of the results challenging. Although these evaluations dealt with women living in a situation of poverty, no articles considered racial inequalities or discussed the ethnic/racial profile of Black, Indigenous, and Asian women, the groups that experience greater social disadvantages and barriers in access to healthcare services, compounded in many countries by structural and institutional racism.

Making this systematic review as comprehensive as possible was behind the idea of not limiting time or geographic area. Even

Fig. 3. Harvest plot.

understanding that the incidence, survival, and mortality from breast or cervical cancer change over time and with the local context, it was worth the effort to capture all published information on the subject and discuss the results in different contexts. Reading the included articles made it possible to verify, for example, that programs with health and education conditions were more common in Latin America – which had a public network to meet these conditions – and were less common in Africa and non-existent in North America.

Another interesting finding was that in rich countries only studies were carried out on obesity/overweight and breastfeeding – including as a protective factor for breast cancer – issues that are critical to these North American countries. In Latin America, studies on fertility predominated – as there is great interest in knowing whether PPSs increase women's fertility, with the supposed increase being used politically against the implementation of these programs – and excess weight. In Africa, fertility and the age of sexual initiation were studied – teenage pregnancy as a producer and reproducer of poverty – while in Asia, contraception and breastfeeding were studied – with an interest in

improving the quality of nutrition for newborns and reducing infant mortality. In this sense, it was clear that local socioeconomic factors were decisive in choosing the topics studied in each region and that, therefore, the results were described considering, indirectly, such factors.

Most studies included here associated SPPs with risk factors for breast and cervical cancer. Factors such as obesity, fertility, sexual debut, sexual risk behaviour, and breastfeeding have been extensively studied by researchers and social policymakers and are useful for identifying groups at risk of breast and cervical cancer. Increased obesity after menopause, delayed first pregnancy, fewer full-term pregnancies, less time breastfeeding, and alcohol consumption are factors that increase the risk of breast cancer [13], while earlier sexual debut and first pregnancy, a greater number of pregnancies, multi-partner sex and smoking increase the probability of cervical cancer [15].

4.1. Breast cancer

Although most of the articles on the fertility of women receiving benefits from SPPs failed to show any effect, the better-rated studies showed a reduction in this indicator. Nevertheless, those studies provided no information on delayed first pregnancy or final family size, factors that could affect the risk of breast cancer. Furthermore, three studies that evaluated women up to the end of their reproductive years involved a short exposure time to the SPP [24,59,65].

The articles on the effect of SPPs on breastfeeding that were better-rated and had larger sample sizes reported greater rates of initiating breastfeeding and a longer duration of breastfeeding in women receiving benefits [48,66]. These studies, conducted in different settings (Yemen and the United States) yielded very similar results. In Yemen, the impact of SPP on breastfeeding also affected women in a control group, residents in the same communities as the participating women, who did not receive benefits (spill-over effect) [66].

Obesity in postmenopausal women is significantly associated with a risk of breast cancer; however, none of the studies reported on women in this age group. Taking into account the tendency to remain obese over time and the poor success rate of weight loss programmes worldwide [68], obesity during the reproductive years could represent a proxy for postmenopausal obesity[69]. These studies used different strategies to overcome a variety of methodological challenges, including difficulty in defining exposure with misreporting participation in programs leading to false negatives [53,70]. Some investigators used percentages of the US federal poverty line to define eligible women [46,52,53], or models that included programme restrictions to predict actual participation [43,44]. Self-declared weight and height represented a problem in several studies [40–42,44–46,52–54], got around by adjusting self-reported weight according to Cawley's factors, based on measurements from the National Health and Nutrition Examination Survey [45,48,71]. Unmeasured confounders and over-adjusted variables, many on various levels [46,52], made analyses complex and heterogeneous, requiring creative solutions [33,35,44,52].

When only the considerable proportion of articles that reported an increase in obesity in women receiving benefits from SPPs are considered, this factor appears strong enough to point to an increased risk of breast cancer. However, if the studies with a low risk of bias that reported reduced obesity and increased breastfeeding rates are considered, it appears plausible that the risk of breast cancer may decrease in women exposed to SPPs.

4.2. Cervical cancer

Earlier sexual debut, a greater number of sexual partners in a lifetime and sexually transmitted infections are factors strongly correlated with HPV infection, a causal agent of cervical cancer [72].

In addition to delaying sexual debut, some studies have shown a reduction in exposure to sexual risk behaviours in women who participate in SPPs, particularly concerning condom use, multiple partners, and recent sex, although the latter does not seem to represent a sexual risk behaviour [56,63].

Fertility was principally evaluated in adolescents and young women, with results showing a delay in the first pregnancy, suggesting an attenuation of the risk of cervical cancer. Most of the intervention studies tended to report a reduction or no effect of receiving benefits on women's fertility. A partial exception was the study conducted by Stecklov [22], which showed no effect on fertility with the PROGRESA programme in Mexico and the Social Protection Network (RPS) programme in Nicaragua, but an increase in family size with the Family Allowance Programme (PRAF) in Honduras. This effect appears to be due to the automatic increase in benefits to the family at the birth of each child [24,59]. Subsequent studies showed that the RPS resulted in greater birth spacing [73], while with the reformulated PRAF-II, evaluated six years after baseline when benefits were then given per household instead of being based on the number of individuals, fertility rates ceased to rise [32]. Another conflicting finding was in the paper published by Soares [37], which evaluated fertility in a cohort of Brazilian women between 2004 and 2010. For the first time, results showed an increase in fertility in women receiving benefits through the PBF.

An academic dissertation evaluated fertility in Mexican adolescents receiving benefits from the *Oportunidades* programme but dealt only partially with this outcome, since women whose sexual debut occurred after 19 years of age were excluded. Evidence showed that when the benefit was given at the beginning of these girls' lives, sexual debut, marriage, and first pregnancy were delayed, effects that became more evident as the duration of exposure to the programme increased, delaying the transition to motherhood and increasing time spent at school [26].

When taken together and in agreement with already established data, these findings suggest a reduction in the risk of cervical cancer, a disease affecting impoverished women with little schooling and difficult access to healthcare. Conditionalities associated with school attendance and compliance with health requirements could potentially overcome these difficulties, reducing this risk.

Conditional or non-conditional programmes exert a similar effect on alleviating poverty, which is the goal of SPPs [11]. Nevertheless, to achieve educational and primary healthcare goals, conditionalities are often important in interrupting the intergenerational cycle of poverty [74,75] as long as the required service infrastructure is available [10,11]. Some investigators have suggested including the Papanicolaou test as one of the conditionalities of the PBF [76].

5. Conclusion

Adding screening for cervical cancer plus the vaccination of girls against HPV to the conditionalities of SPPs might have an impact on the incidence and consequent mortality from this disease, especially in vulnerable women, such as indigenous and black women from Brazil [77,78] and Mexican women from rural areas, among others [36]. These measures could expand the coverage of these strategies, increasing prevention, early diagnosis and treatment of cervical cancer.

This systematic review found no evidence that receiving social protection benefits or adding breast cancer early detection measures to conditionalities had any effect on breast cancer primary outcomes. A study published after the period of this review, however, was able to verify a lower risk of dying from breast cancer in municipalities with high segregation when they were beneficiaries of the PBF when compared to non-beneficiaries [79].

Further studies must be carried out to evaluate the impact of SPPs in the space where different disciplinary traditions converge, such as cancer epidemiology, the field of public policies and the evaluation of health policies and programmes. These studies should assess the effect of SPPs on the incidence, survival and mortality patterns of these types of cancer that represent a major burden for women and their families,

particularly the most vulnerable women who are the main beneficiaries of these programmes.

6. Data sharing

The protocol of this systematic review is registered in PROSPERO and is available at: https://www.crd.york.ac/prospero/display_record.php?=CRD42020202197. The search terms and tables on the evaluation of the risk of bias are to be found in the supplementary material. Any other information that is required can be made available to the editors or researchers upon reasonable request.

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CRediT authorship contribution statement

Ligia Gabrielli: Writing – review & editing, Writing – original draft, Validation, Supervision, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Sheila M. Alvim Matos:** Writing – review & editing, Validation, Investigation, Conceptualization. **Ana Luísa Patrão:** Writing – original draft, Validation, Investigation, Conceptualization. **Emanuelle F. Góes:** Writing – original draft, Investigation, Data curation, Conceptualization. **Maria da Conceição C. Almeida:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Greice M.S. Menezes:** Writing – review & editing, Methodology, Conceptualization. **Isabel dos-Santos-Silva:** Writing – review & editing, Methodology, Formal analysis, Conceptualization. **Gulnar Azevedo e Silva:** Writing – review & editing, Methodology, Conceptualization. **Maria Teresa Bustamante-Teixeira:** Writing – review & editing, Conceptualization. **Mauricio L. Barreto:** Writing – review & editing, Funding acquisition, Conceptualization. **Srinivasa Vittal Katikireddi:** Writing – review & editing, Methodology, Funding acquisition, Formal analysis. **Alastair H. Leyland:** Writing – review & editing, Funding acquisition. **Luana Ferreira Campos:** Validation, Investigation, Data curation. **Ester Maria Dias Fernandes de Novaes:** Validation, Investigation, Data curation. **Daniela de Almeida Pereira:** Validation. **Elvira Rodrigues Santana:** Validation, Investigation, Data curation. **Fernanda Rodrigues Gonçalves Zeferino:** Validation, Investigation, Data curation. **Ana Cleide da Silva Dias:** Validation, Investigation, Data curation. **Fábio G. Fernandes:** Visualization, Investigation, Data curation. **Ana Cristina de Oliveira Costa:** Validation, Investigation, Data curation. **Estela M.L. Aquino:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Funding acquisition, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.hpopen.2024.100122.

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