

## A scoping review of excessive use of mammography screening

Uma revisão de escopo do uso excessivo de mamografia de rastreamento

Una revisión de alcance del uso excesivo de mamografía de tamizaje

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## Resumo

**Objetivos:** Identificar como os estudiosos definem o rastreamento excessivo para mulheres sem risco de desenvolver câncer de mama, examinar os determinantes (barreiras e facilitadores) do uso excessivo da mamografia de rastreamento e descrever as taxas de observação do uso excessivo da mamografia de rastreamento.

**Métodos:** Revisão de escopo baseada em busca realizada em maio de 2022 em seis bancos de dados e bibliotecas eletrônicas de saúde. Artigos revisados por pares em qualquer idioma e ano de publicação foram incluídos.

**Resultados:** Na amostra de 18 artigos publicados a partir de 1991, a maioria deles dos Estados Unidos, o uso excessivo de mamografia foi definido como a intenção ou realização de mamografia fora da faixa etária ou intervalo recomendado, entre mulheres com expectativa de vida limitada, em programas, organizados e oportunistas, coexistentes. As taxas de observação do uso excessivo de mamografia de rastreamento nos estudos selecionados variaram de 1,4% a 87,2%. Os facilitadores da mamografia excessiva são preocupações relacionadas ao câncer; a recomendação médica, especialmente de especialistas; e ao maior acesso a exames. As mais expostas ao rastreamento excessivo são as mulheres com maior escolaridade e renda. As barreiras para o excesso de mamografia incluíram orientações nas consultas sobre os malefícios da mamografia e a expectativa de vida, por médicos generalistas, principalmente os da atenção primária.

**Conclusão:** Nosso estudo identificou que o uso excessivo da mamografia de rastreamento tem alta prevalência quando realizado como rastreamento e é permeado por fatores multiníveis. Nossa lista de determinantes pode fornecer algumas orientações para estudos futuros com o objetivo de desimplementar o cuidado de baixo valor do uso excessivo da mamografia de rastreamento.

## Abstract

**Objectives:** To identify how scholars define excessive screening for women without risk of developing breast cancer, examine the determinants (barriers and facilitators) of excessive use of mammography screening, and describe the rates of observations of excessive use mammography screening.

**Methods:** Scoping review based on a search in May 2022 in six electronic health databases and libraries. Articles included were peer-reviewed articles, in any language and year of publication.

**Results:** In a sample of 18 articles, published from 1991 onwards, most of them from the United States, the excessive use of mammography were defined as the intention or performance of mammography outside the recommended age or interval range, among women with limited life expectancy, in coexisting, organized and opportunistic programs. The rates of observations of excessive use of mammography screening in the selected

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studies ranged from 1.4% to 87,2%. Facilitators for excessive mammography are related concerns of getting cancer; to the medical advice, especially from specialists; and to the increased access to tests. The most exposed to excessive screening are women with higher levels of education and income. Barriers for excessive mammography included guidance in consultations about the harm of mammography and life expectancy by general practitioners, particularly those in primary care.

**Conclusion:** Our study identified that the excessive use of mammography screening has a high prevalence when done as screening and is permeated by multi-level factors. Our list of determinants can provide some guidance for future studies aiming to de-implement the low-value care of excessive mammography screening.

## Resumen

**Objetivos:** Identificar cómo los académicos definen el tamizaje excesivo en mujeres sin riesgo de presentar cáncer de mama, examinar los determinantes (barreras y facilitadores) del uso excesivo de mamografía de tamizaje y describir los índices de observación del uso excesivo de mamografía de tamizaje.

**Métodos:** Revisión de alcance basada en una búsqueda realizada en mayo de 2022 en seis bases de datos y bibliotecas electrónicas de salud. Se incluyeron artículos revisados por pares en cualquier idioma o año de publicación.

**Resultados:** En la muestra de 18 artículos publicados a partir de 1991, la mayoría de Estados Unidos, el uso excesivo de mamografía fue definido como la intención o realización de mamografía fuera del grupo de edad o intervalo recomendado, en mujeres con expectativa de vida limitada, en programas coexistentes, organizados y oportunistas. Los índices de observación del uso excesivo de mamografía de tamizaje en los estudios seleccionados varían de 1,4 % a 87,2 %. Los facilitadores de la mamografía excesiva son las preocupaciones relacionadas con el cáncer, las recomendaciones médicas, especialmente de especialistas, y el mayor acceso al examen. Las personas más expuestas al tamizaje excesivo son las mujeres con mayor escolaridad e ingresos. Las barreras para el exceso de mamografías incluyeron orientaciones en consultas sobre los maleficios de la mamografía y expectativa de vida, por parte de médicos generales, principalmente los de atención primaria.

**Conclusión:** El estudio identificó que el uso excesivo de mamografía de tamizaje tiene alta prevalencia cuando se realiza como tamizaje y está impregnado de factores multinivel. La lista de determinantes puede ofrecer algunas orientaciones para estudios futuros con el objetivo de dejar de implementar esta atención de escaso valor que es el uso excesivo de mamografía de tamizaje.

## Introduction

Overuse of health services can be defined as the “provision of medical care that does not bring benefits or whose harm outweighs the potential benefits”,<sup>(1)</sup> or as “screening more frequently than guidelines recommend in a population that is unlikely to benefit because of the risk of death or where there is little evidence of clinical utility”.<sup>(2)</sup> For example, a review identified 154 unnecessary and potentially harmful health services offered to the population. Most are related to breast cancer (79%), with diagnostic imaging tests being more common.<sup>(1)</sup> Mammography has been extensively studied because its excessive use can be a driver of overdiagnosis. Overdiagnosis can lead to overtreatment of the cancer, increasing the chances of psychological complications that include anxiety and stress.<sup>(3,4)</sup> Additionally, other potential harms of excessive mammography include excess of invasive tests and radiation-induced cancer,<sup>(5)</sup> and high costs of follow-up exams.<sup>(6)</sup> It is estimated that between 0.3% and 50% of detected cancers are overdiagnosis of mammography screening.<sup>(7)</sup>

Although guidelines vary between countries, the majority of them recommend mammography screening at intervals of 1 to 3 years, in the age

group of 50 to 69 years, embedded in organized programs to achieve their greatest effectiveness.<sup>(8)</sup> There are two types of programs for the mammography screening: organized and opportunistic.<sup>(8)</sup> In the organized program, there is a constant monitoring of the patient screening with the goal of increasing coverage. Additionally, there is close monitoring of those patients who show alteration in exams so they can receive the follow up care that they need. In opportunistic programs, such monitoring does not happen. Rather, in this program, the demand for mammography is spontaneous and solicited by women or offered by prescribing professionals, doctors and nurses. Sometimes, women have access to both, for example, when she pays for the exam and when she has the opportunity to take the exam in public health programs.<sup>(9)</sup>

The complexity of the guidelines and the results of empirical studies show that, while mammography screening has the potential to reduce cancer morbidity and mortality,<sup>(8)</sup> it also poses health risks for people unnecessarily exposed to the screening.<sup>(3-7,10)</sup> This scenario has many implications, both for the quality and safety of care provided to women, and for the economy of health systems, since resources used in unnecessary ser-

vices could be reallocated to increase and improve access to mammography for women who need it most.

Concerns about the ethical dimension of care and the sustainability of the health system's capacity to pay for unnecessary and potentially harmful health actions and services have been discussed and publicized by medical societies. An example is the Choosing Wisely (CW) campaign, from the American Board of Internal Medicine (ABIM) foundation, which publishes a list of procedures that could be reconsidered, by doctors and patients, which includes requesting a mammogram for women with an expectation of less than 5 years old.<sup>(11)</sup>

In a recent scoping review, the authors identified that the factors associated with increased chances of overuse of breast cancer screening were medical consultation with a specialist, in addition to regular access to primary care and the patient's desire for screening.<sup>(12)</sup> In contrast, white women had fewer probability of receiving excessive mammography screening compared to their other counterparts. This study, however, is specific to the U.S. population, it includes factors associated with several imaging methods, such as ultrasound, resonance, excluded the population aged between 40 and 49 years, and included those ones population at risk of developing breast cancer for women aged 18 years and over.<sup>(12)</sup> To expand on the current literature, our team aimed to examine the existing literature on mammography screening in global settings, and of women without clinical symptoms of the disease. We did not want to address cases in which mammography would be used to diagnose suspected cases of breast cancer. Similarly, we excluded studies with women with risk factors for developing cancer, as normally having a risk factor such as a history of a first-degree relative with breast cancer would lead to a change in guideline recommendations for screening. In these cases, for example, the type of examination performed may not be mammography, and the age at which screening begins, and the frequency of examinations can vary greatly.<sup>(8)</sup>

In summary, the present study aims to: (a) identify how scholars define excessive screening for women without risk of developing breast cancer, (b)

examine the determinants (barriers and facilitators) of excessive use of mammography screening, and (c) describe the rates of observations of excessive use mammography screening based on the selected studies.

## Methods

This study is a scope review that, through a rigorous and systematized analysis, enables the mapping of the topic of interest.<sup>(13)</sup> We followed the following five steps in this review: (1) identification of the research question; (2) identification of studies; (3) selection of studies; (4) data mapping (5) grouping, synthesis and detailing of results.<sup>(14,15)</sup> The review is being reported in accordance to the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-analyses for Scoping Reviews (PRISMA-ScR).<sup>(1)</sup>

The review question was elaborated through the PCC strategy, which includes the mnemonic acronym as fundamental elements: P - Population, C - Concept and C - Context.<sup>(16)</sup> Asymptomatic women with no risk factor for developing breast cancer were defined as elements of the population, excessive mammographic screening was defined as concept, and screening programs were defined as context. We aimed to answer the following question: *what does the literature report on excessive use of mammography screening for women without risk factors for developing breast cancer?*

Inclusion criteria were studies with primary and secondary data, in any methodological design, that addressed excessive use of mammography screening, without delimitation of publication date and language. Non-peer-reviewed studies, in addition to studies that addressed women with a history of breast cancer were excluded; women with a family history of breast cancer; or women with a genetic predisposition to cancer. Articles not available in full were requested by contacting the corresponding authors by email.

The databases consulted for data collection were: Medical Literature Analysis and Retrieval System Online via PubMed (MEDLINE/PubMed),

Web of Science, Scopus, Excerpta Médica Database (EMBASE). The Scientific Electronic Library Online (SciELO) and Latin American and Caribbean Literature on Health Sciences (LILACS) were also accessed. A manual search of references was performed based on keywords and descriptors: mammography, excess, screening, overuse and over-screening. The search strategies developed and used for each electronic database are presented in chart 1 and the searches were completed on May 30, 2022.

**Chart 1.** Database search strategies with Boolean operators and total number of articles identified

Database	Strategies	Number
MEDLINE/ PubMed	mammography) AND (excess) AND (screening)	241
	(mammography) AND (overuse) AND (screening)	189
	(mammography) AND (overscreening)	21
SciELO	((mammography ) AND (excess))	5
	(mammography) AND (overuse)	0
	(mamografia) AND (overscreening )	0
LILACS	(mammography) AND (excess)	09
	(mammography) AND (overuse)	05
	mammography overscreening	1
Web of Science	mammography (All Fields) AND excess (All Fields) AND screening (All Fields)	130
	mammography (All Fields) AND overuse (All Fields) AND screening (All Fields)	38
	mammography (All Fields) AND overscreening (All Fields)	16
EMBASE	('mammography'/exp OR mammography) AND excess AND ('screening'/exp OR screening)	188
	('mammography'/exp OR mammography) AND overuse AND ('screening'/exp OR screening)	47
	('mammography'/exp OR mammography) AND overscreening	34
SCOPUS	( TITLE-ABS-KEY ( mammography ) AND TITLE-ABS-KEY ( excess ) AND TITLE-ABS-KEY ( screening ) )	172
	( TITLE-ABS-KEY ( mammography ) AND TITLE-ABS-KEY ( overuse ) AND TITLE-ABS-KEY ( screening ) )	194
	( TITLE-ABS-KEY ( mammography ) AND TITLE-ABS-KEY ( overscreening ) )	20
Total		1310

The selection of studies was conducted in three stages. In the first step, the titles and abstracts of the references identified through the search strategy were evaluated, and potentially eligible studies were pre-selected. In the second stage, the full text of the pre-selected studies was evaluated to confirm their eligibility. The selection of studies according to title and abstract was performed using the Rayyan QCR® digital tool, and the articles selected from each database were imported into this tool in the BibTex file format. Two reviewers independently read the titles and abstracts to reduce the possibility of interpretive bias. In cases where there was doubt

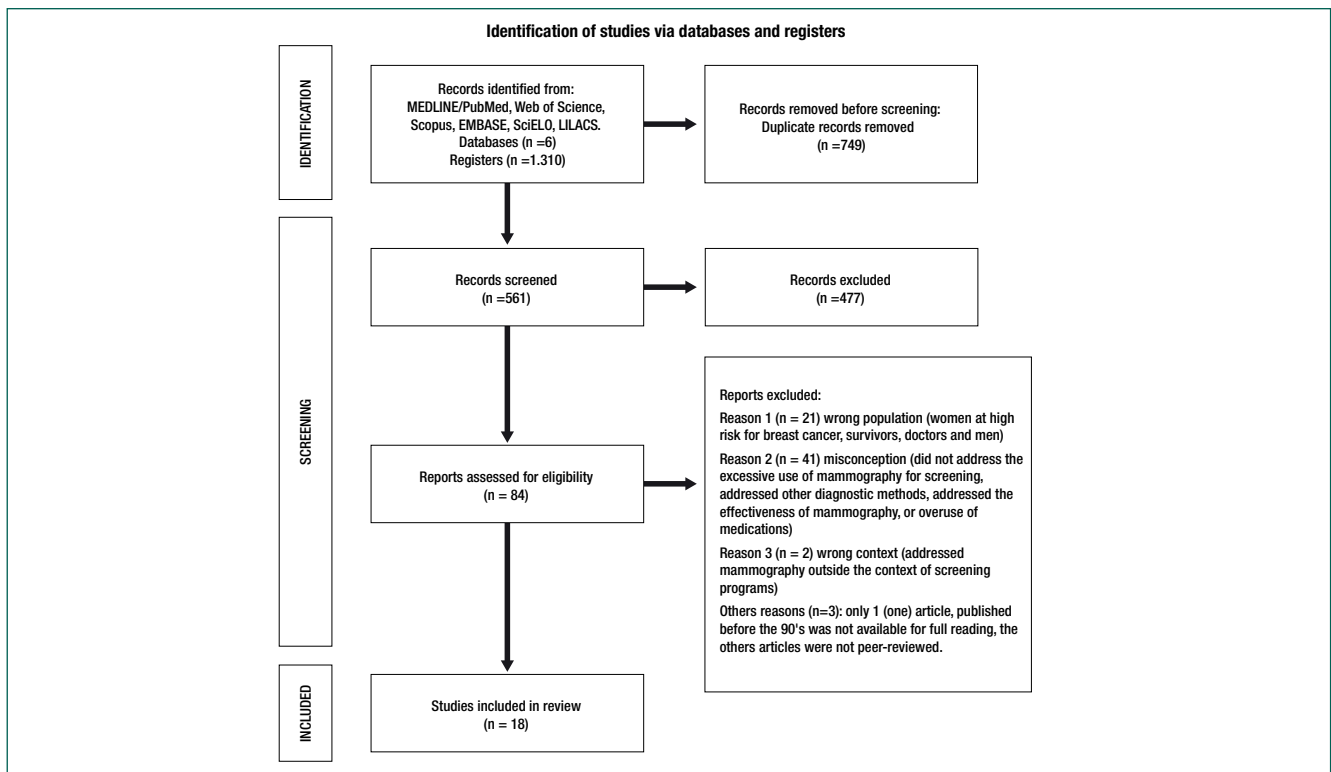
about the selection, the article remained, advancing to the next step. Finally, the two researchers read the eligible articles in full and selected the articles to compose the sample. In case of divergence, there was a debate between the two for a decision on inclusion or exclusion in the study, not being necessary to consult a third reviewer. The reasons for exclusion are described in figure 1.

The extraction of data from the articles in full was performed using an instrument containing the items: name of the first author, year of publication, type of study, number of population studied and country where the research was carried out, definition of excessive mammography screening, evaluation measure, associated factors and other findings for non-quantitative research. The data was then synthesized according to: a) Distribution of articles according to year of publication, place of study and type of study; b) Distribution of articles according to definitions of excessive use of mammography screening; c) Distribution of articles according to population, assessment measures, event observation rates, factors associated with excessive use of mammography screening and other descriptive findings from non-quantitative Research; d) Summary the barriers and facilitators of excessive use of mammography screening according to age group and limited life expectancy.

Results

The search in the databases resulted in 1,310 studies, 18 were selected according to eligibility criteria (Figure 1).

The sample consisted of 18 articles, with the publication date from 1991. It was found that 13 studies were conducted in the United States, two in Brazil, one in France, one in Italy and one in Canada. There was no representation of population in countries from Asia, Africa and Oceania. Regarding the methodological design, eight were cross-sectional studies, six cohorts, one pre and post test without a control group, one mixed method (qualitative and quantitative) and one was a narrative review article. Regarding the language, only



**Figure 1.** Diagram of the article selection process, according to the PRISMA-ScR flowchart

one was not available for reading in English. For this single article, written in Italian, we asked an interpreter to confirm that the data collected from the article were correct.

The following definitions of excessive use of mammography screening were used by the authors in the included studies:

- Mammography outside the recommended age group in women < 50 years<sup>(17-20)</sup> or, elderly women aged > 69 years<sup>(17,21,27)</sup> or with >74 years.<sup>(22-24,28)</sup>
- Mammography in the recommended age group, but with a shorter than recommended interval between exams (<2 years).<sup>(25,26)</sup>
- Performance or intention to undergo mammography in elderly women with limited life expectancy.<sup>(10,29-30)</sup>
- Performance or intention to undergo mammography in women of any age group with limited life expectancy.<sup>(30-32)</sup>
- Mammography performed in health systems with two programs, opportunistic and organized, which coexist.<sup>(33)</sup>

Chart 2 presents the characteristics of the studies in terms of assessment measures, population, observation rate and factors significantly associated with the excessive use of mammography screening, among other findings from non-quantitative research.

Below, we summarize the barriers and facilitators of excessive use of mammography screening according to age group and limited life expectancy.

### Barriers and facilitators of excessive use of mammography screening in women 50 years old or younger

The studies in this sample indicate that 22.2% to 71% of women had undergone mammography screening were ≤ 50 years old, and 34% to 56% expressed an intention to maintain annual screening.<sup>(17-20)</sup> Excessive concern about cancer, perceived risk of developing breast cancer, feeling that mammography is better than clinical examination, having a high annual income, having a regular physician, having had a cervical cytology exam in the last 3 years, and publicity in media about the Pink October campaign, were facilitators that increased



**Chart 2.** Study results regarding assessment measures, population, observation rate, factors associated with excessive use of mammography screening, and others non-quantitative results

Ref	Measures to assess excessive use of mammography screening	Population experiencing an overuse event (who, number, age, where, when)	Observation rate of excessive use of mammography screening	Factors associated with excessive use of mammography screening and other non-quantitative results
10	Rates of screening mammography use by women with limited life expectancy at 6, 3, and 1 year (s).	106,737 U.S. women Medicare beneficiaries age 66 and older and life expectancy < 7 years between 2008 and 2009.	35.0%, 25.1%, and 17.9% of women with life expectancy, respectively, estimated at 6, 3, and 1 year (s) performed screening mammography.	Having access to a Primary Care physician, having an appointment 1 or more times and living in a region with a greater supply of mammography and radiologists.
17	Annual ratio of screening mammograms in age groups contrary to recommendations: 35-49 years, 70-74 years, and 75 years and over. Percentage of mammograms between 35 to 49 and ≥70 years.	92,532,240 of mammograms of Brazilian women, between 2010 and 2019.	Mammography ratio between 35-49 years was 0.18; between 70 and 74 years was 0.17; and in 75 years and over it was 0.07. Percentage of mammograms between 35 and 49 was 35.5% and ≥70 years 5.9%.	October Pink October Campaign
18	Prevalence of screening mammography among women aged between 40 and 49 years.	2,393,200 Canadian women aged 40 to 49 interviewed in the Canadian Community Health Survey, 2011 to 2013.	22.2% of women aged 40 to 49 reported having had a routine screening mammogram in the last two years	Having had a Pap smear in the last 3 years; being married; having an annual income above \$59,999 and having a regular physician.
19	Percentage of women who reported having had a mammogram; percentage they did in the last year; percentage with intention to do in the next year.	1,163 women aged 30 to 74 residing in two North Carolina cities, 1988.	25% and 49% of women underwent mammography, respectively, aged 30-39 and 40-49 years, with 15% and 32% having done it in the previous year, and 34% and 56% intend to do it in the following year.	Concern about breast cancer, perception of the risk of developing cancer, thinking that mammography is better than clinical examination.
20	Percentage of women screened before age 50; percentage of women who started mammographic screening at age 40; percentage of women who started screening before age 40; percentage of women who started screening after 40 years and up to 49 years.	383 American women aged between 40 and 49 years.	71% started screening before age 50, with 32% starting at age 40; 25% started before age 40 and 14% after age 40 and up to age 49.	Being aware to the tracking recommendations increased the chance of overuse. Being older than 45 years and having a primary care doctor decreased the odds of not initiating screening.
21	Aspects about knowledge and perception: How often do you think you need a mammogram? Is it important for me to plan to have an annual mammogram? In the past 12 months, has a doctor or other healthcare professional recommended that you have a mammogram? In the last 12 months, have you received a letter, phone call, or email reminding you to make an appointment for a mammogram?	52 American women between 70 and 89 years old, attended at a clinic in New York.	56% of women aged ≥75 years report having had a recent mammogram, 80% report having received a recommendation from a professional to have a mammogram, and 87.2% agree that they need to have it done annually.	Associated factors were not evaluated, but other findings derived from qualitative research were reported: older women think about having and are encouraged to have a mammogram; there are many opportunities to get a mammogram; Older women are unaware about overuse of mammography.
22	Adjusted mean rate of screening mammography in female population ≥75 years	26,457,925 American women ages 75 to 99, Medicare beneficiaries, as of January 2012.	The adjusted mean rate of screening mammography was 24%, with a range from 20% to 30%.	Not evaluated
23	Odds ratio of receiving low-value mammography among women ≥75 years absolute frequency of screening mammograms in women ≥75 years.	19,451 US women aged ≥75 years who participated in the National Ambulatory Medical Care Survey, 2011 to 2016.	The chance of a woman aged ≥75 years receiving a mammogram is OR=0.95(0.89-1.02) 3,040,128 low-value mammograms.	Consultations with obstetricians and gynecologists. The chances of consultations with general specialists, such as general practitioners and family physicians, decreased.
24	Number of mammograms performed on women aged ≥75 years, without a diagnosis of symptoms, out of the total population aged ≥75 years	16,396 women who participated in the Medicare Current Beneficiary Access to Care survey between 2007 and 2013	23% women aged ≥75 years underwent screening mammography.	Having higher income and having private supplementary coverage, having a regular source of care.
25	Proportion of women aged 52 to 69 who had a mammogram in less than two years.	16,459 Italian women aged 52 to 69 years, 2012 to 2013.	18.4% perform at intervals < 2 years, those aged ≤ 59 years old are 20.7% and those aged ≤ 69 years old are 16.4%.	Being a foreigner, not performing physical activity and not controlling weight; having their own initiative to carry out the exam, having a recommendation to carry out the exam by a general practitioner or specialist or by the public health service.
26	Number of overscreened (women with mammograms performed at an interval < 18 months) divided by the total number of study women.	13,387 Brazilian women aged 50 to 69 years, with normal mammography results, followed from 2010 to 2012.	Overscreening reached 2,860 women (21%) and its rate was 150/1,000 women/year. Most cases of overscreening (73.8%) occurred after 1 year of normal mammography.	Age 60-69 years, Pink October campaign (increased availability of services or excessive focus on screening campaigns) and previous mammogram.
27	Performing biennial screening mammography among women aged 70 and over, knowledge and perception about excessive use.	Four articles focused on mammography overuse among American women ≥ 65 years.	Up to 50% of women aged ≥ 70 years believe they have to undergo screening continuously.	Associated factors were not evaluated, but other findings derived from the narrative review were reported: the elderly women feel confused about the frequency after changing the guidelines, few women have heard about excessive use and even fewer understand what would be the excessive use, are resistant to the idea of discontinuing screening and a decision aid may improve older women's decision-making around mammography screening.
28	Prevalence of mammographic screening of women aged 65-74 years and ≥75 years	389,821 U.S. women living in long-term care homes were Medicaid and Medicare beneficiaries in 2011.	6.2% women aged 65-74 years underwent mammography and 1.4% aged ≥75 years.	Having no or mild cognitive impairment, being a non-frail elderly and having some comorbidities.

Continue...

Continuation.

Ref	Measures to assess excessive use of mammography screening	Population experiencing an overuse event (who, number, age, where, when)	Observation rate of excessive use of mammography screening	Factors associated with excessive use of mammography screening and other non-quantitative results
29	Mammographic screening rate for women stratified according to a specific mortality rate that classifies as low (<25%), intermediate (25%-49%), high (50%-74%), and very high (75%) risk of breast cancer die in 9 or 5 years.	27,404 U.S. women age 65 and older who participated in the National Center for Health Statistics from 2000 to 2010.	Screening rate of 73.9% at low 9-year mortality rate, 63.8% at intermediate, 53.3% at high and 37.5% at very high risk. Screening rate of 67.9% in the low 5-year mortality rate, 44.4% in the intermediate and 34.2% in the high risk.	Having a higher level of education was a factor that increased the chance. Protective factors were: being older, having a higher risk of dying, not being married, not having health insurance, not having a place of reference for routine care.
30	Screening intent among women with a life expectancy of < 10 years was assessed using a Likert scale from 1 to 15; lower scores suggest lower intentions.	43 American women > 75 years old, seen by Primary Care physicians at a Boston Community Center.	51% of women with a life expectancy of < 10 years intend to be screened, even after talking about life expectancy with a doctor.	The intention tends to decrease after talking about interruption of screening, harms of mammography and life expectancy with a Primary Care physician.
31	Low-value screening rate: women aged <40 years or life expectancy <1 year, over total women aged >18 years with screening mammograms.	21,930 American women (mean age 54.9 years) in a primary care clinic by the Veterans Health Administration.	2.9% received low-value mammography.	Having care in a hospital clinic, in a place with highly complex services and not living in the West region, increases the propensity to receive low-value exams. Women with greater comorbidity and frailty and exams with co-payments are factors that decrease the chances of receiving low-value exams.
32	Rates of mammography screening in the last two years by age and life expectancy < 10 years and future breast cancer screening intentions.	2,804 US women ages 55 to 97 who participated in the National Social Life Health and Aging Project in 2015 to 2016.	Women expected < 10 years who reported having had a mammogram in the last two years: 69.1% aged 55-74 years, 67.8% aged 75-84 years and 44% aged 85 years or older; Women with a life expectancy of < 10 years who intend to undergo mammography in the future: 59% aged 75-84 years and 25.2% aged 85 years and over.	It was associated with future intentions to have a recent mammogram and not having talked to the doctor that screening is no longer necessary. Intentions were reduced among elderly women or those with lower life expectancy.
33	Women aged 50 to 74 years who undergo free mammography screening in the program organized every 2 years and undergo opportunistic mammography.	1,202 French women aged between 51 and 74 years, 2010 and 2011.	45.1% of women underwent mammography for breast cancer screening in both programs (opportunistic and organized).	Making regular appointment with gynecologist for check-up and being in the workforce.

\*Ref-reference.

the chance of having excess mammogram in this group.<sup>(17-20)</sup> Additionally, being aware about mammography screening recommendations was not a protective factor against excessive use.<sup>(20)</sup> Being older than 45 years, and having a primary care doctor decreased the odds of not initiating screening.<sup>(20)</sup>

### Barriers and facilitators of excessive use of mammography screening for women 70 years old or older

The results about perceptions and knowledge about use of mammography screening show that, among those aged 70 years or older, that is, who should be being prepared to stop screening at 74 years, the intention to continue screening is high (50% to 87.2%), the concept of overdiagnosis is hard to understand, and decision aid may improve older women's decision-making around mammography screening.<sup>(21-27)</sup> In elderly women aged 75 years or older, mammography screening was performed between 23% and 56% of women,<sup>(17,21,22,24)</sup> much lower among those living in long-stay institutions (1.4%).<sup>(28)</sup> Facilitators that increased the chances of having excess mammogram were: having higher income, having health

insurance coverage, having a regular source of care, having consultation with specialists (gynecologists and obstetricians).<sup>(23,24)</sup> Additionally, it was found that women seem to have little knowledge about the danger of excessive use of mammography and a belief in the importance of performing mammography screening, regardless of age and at annual intervals.<sup>(21,27)</sup> The results indicate that women are encouraged to have a mammogram screening by health professionals, that the opportunities for doing so are many and increase during the Pink October campaign.<sup>(17,21)</sup> In one study in long-term care homes, women with no or with mild cognitive impairment, being non-frail elder, and having some comorbidities had higher probability of having excess mammogram.<sup>(28)</sup> Consultations with general practitioners were barriers of excessive use of mammography screening.<sup>(23)</sup>

### Barriers and facilitators of excessive use of mammography screening in women 50 and 69 years old recommended by Brazilian, Italian, and French guidelines

Studies of excessive use of mammography screening in women with the age group commonly tar-

geted by screening programs have identified that the interval between mammograms is less than 2 years for 18.4% to 21% of women,<sup>(25,26)</sup> with annual interval being the most common one.<sup>(26)</sup> In Brazil, not having healthy lifestyle habits, having women taking their own initiative to take the exam, having a medical recommendation and the “Pink October” campaign, are reported as factors that increased the opportunities that influence screening.<sup>(26)</sup> In Brazil, the age of 60 to 69 years is a factor that increases the probability of being overscreened,<sup>(26)</sup> and in Italy, being a foreigner was also a facilitator.<sup>(25)</sup> In France, where the target age group for mammography screening is 50 to 74 years, a study shows that facilitators for excessive screening were the coexistence of two screening programs (the organized and the opportunistic), having regular consultations with gynecologists, and of women being in the workforce. Women who undergo mammography in both screening programs (organized and opportunistic) had a 45.1% prevalence of overscreening.<sup>(29-33)</sup>

### Barriers and facilitators of excessive use of mammography screening among women with limited life expectancy

The results indicate that the rates of excessive use of mammography screening are lower when it relates to women with limited life expectancy. Even lower compared to the other age groups, the rate of mammography screening is high, as it ranged from 69.1% (with women with life expectancy of less than 10 years) to 17.9% (with women with life expectancy of less than 1 year).<sup>(10,29-32)</sup> The chances of having an excess mammogram increased with: having access to doctors, having a greater number of consultations, having a greater supply of mammograms and having a higher level of education.<sup>(10,29,31,32)</sup> On the other hand, the following were protective factors: older age, being single, being more likely to die, being more fragile, not having health insurance, co-payments and not having a regular source of health care.<sup>(29-32)</sup> In two studies, data show that although more than half women expressed an intention to be screened in the coming years,<sup>(30,32)</sup> it was found that the percentage decreases after medical advice

on the harms of mammography and life expectancy.<sup>(30)</sup> The decision seems to increase among those who do not talk to the doctor about stopping screening and decrease among those who talk to the primary care doctor and also among those with older age and lower life expectancy.<sup>(30,32)</sup>

## Discussion

We set forth to answer the question *what does the literature report on excessive use of mammography screening for women without risk factors for developing breast cancer?* The present scoping review identified 18 articles in which the concept of excessive use of mammography screening was analyzed in different aspects. Excessive use were understood as the intention or performance of mammography outside the recommended age or interval range, among women with limited life expectancy, and in coexisting, opportunistic and organized screening programs.

This review replicates other findings in the literature<sup>(12)</sup> in that it identified that most studies defined excessive use of mammography screening as an intention or performance outside the age group (whether the age below or above the recommended),<sup>(17-24,27,28)</sup> from the interval recommended by the guidelines from national health institutions<sup>(25,26)</sup> and in people with limited life expectancy.<sup>(10,29-32)</sup>

The variation in the definitions of excessive use of mammography screening found in our review shows the heterogeneity in the way of measuring and determining factors associated about the phenomenon. While variation in the definition of mammography screening is very common, a review that evaluates the validity of the qualifiers used in the numerators and denominators to measure low-value practices found that those used for mammography screening are not among those with the highest level of evidence, reinforcing the need to improve the quality of these indicators.<sup>(34)</sup>

Our results indicate a recent interest in the topic, with an increase number of publication from the 1990s onwards. Although the first study identified is from 1991, there is a gap in the production of studies: in 2014 there were 3 publications



but from 2015-2016 there was no study published in this topic. Only from 2017 onwards, our sample had 4 publications per year until 2021. One of the possible drivers of the increase in publications about mammography screening can be explained by the growing concern with the potential damages of mammography in excess to women's health, also addressed in other studies.<sup>(3,7)</sup>

The main objective of our review was to identify determinants that act as facilitators and barriers of excessive use of mammography screening to women. At the patient level, we found that great access to exams and appointments, concerns about breast cancer, higher levels of education and income, having difficulty in understanding the changes in the guidelines and the concept of excessive use were facilitators that increased of excessive use of mammography screening rates.<sup>(10,17,33)</sup> Factors such as fear of cancer, of the suffering that cancer can cause, leading to limitations, or disabilities of the female body, which are factors related to a legacy of beliefs about the disease socially constructed over the course of time, seem to increase rates of screening.<sup>(35)</sup> Our results are in line with the data reported in another study in which experiences with the disease drive the consumption of screening mammogram because they believe that the exam is life-saving.<sup>(36)</sup>

Our results also indicate that the facilitators of excess use of mammography screening can be different based on the age. While women under 50 years old report that they are aware of the guidelines but undergo mammography because they believe in its effectiveness and because they are worried about developing the disease early, older women feel confused by the guidelines after guideline changes, and believe that the mammography must be continued. Common to both women, the access opportunities in the Pink October Campaigns.<sup>(10,17-22,31)</sup> The facilitators of excess use of mammography screening can be explain by a misunderstanding of the mammography exam, both because screening mammogram does not prevent the onset of the disease, but also because there is no impact on the reduction of mortality rates from breast cancer in these age groups. These misunderstanding were reported by another study.<sup>(37)</sup>

These facilitators identified by our study indicate a misperception of the purpose of mammography and the understanding of the meaning of screening, especially regarding effectiveness, not only by users, but also by prescribing professionals. In fact, our data show that, from the provider level, factors such as receiving guidance in consultations with doctors, especially with specialists, increased excessive use of mammography screening rates.<sup>(10,17,33)</sup> The literature indicate that professionals end up allowing (or not restricting) access to those with higher incomes and higher education, instead of concentrating on those who need it most and in the age group in which they will benefit the most. A study points out that this behavior of professionals is more frequent among obstetricians and gynecologists, suggesting that the influence of specialists' recommendations and the inflexible of their conduct are important factors in the context of screening.<sup>(38)</sup>

Researchers argue that there seems to be a clash between women's expectations and the incorporation of the best evidence by physicians, as it generates a feeling of distrust among women in professionals who do not request screening tests.<sup>(39)</sup> Another study confirms this finding by identifying the perception of women that the recommendation to undergo the exam demonstrates the professional's concern with their health.<sup>(40)</sup> A second survey revealed that 47.7% of physicians "super-recommend" screening mammogram when asking women with terminal lung cancer, demonstrating that practice is not uncommon even among those with limited life expectancy, reaffirming the high rates observed in this revision.<sup>(41)</sup>

Our study identified few barriers for the of excessive use of mammography, which include having consultations with general practitioners or primary care physicians.<sup>(20,23)</sup> More barriers were identified among women with limited life expectancy: older age, being single, being more likely to die, being more fragile, not having health insurance and not having a regular source of health care and for this population group it was effective informing women, in any age group, about the harms of mammography and life expectancy.<sup>(29,32)</sup> The decision to be screened in the coming years seems to increase

among those who do not talk to the doctor about stopping screening and decrease among those who talk to the primary care doctor and also among those with older age and lower life expectancy.<sup>(30,32)</sup>

Although our review have focused on the women, it was interesting to note multilevel factors that interfere in the excessive use of mammography screening. We found provider factors that affected the probability of screening: prescribing professionals, whether doctors or nurses, have legal support for requesting mammography, but they have a low adherence to evidence-based practices.<sup>(42)</sup> Research that analyzed physicians' perspective on the discontinuation of screening identified that, in the case of breast cancer compared to other types of cancer such as prostate and colorectal cancer, they fail to comply more with the recommended age group and discuss less about the damages of screening.<sup>(43)</sup>

Our study also found factors at the organizational and policy levels. For example, greater access to exams, greater supply of mammograms, and "Pink October" campaigns were factors associated with greater chances of excessive use. One possible explanation for the effect of policy levels on the excessive screening concerns the controversial content of information on mammography screening for breast cancer in several countries. For example, in Brazil there is a law that guarantees mammography for women from 40 years old, with recommendations from screening specialists from 40 years old at annual intervals,<sup>(44)</sup> while at the same time, another recommendation from the Ministry of Health states that mammography screening should only be performed for women aged 50 to 69 years, every two years.<sup>(45)</sup> In the U.S., the recommendations of the United States Preventive Services Task Force and specialist societies, such as the American Cancer Society, and National Comprehensive Cancer Network are also not aligned about the initiation age, frequency nor about when to stop screening.<sup>(46)</sup> In France, mammography can be initiated by women in either opportunistic and/or organized programs, based within existing radiologic facilities in private and public health system,<sup>(33)</sup> a similar context in Asia, where in some countries the exam is paid by government programs.<sup>(47)</sup>

While we have identified some factors on how we can improve the adoption of evidence-based practices among women, the option of reducing the frequency or discontinuing routine screening mammogram can be hard work, given the numerous factors identified in this study and the lack of studies that address strategies aimed at this problem supported by other researchers.<sup>(48)</sup> Our results are aligned with the larger literature<sup>(12)</sup> showing the complexity of factors that need to be accounted for when considering excess.<sup>(49)</sup>

De-implementation of low-value care (or strategies to reduce low-value care use) is, as shown by our results, complex and affected by multi-level factors.<sup>(49-51)</sup> While a recent field,<sup>(52)</sup> scholars have already put forth frameworks,<sup>(53)</sup> scoping reviews of strategies or processes by which low value care programs can be de-implemented, and suggested outcomes.<sup>(50)</sup> Researchers interested in decreasing excessive mammography screening could benefit from learning and fostering the field of de-implementation to improve women's health.

## Conclusion

Our study identified that the excessive use of mammography screening has a high prevalence in the context of screening and is permeated by multi-level factors, including patient, provider, organization and policy factors. Our data show that excessive screening was defined by scholars as the intention or performance of mammography outside the recommended age or interval range, among women with limited life expectancy, in coexisting, organized and opportunistic programs. Our results indicate that the facilitators for the excessive mammography screening are related to their concerns of getting cancer; to the medical advice that they received, especially from specialists; and to the increased access to tests. The most exposed to excessive screening are women with higher levels of education and income. The data show that barriers for excessive mammography include guidance in consultations about the harm of mammography and life expectancy by general practitioners, particularly those in primary care. Our list of determinants can

provide some guidance for future studies aiming to de-implement the low-value care of excessive mammography screening.

## Collaborations

Sala DCP, Silva L, Okuno MFP and Baumann A contributed to the conception, design, analysis and interpretation of data, writing the article, critically reviewing the relevant intellectual content and final approval of the version to be published.

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