A systematic review of the impact of the COVID-19 pandemic on breast cancer screening and diagnosis

Appendices

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Appendix A: Full search strategy

Embase database

Database: Embase Classic <1947 to 1973>, Embase <1974 to 2022 March 16>
Search Strategy:

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1 cancer screening.mp. or exp cancer screening/ (102768)
2 exp breast cancer/ or breast.mp. (884908)
3 1 and 2 (28570)
4 exp mammography/ or mammogra$.mp. (70288)
5 3 or 4 (82729)
6 cancer diagnosis.mp. or exp cancer diagnosis/ (718088)
7 2 and 6 (119568)
8 5 or 7 (167043)
9 covid$.mp. or exp coronavirus disease 2019/ (257193)
10 sars-cov-2.mp. or exp Severe acute respiratory syndrome coronavirus 2/ (102989)
11 coronavir$.mp. (251743)
12 9 or 10 or 11 (290070)
13 8 and 12 (955)
14 limit 13 to (english language and yr="2020 -Current") (934)

Medline database

Database: Ovid MEDLINE(R) ALL <1946 to March 18, 2022>
Search Strategy:

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1 cancer screening.mp. or exp Mass Screening/ (162155)
2 exp Breast Neoplasms/ or breast.mp. (556985)
3 1 and 2 (18236)
4 exp Mammography/ or mammogra$.mp. (43718)
5 3 or 4 (50743)
6 cancer diagnosis.mp. or exp Diagnosis/ (9065862)
7 2 and 6 (214686)
8 5 or 7 (225091)
9 covid$.mp. or exp COVID-19/ (230068)
10 sars-cov-2.mp. or exp SARS-CoV-2/ (153138)
11 coronavir$.mp. (125795)
12 9 or 10 or 11 (254071)
13 8 and 12 (463)
14 limit 13 to (english language and yr="2020 -Current") (444)

Global Health database

Database: Global Health <1910 to 2022 Week 11>
Search Strategy:

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1 cancer screening.mp. or exp screening/ (85203)
2 exp breast cancer/ or breast.mp. (94198)
3 1 and 2 (6200)
4 exp mammography/ or mammogra$.mp. (4996)
5 3 or 4 (7984)
6 cancer diagnosis.mp. or exp diagnosis/ (233530)
7 2 and 6 (5161)

8 5 or 7 (10777)
9 covid$.mp. or exp coronavirus disease 2019/ (62672)
10 sars-cov-2.mp. or exp severe acute respiratory syndrome coronavirus 2/ (33083)
11 coronavir$.mp. (73071)
12 9 or 10 or 11 (75918)
13 8 and 12 (97)
14 limit 13 to (english language and yr="2020 -Current") (93)

Evidence-Based Medicine Reviews (EBMR) database
Database: EBM Reviews - NHS Economic Evaluation Database <1st Quarter 2016>, EBM Reviews - Health Technology Assessment <4th Quarter 2016>, EBM Reviews - Cochrane Methodology Register <3rd Quarter 2012>, EBM Reviews - Cochrane Database of Systematic Reviews <2005 to March 16, 2022>, EBM Reviews - ACP Journal Club <1991 to February 2022>, EBM Reviews - Database of Abstracts of Reviews of Effects <1st Quarter 2016>, EBM Reviews - Cochrane Clinical Answers <February 2022>, EBM Reviews - Cochrane Central Register of Controlled Trials <January 2022>
Search Strategy:
---
1 screening.mp. (77080)
2 breast.mp. (60906)
3 1 and 2 (4927)
4 mammogra$.mp. (3579)
5 3 or 4 (6629)
6 diagnosis.mp. (143502)
7 2 and 6 (7208)
8 5 or 7 (11828)
9 (covid$ or CO?V2 or COV-2 or coronavir$ or SARS or pandemic).mp. (13177)
10 8 and 9 (145)
11 limit 10 to (english language and yr="2020 -Current") [Limit not valid in CLCMR,CDSR,ACP Journal Club,DARE,CCA; records were retained] (24)

Pre-Medline database
Database: PREMEDLINE (Most Recently Published)
Search Strategy:
---
1 screening.mp. or exp Mass Screening/ (3791)
2 exp Breast Neoplasms/ or breast.mp. (2258)
3 1 and 2 (150)
4 mammogra$.mp. (84)
5 3 or 4 (193)
6 diagnosis.mp. (7715)
7 2 and 6 (259)
8 5 or 7 (419)
9 (covid$ or CO?V2 or COV-2 or coronavir$ or SARS or pandemic).mp. (1279)
10 8 and 9 (3)
11 limit 10 to (english language and yr="2020 -Current") (3)

CINAHL Complete database

#	Query	Limiters/Expanders	Last Run Via	Results
S12	S8 AND S11	Limiters -	Interface - EBSCOhost	181

		Published Date: 20200101-; English Language Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Research Databases Search Screen - AdvancedSearch Database - CINAHL Complete	
S11	S9 OR S10	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - AdvancedSearch Database - CINAHL Complete	61,370
S10	(MH "SARS-CoV-2") OR "sars-cov-2"	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - AdvancedSearch Database - CINAHL Complete	12,157
S9	(MH "COVID-19") OR (MH "COVID-19 Pandemic") OR "covid$"	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - AdvancedSearch Database - CINAHL Complete	55,042
S8	S5 OR S7	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - AdvancedSearch Database - CINAHL Complete	64,240
S7	S1 AND S6	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - AdvancedSearch Database - CINAHL Complete	61,669
S6	"cancer diagnosis" OR (MH "Diagnosis+")	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - AdvancedSearch Database - CINAHL Complete	2,063,462
S5	S3 OR S4	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	17,816
S4	S1 AND S2	Expanders - Apply	Interface - EBSCOhost	8,751

		equivalent subjects Search modes - Boolean/Phrase	Research Databases Search Screen - Advanced Search Database - CINAHL Complete	
S3	(MH "Mammography") OR "mammogra$"	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	13,106
S2	(MH "Cancer Screening") OR "cancer screening"	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	30,606
S1	"breast" OR (MH "Breast Neoplasms+")	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Complete	159,251

Scopes database

(TITLE-ABS-KEY (breast) AND TITLE-ABS-KEY (screening OR diagnosis) AND TITLE-ABS-KEY (covid$ OR co?v2 OR cov-2 OR coronavir$ OR sars OR pandemic)) AND PUBYEAR > 2019 AND (LIMIT-TO (LANGUAGE , "English"))

Number of results: 772

Appendix B: Inclusion and exclusion criteria

1. Study population
    - Screening and assessment: asymptomatic women attending breast cancer screening programs/practice, and recalled women for further assessment.
    - Diagnosis: symptomatic women or women with suspicious lesions or newly diagnosed women.
    - Studies will be excluded if:
        - Reporting women with other cancers (unless the data for breast cancer screening/diagnosis are reported separately).
        - Reporting on women have been diagnosed with breast cancer before COVID-19.
        - Reporting on women had treatments (e.g. women who underwent surgery).
        - Including male breast cancer.
2. Exposure
    - COVID-19 pandemic
    - Studies assessing the effects of any intervention or strategy for mitigating the impact of COVID-19 (e.g. implementation of triaging systems or telehealth services) will be excluded.
3. Comparison
    - Any comparison reporting a change or impact due to COVID-19 (e.g. before vs after COVID-19, or lockdown vs reopen stages).
    - Studies without a comparison will be excluded.
4. Outcomes
    - Screening and assessment: detection measures such as cancer detection rate, recall rate, interval cancer rate; service utilisation such as participation rate and assessment change; other screening-oriented outcome if available.
    - Diagnosis: number of diagnosed women; cancer stage at diagnosis; number of diagnostic imaging; other diagnostic outcome if available.
    - Studies will be excluded if:
        - it does not assess the actual impact/change due to COVID-19 (e.g. hypothetical studies of impact of COVID-19, estimated or projected outcomes).
        - it reports COVID-19 outcome only (e.g. tested positive for COVID-19).
        - it reports treatment outcome only (e.g. change of surgery/intervention type).
5. Study design
    - Studies will be excluded if:
        - Non-clinical studies (e.g. review, animal study, study protocol, survey, editorial, letter, communication, comment, opinion, viewpoint, perspective, guideline/recommendation/statement, .etc.) unless it reported sufficient methods and results of original studies.
        - Case reports
        - Modelling studies
        - Abstract only
6. Language
    - Non-English language studies will be excluded.

Appendix C: Data extraction

Because various outcomes were reported across publications, we focused on extracting the main outcomes reported in the included studies. For general medical imaging studies involving multiple imaging modalities, we only extracted data of mammography because other modalities could include examinations of organ sites other than breast (unless data were separately reported for the breast). For breast imaging studies, we extracted data of all imaging modalities where relevant.

There was inconsistency between studies in the estimates of effect reported for each outcome (e.g. frequency, proportion, rate, ratio etc). We therefore extracted the outcome data in the original format (i.e. how it was reported in the included study).

Data presented only in figures without any associated numeric values were extracted using open-source software PlotDigitizer (https://plotdigitizer.com/app), and these data were averaged between two authors' extractions.

When the study used data for more than 1 year (e.g. 2018 and 2019) as the pre-pandemic cohort, we extracted the data of the most recent year.

For studies which did not present cumulative numbers over the periods and only presented data by month (or fortnight or week or day), we did not extract every time point. Instead, we conducted an aggregation when the study reported raw data. Generally, we aggregated a pandemic period and the same time period in the previous year, to make an 'pre' versus 'post' pandemic comparison. When the study did not report raw data and only reported the relative change, we extracted the range of the relative change, and/or the change at the beginning of the decline and time of the 'nadir' before starting to recover.

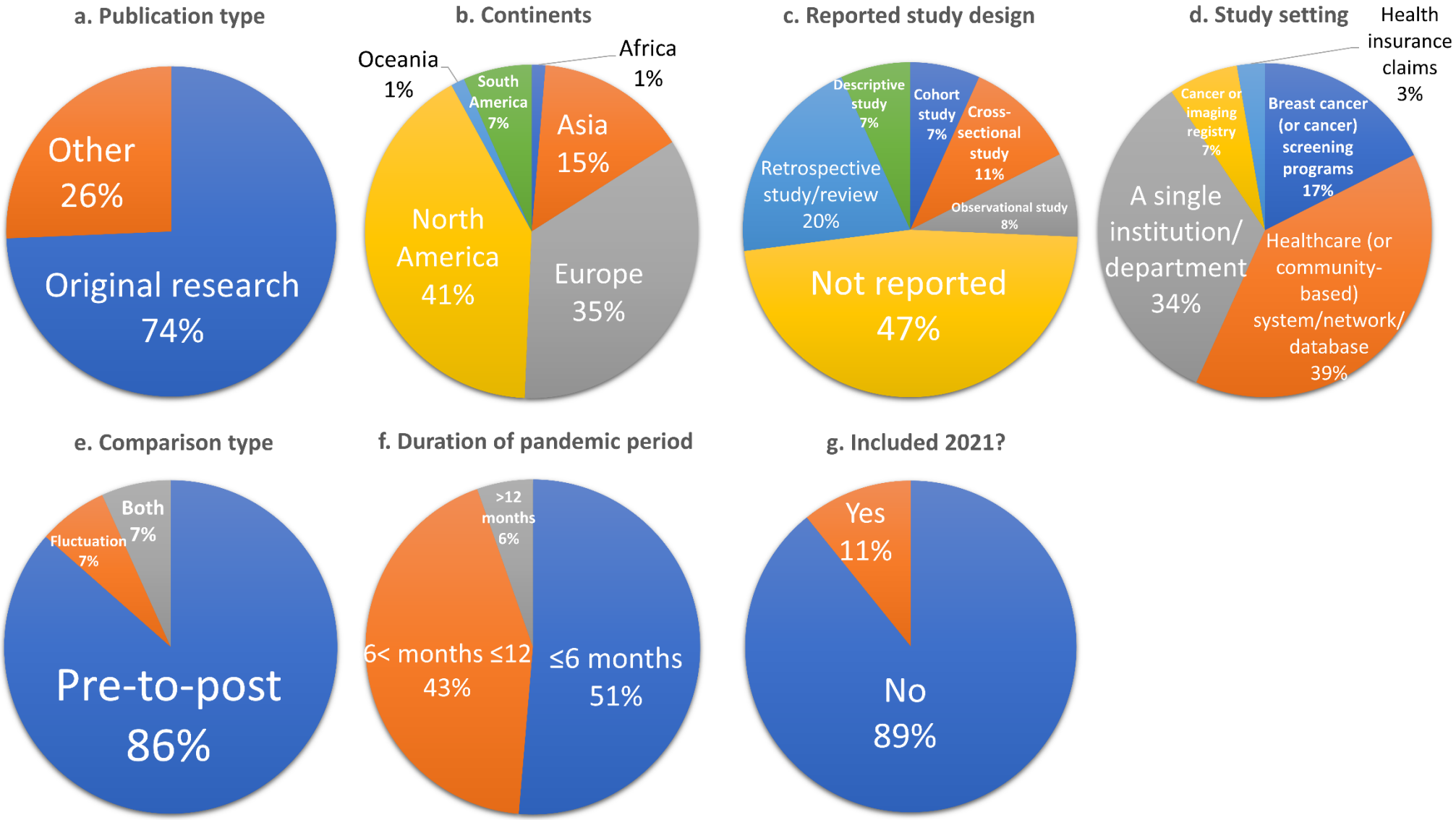
For studies which did not report the change between pre-pandemic or comparison outcome (outcome_A) and pandemic outcome (outcome_B), we computed the change: i) when the reported outcome was presented in frequency format only, relative percentage change was calculated by 100% * ((outcome_B - outcome_A)/outcome_A); ii) when the reported outcome was presented in rate or distribution using proportion (or both proportion and frequency), absolute change of the value was calculated, i.e. change (in %) = outcome_B - outcome_A.

Appendix D: Risk of bias criteria

- Criterion 1: Study question
  Was the study question or objective clearly stated?
- Criterion 2: Eligibility criteria and study population
  Were eligibility/selection criteria for the study population prespecified and clearly described?
- Criterion 3: Study participants representative of clinical populations of interest
  Were the participants in the study representative of those who would have the exposure in the general or clinical population of interest?
- Criterion 4: All eligible participants enrolled
  Were all eligible participants that met the prespecified entry criteria enrolled?
- Criterion 5: Sample size
  Was the sample size sufficiently large to provide confidence in the findings?
- Criterion 6: Exposure clearly described
  Was the exposure clearly described and consistent across the study population?
- Criterion 7: Exposure unlikely to affect data collection
  Were sources and methods of data collection the same before and after the intervention?
- Criterion 8: Exposure independent of other changes
  Were there compelling arguments that the exposure occurred independently of other changes over time, and was the outcome not influenced by other confounding variables/historic events during study period?
- Criterion 9: Outcome measures clearly described, valid, and reliable
  Were the outcome measures prespecified, clearly defined, valid, reliable, and assessed consistently across all study participants?
- Criterion 10: Statistical analysis
  Did the statistical methods examine changes in outcome measures from before to after the exposure? Were statistical tests done that provided p values for the pre-to-post changes?
- Criterion 11: Multiple outcome measures
  Were outcome measures of interest taken multiple times before the exposure and multiple times after the exposure?
- Criterion 12: Other risks of bias
  Was there no evidence of other risk of biases?

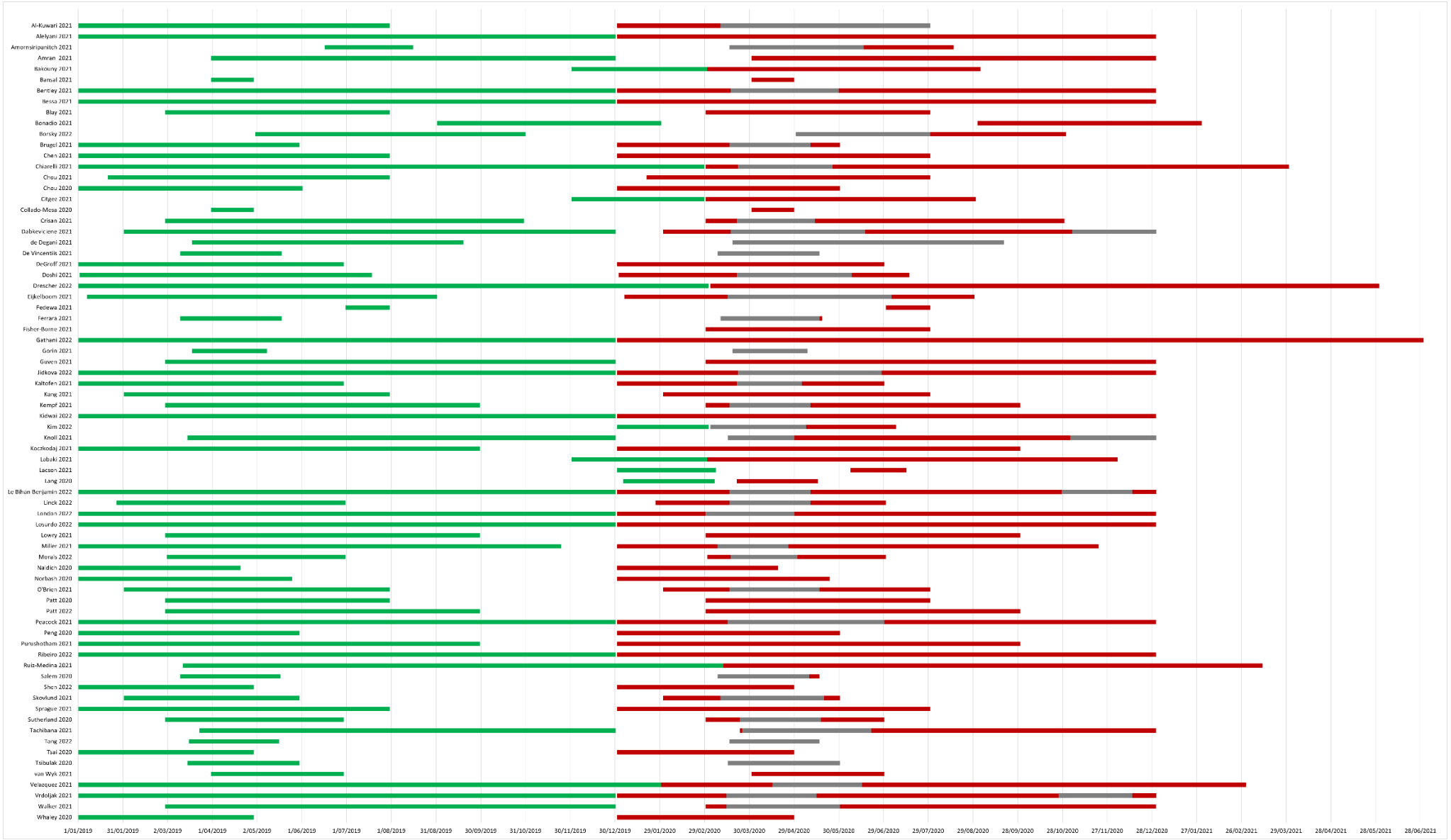
Appendix E: Supplementary figures

AppxFigure E.1: Summary of study characterises



a: Publication type ('Other' includes letters, communications, editorials, and brief reports); b: Continents; c: Study design as reported in each study; d: Study setting; e: Comparison type; f: Duration of reported COVID-19 period; g: Whether the pandemic period included any time in 2021.

AppxFigure E.2: Timeline of before and after COVID-19 for each individual study



Green bar represents the period of pre-pandemic (or comparison) group; Red bar represents the period of pandemic group; Grey bar represents the period/s of service suspension or regional lockdown (where reported). For each study, we used the longest period (i.e. the very start and very end points) for both groups; therefore the time period was not necessarily matched with the study period of each outcome presented in tables 1-2 and AppxTables F.3-F.8.

Appendix F: Supplementary tables

AppxTable F.1: Study characterises for each individual study

Study	Country or Region	Healthcare setting or data source	Publication type*	Reported study design**	Comparison type***	Duration of reported pandemic period (months)	Including any time in 2021
Al-Kuwari 2021 [1]	Qatar	27 Primary Health Care Corporation health centres	Original research	Retrospective study/review	Pre-to-post	7	No
Alelyani 2021 [2]	Saudi Arabia	3 hospitals in the region	Original research	Retrospective study/review	Pre-to-post	12	No
Amornsiripanitch 2021 [3]	US	Various centres from one institution	Original research	Retrospective study/review	Pre-to-post	5	No
Amran 2021 [4]	US	A large statewide non-profit community health care system	Other	Observational study	Pre-to-post	9	No
Bakouny 2021 [5]	US	A large health care system with a centralized repository of clinical and administrative data	Other	Observational study	Pre-to-post & Fluctuation	6	No
Bansal 2021 [6]	UK	A symptomatic breast clinic in a university hospital	Original research	Retrospective study/review	Pre-to-post	1	No
Bentley 2021 [7]	Canada	Breasts screening program	Other	Not reported	Pre-to-post	12	No
Bessa 2021 [8]	Brazil	Standard screening program	Original research	Cross-sectional study	Pre-to-post	12	No
Blay 2021 [9]	France	French Federation of Comprehensive Cancer Centres (Unicancer network)	Original research	Not reported	Pre-to-post	5	No
Bonadio 2021 [10]	Brazil	A tertiary cancer centre	Original research	Cross-sectional study	Pre-to-post	5	Yes
Borsky 2022 [11]	UK	A breast unit	Other	Cohort study	Pre-to-post	6	No
Brugel 2021 [12]	France	A tertiary care centre and a general hospital	Other	Not reported	Pre-to-post	5	No
Chen 2021 [13]	US	A large national commercial insurance carrier	Original research	Cohort study	Pre-to-post	7	No
Chiarelli 2021 [14]	Canada	Ontario Breast Screening Program	Original research	Descriptive study	Fluctuation	12	Yes
Chou 2021 [15]	Taiwan	A public, academic medical centre	Original research	Retrospective study/review	Pre-to-post	6.5	No
Chou 2020 [16]	Taiwan	A public, academic medical centre	Other	Retrospective study/review	Pre-to-post	5	No
Citgez 2021 [17]	Turkey	A tertiary university hospital	Original research	Retrospective study/review	Fluctuation	6	Yes
Collado-Mesa 2020 [18]	US	5 breast imaging centres	Other	Observational study	Pre-to-post	1	No
Crisan 2021 [19]	Romania	A large tertiary oncological centre	Original research	Not reported	Pre-to-post	8	No
Dabkeviciene 2021 [20]	Lithuania	National Cancer Institute (a cancer treatment-dedicated hospital)	Original research	Not reported	Pre-to-post	11	No
de Degani 2021 [21]	Argentina	National screening information system, and local cancer registry	Original research	Cross-sectional study	Pre-to-post	6	No
De Vincentiis 2021 [22]	Italy	A pathology unit of a secondary care hospital network	Other	Not reported	Pre-to-post	2	No
DeGroff 2021[23]	US	National Breast and Cervical Cancer Early Detection Program	Original research	Not reported	Pre-to-post	6	No

Doshi 2021 [24]	US	A large, metropolitan hospital system consisting of 6 outpatient practices	Original research	Retrospective study/review	Pre-to-post & Fluctuation	7.5	No
Drescher 2022 [25]	US	A large, community-based health care system of 40 inpatient or outpatient facilities	Original research	Cross-sectional study	Pre-to-post & Fluctuation	14	Yes
Eijkelboom 2021 [26]	Netherlands	Netherlands Cancer Registry	Original research	Not reported	Pre-to-post	8	No
Fedewa 2021 [27]	US	32 community health centres	Other	Not reported	Pre-to-post	1	No
Ferrara 2021 [28]	Italy	7 anatomic pathology units serving secondary care hospital networks	Original research	Not reported	Pre-to-post	2	No
Fisher-Borne 2021 [29]	US	22 federally qualified health centres	Original research	Not reported	Pre-to-post	5	No
Gathani 2022 [30]	UK	National Health Service (NHS) cancer service activity data	Other	Not reported	Fluctuation	18	Yes
Gorin 2021 [31]	US	A large, midwestern private medical centre	Other	Descriptive study	Pre-to-post	1.5	No
Guven 2021 [32]	Turkey	A medical oncology clinic	Other	Not reported	Pre-to-post	10	No
Jidkova 2022 [33]	Belgium	Population-based cancer screening program	Original research	Not reported	Pre-to-post	12	No
Kaltofen 2021 [34]	Germany	A tertiary academic gynaeco-oncological centre	Original research	Not reported	Pre-to-post	5	No
Kang 2021 [35]	Korea	A clinical data warehouse of 6 university hospitals	Original research	Retrospective study/review	Pre-to-post	6	No
Kempf 2021 [36]	France	A clinical data warehouse of Greater Paris University hospitals (comprising 39 specialised health care centres)	Original research	Not reported	Pre-to-post	7	No
Kidwai 2022 [37]	US	A Veteran Affairs primary care clinic	Other	Not reported	Pre-to-post	12	No
Kim 2022 [38]	US	A large, nonprofit academic health system	Original research	Retrospective study/review	Pre-to-post & Fluctuation	4	No
Knoll 2021 [39]	Austria	A tertiary referral centre	Original research	Not reported	Pre-to-post	9.5	No
Koczkodaj 2021 [40]	Poland	National Health Fund	Original research	Not reported	Pre-to-post	9	No
Labaki 2021 [41]	US	A large healthcare system comprising 7 hospitals	Other	Observational study	Pre-to-post	9	No
Lacson 2021 [42]	US	An urban academic quaternary care hospital with 8 affiliated outpatient facilities	Original research	Cohort study	Pre-to-post	1	No
Lang 2020 [43]	US	A large urban academic hospital and its affiliated imaging centres	Original research	Descriptive study	Fluctuation	2	No
Le Bihan Benjamin 2022 [44]	France	French National Cancer Institute (French administrative healthcare database, and Medicalised information system programme from all French hospital facilities)	Original research	Not reported	Pre-to-post	12	No
Linck 2022 [45]	France	A tertiary cancer centre	Original research	Observational study	Fluctuation	5	No
London 2022 [46]	US	A health research network of 22 US health care organizations, and tumour registry data	Original research	Not reported	Pre-to-post	16	Yes
Losurdo 2022 [47]	Italy	Osservatorio Nazionale Screening Program	Original research	Not reported	Pre-to-post	12	No
Lowry 2021 [48]	US	7 breast imaging registries within the Breast Cancer Surveillance Consortium	Original research	Not reported	Pre-to-post	7	No
Miller 2021 [49]	US	Electronic medical record from one institution	Original research	Retrospective study/review	Pre-to-post	11	No
Morais 2022 [50]	Portugal	A cancer-dedicated hospital	Original research	Not reported	Pre-to-post	4	No

Naidich 2020 [51]	US	A large health care system	Original research	Retrospective study/review	Pre-to-post	4.5	No
Norbash 2020 [52]	US	6 academic medical systems and a large national private practice coalition	Original research	Not reported	Pre-to-post	6	No
O'Brien 2021 [53]	Ireland	A tertiary referral symptomatic breast cancer centre	Other	Not reported	Pre-to-post	6	No
Patt 2020 [54]	US	A large medical claims clearinghouse database	Original research	Retrospective study/review	Pre-to-post	5	No
Patt 2022 [55]	US	A multipayer database	Original research	Not reported	Pre-to-post	7	No
Peacock 2021 [56]	Belgium	Pathology laboratories (of the Belgian Cancer Registry)	Original research	Not reported	Pre-to-post	12	No
Peng 2020 [57]	Taiwan	Population-based breast cancer screening program	Other	Not reported	Pre-to-post	5	No
Purushotham 2021 [58]	UK	A major cancer hospital network (South East London Cancer Alliance)	Original research	Not reported	Pre-to-post	9	No
Ribeiro 2022 [59]	Brazil	Brazilian National Health Service Outpatient Information Systems, and Cancer Information System	Original research	Descriptive study	Pre-to-post	12	No
Ruiz-Medina 2021 [60]	Spain	2 university-affiliated hospitals	Original research	Cross-sectional study	Pre-to-post	12	Yes
Salem 2020 [61]	Lebanon	The radiology department of a single university hospital institution	Original research	Descriptive study	Pre-to-post	2	No
Shen 2022 [62]	Taiwan	The nationwide cancer screening registry database	Original research	Cross-sectional study	Pre-to-post	4	No
Skovlund 2021 [63]	Denmark	National cancer registry and national patient register	Other	Not reported	Pre-to-post	4	No
Sprague 2021 [64]	US	6 breast imaging registries within a network of breast imaging facilities (Breast Cancer Surveillance Consortium)	Original research	Not reported	Pre-to-post	7	No
Sutherland 2020 [65]	Australia	Breast cancer screening program (BreastScreen NSW, Cancer Institute NSW)	Original research	Not reported	Pre-to-post	4	No
Tachibana 2021 [66]	Brazil	A breast imaging centre in a private hospital	Original research	Cohort study	Pre-to-post	9	No
Tang 2022 [67]	US	A large integrated health care system (21 medical centres with more than 250 outpatient facilities)	Original research	Cohort study	Pre-to-post	2	No
Tsai 2020 [68]	Taiwan	A national screening database	Other	Not reported	Pre-to-post	4	No
Tsibulak 2020 [69]	Austria	18 gynaecological departments	Original research	Not reported	Pre-to-post	2.5	No
van Wyk 2021 [70]	South Africa	An anatomical pathology laboratory in one institution	Original research	Retrospective study/review	Pre-to-post	3	No
Velazquez 2021 [71]	US	An urban integrated health system’s safety-net hospital	Other	Cross-sectional study	Pre-to-post	13	Yes
Vrdoljak 2021 [72]	Croatia	25 Croatian hospitals	Original research	Retrospective study/review	Pre-to-post & Fluctuation	12	No
Walker 2021 [73]	Canada	Cancer screening programs	Original research	Observational study	Pre-to-post	12	No
Whaley 2020 [74]	US	Health insurance claims	Original research	Cross-sectional study	Pre-to-post	4	No

* ‘Other’ publication type includes letters, communications, editorials, and brief reports.
** This is the study deign reported in each study (i.e. not judged by the authors).
*** Comparison of dichotomous 'pre-to-post’ time periods includes pre vs during, pre vs peak/shutdown, and pre vs after-peak/reopening; Comparison of ‘fluctuation’ includes changes over multiple time points before and during the pandemic period, such as pre vs shutdown vs reopen.

AppxTable F.2: Risk of bias assessment for each individual study

Criterion / Study	1	2	3	4	5	6	7	8	9	10	11	12	Overall
	Study question	Eligibility criteria and study population	Study participants representative of clinical populations of interest	All eligible participants enrolled	Sample size	Exposure clearly described	Exposure unlikely to affect data collection	Exposure independent of other changes	Outcome measures clearly described, valid, and reliable	Statistical analysis	Multiple outcome measures	Other risks of bias	
Al-Kuwari 2021 [1]	Y	Y	Y	Y	Y	Y	Y	NR	Y	N	Y	NR	High
Alelyani 2021 [2]	Y	Y	Y	Y	Y	Y	Y	NR	Y	Y	Y	NR	Unclear
Amornsiripanitch 2021 [3]	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	N	High
Amran 2021 [4]	Y	Y	Y	Y	Y	Y	Y	NR	Y	Y	N	N	High
Bakouny 2021 [5]	Y	Y	Y	Y	Y	Y	Y	NR	Y	N	N	N	High
Bansal 2021 [6]	Y	Y	N	Y	N	Y	Y	N	N	N	N	N	High
Bentley 2021 [7]	Y	N	Y	NR	Y	Y	Y	NR	Y	N	Y	NR	High
Bessa 2021 [8]	Y	Y	Y	Y	Y	Y	Y	N	N	N	Y	NR	High
Blay 2021 [9]	Y	Y	Y	Y	Y	Y	Y	NR	Y	N	Y	NR	High
Bonadio 2021 [10]	Y	Y	N	Y	N	Y	Y	NR	Y	Y	N	NR	High
Borsky 2022 [11]	Y	Y	N	Y	N	Y	Y	NR	Y	Y	N	Y	High
Brugel 2021 [12]	Y	N	Y	NR	Y	Y	Y	NR	Y	N	Y	N	High
Chen 2021 [13]	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	High
Chiarelli 2021 [14]	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	N	High
Chou 2021 [15]	Y	Y	N	Y	N	Y	Y	N	Y	Y	Y	Y	High
Chou 2020 [16]	Y	N	N	NR	N	Y	Y	N	N	Y	Y	NR	High
Citgez 2021 [17]	N	Y	N	Y	N	Y	Y	NR	Y	Y	N	N	High
Collado-Mesa 2020 [18]	Y	Y	Y	Y	Y	Y	Y	NR	Y	N	N	NR	High
Crisan 2021 [19]	Y	N	N	NR	N	Y	Y	NR	Y	Y	Y	NR	High
Dabkeviciene 2021 [20]	Y	N	N	NR	Y	Y	Y	NR	Y	Y	Y	Y	High
de Degani 2021 [21]	Y	Y	Y	N	Y	Y	Y	NR	Y	Y	N	Y	High
De Vincentiis 2021 [22]	Y	Y	Y	Y	Y	Y	Y	NR	Y	N	N	NR	High
DeGroff 2021[23]	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	N	High
Doshi 2021 [24]	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	N	High
Drescher 2022 [25]	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	High
Eijkelboom 2021 [26]	Y	Y	Y	Y	Y	Y	Y	NR	Y	Y	Y	Y	Unclear
Fedewa 2021 [27]	Y	Y	Y	Y	Y	Y	Y	N	Y	N	N	N	High
Ferrara 2021 [28]	N	Y	Y	Y	Y	Y	Y	NR	Y	N	Y	NR	High
Fisher-Borne 2021 [29]	Y	Y	Y	Y	Y	Y	Y	N	Y	N	N	N	High
Gathani 2022 [30]	Y	Y	Y	Y	Y	Y	Y	NR	Y	N	Y	Y	High

Gorin 2021 [31]	Y	Y	N	Y	N	Y	Y	N	Y	N	Y	Y	High
Guven 2021 [32]	Y	N	N	NR	N	Y	Y	NR	Y	Y	N	Y	High
Jidkova 2022 [33]	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	High
Kaltofen 2021 [34]	Y	Y	N	Y	N	Y	NR	NR	Y	N	Y	Y	High
Kang 2021 [35]	Y	Y	Y	Y	Y	Y	Y	NR	N	N	Y	N	High
Kempf 2021 [36]	Y	Y	Y	Y	Y	Y	Y	NR	Y	N	Y	NR	High
Kidwai 2022 [37]	Y	N	N	NR	N	Y	Y	NR	Y	N	N	N	High
Kim 2022 [38]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	High
Knoll 2021 [39]	Y	Y	N	Y	N	Y	NR	NR	Y	Y	Y	Y	High
Koczkodaj 2021 [40]	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	N	High
Labaki 2021 [41]	Y	Y	Y	Y	Y	Y	Y	NR	Y	N	N	N	High
Lacson 2021 [42]	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	Y	High
Lang 2020 [43]	Y	Y	N	Y	Y	Y	Y	NR	Y	Y	Y	Y	High
Le Bihan Benjamin 2022 [44]	Y	Y	Y	Y	Y	Y	Y	NR	Y	Y	Y	N	High
Linck 2022 [45]	Y	Y	N	Y	N	Y	Y	NR	Y	Y	N	N	High
London 2022 [46]	Y	Y	Y	Y	Y	Y	Y	NR	Y	N	Y	NR	High
Losurdo 2022 [47]	Y	N	Y	NR	Y	Y	NR	NR	N	N	N	NR	High
Lowry 2021 [48]	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	High
Miller 2021 [49]	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	N	High
Morais 2022 [50]	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	High
Naidich 2020 [51]	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	High
Norbash 2020 [52]	N	N	Y	NR	Y	Y	Y	N	Y	N	Y	N	High
O'Brien 2021 [53]	Y	N	N	NR	N	Y	NR	NR	N	N	Y	NR	High
Patt 2020 [54]	Y	Y	Y	Y	Y	Y	Y	NR	Y	Y	Y	NR	Unclear
Patt 2022 [55]	Y	N	Y	NR	Y	Y	Y	NR	Y	N	Y	N	High
Peacock 2021 [56]	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	NR	High
Peng 2020 [57]	Y	Y	Y	Y	Y	Y	Y	NR	Y	N	Y	NR	High
Purushotham 2021 [58]	Y	Y	Y	Y	Y	Y	Y	NR	N	N	Y	N	High
Ribeiro 2022 [59]	Y	Y	Y	Y	Y	Y	N	N	Y	N	Y	NR	High
Ruiz-Medina 2021 [60]	Y	Y	Y	Y	Y	Y	Y	NR	Y	Y	Y	Y	Unclear
Salem 2020 [61]	Y	Y	N	Y	N	Y	NR	NR	N	N	Y	NR	High
Shen 2022 [62]	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	N	High
Skovlund 2021 [63]	Y	Y	Y	Y	Y	Y	N	N	Y	N	Y	NR	High
Sprague 2021 [64]	Y	Y	Y	Y	Y	Y	Y	NR	Y	N	Y	N	High
Sutherland 2020 [65]	Y	N	Y	NR	Y	Y	Y	NR	Y	N	Y	N	High
Tachibana 2021 [66]	Y	Y	N	Y	Y	Y	Y	NR	Y	Y	Y	Y	High
Tang 2022 [67]	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	High
Tsai 2020 [68]	Y	Y	Y	Y	Y	Y	Y	NR	Y	Y	N	NR	High
Tsibulak 2020 [69]	Y	Y	Y	Y	Y	Y	NR	NR	Y	Y	Y	N	High
van Wyk 2021 [70]	Y	Y	N	Y	N	Y	Y	NR	Y	Y	N	Y	High

Velazquez 2021 [71]	Y	Y	N	Y	Y	Y	N	NR	N	Y	Y	N	High
Vrdoljak 2021 [72]	Y	Y	Y	Y	Y	Y	Y	NR	Y	Y	Y	NR	Unclear
Walker 2021 [73]	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	High
Whaley 2020 [74]	Y	Y	Y	Y	Y	Y	Y	NR	Y	Y	Y	Y	Unclear
Count of Y/Low	**71**	**62**	**50**	**61**	**58**	**74**	**65**	**8**	**63**	**35**	**53**	**22**	**0**
Count of NR /Unclear	**0**	**0**	**0**	**12**	**0**	**0**	**6**	**46**	**0**	**0**	**0**	**23**	**6**
Count of N/High	**3**	**12**	**24**	**1**	**16**	**0**	**3**	**20**	**11**	**39**	**21**	**29**	**68**

N=No, Y=Yes, NR=Not reported; Low=Low risk, Unclear=Unclear risk, High=High risk.

AppxTable F.3: Summary of positive screens or recalls

Study, Country/Region (n=8)	Health service setting	Pre-pandemic	Pandemic		Proportion of abnormal/positive screens or recall rate	
		Time period	Time period	Services suspension/ lockdown	Pre-pandemic vs Pandemic (data are in proportion (%) unless specified)	Absolute change in outcome
Bakouny 2021, US [5]	HCS	Same months 2019: 02/03/2019 to 02/06/2019; Pre-peak: 01/12/2019 to 02/03/2020.	Peak: 02/03/2020 to 02/06/2020; After-peak: 03/06/2020 to 03/09/2020.	NR	Peak vs Same months 2019/Pre-peak/After-Peak: 4.1% vs 1.9%-2.3%	↓*1.8%-2.2%*
Chou 2020, Taiwan [16]	ASI	Week1, 2019 to Week 22, 2019	Week 1, 2020 to Week 22, 2020	NR	Recall rate: 5.8% vs 5.6%	↓*0.2%,* p=0.91
de Degani 2021, Argentina [21]	BCSP	19/03/2019 to 19/09/2019	19/03/2020 to 19/09/2020	19/03/2020-19/09/2020	0.60% vs 2.43%	↑1.83%, p<0.0001
Peng 2020, Taiwan [57]	BCSP	01/01/2019 to 31/05/2019	01/01/2020 to 31/05/2020	No suspension	4.88% (24204/496207) vs 7.20% (25847/358771)	↑*2.32%*
Tsai 2020, Taiwan [68]	BCSP	01/01/2019 to 30/04/2019	01/01/2020 to 30/04/2020	No suspension	Recall rate: In hospital: 8.3% vs 8.7%; Outreach: 6.6% vs 6.9%.	In hospital: ↑0.4%, p<0.001; Outreach: ↑0.3%, p<0.001.
Walker 2021, Canada [73]	BCSP	01/01/2019 to 31/12/2019	01/01/2020 to 30/06/2020	Mid 03/2020-End 05/2020	Average risk women: 8.2-9.3% (8.8%) vs 8.5-11.3% (*9.9%*); High risk women: 15.8-21.0% (18.6%) vs 18.4-37.3% (*19.2%*).	Average risk women: ↑*1.1%;* High risk women: ↑*0.6%.*
					Number of abnormal screening mammograms	
					Pre-pandemic vs Pandemic (data are in frequency (N))	**Relative change in outcome**
Bentley 2021, Canada [7]	BCSP	01/01/2019 to 31/12/2019	01/01/2020 to 31/12/2020	18/03/2020-30/05/2020	23766 vs 16236	↓31.7%
Chiarelli 2021, Canada [14]	BCSP	01/01/2019 to 29/02/2020	Suspension: 01/03/2020 to 31/05/2020; Resumption: 01/06/2020 to 31/03/2021.	23/03/2020-26/05/2020	March: 5246 vs 2690 vs 5896	03/2019 vs 03/2020: ↓48.7%; 03/2019 vs 03/2021: ↑11.0%.

BCSP= Breast cancer (or cancer) screening program, HCS=Healthcare (or community-based) system/network/database, ASI=A single institution or department, NR=Not reported.
Italics: computed data (see Appendix C).

AppxTable F.4: Summary of screening by age

Study, Country/Region (n=8)	Health service setting	Pre-pandemic	Pandemic		Age distribution of women having screening or number of screening mammography by age	
		Time period	Time period	Services suspension/ lockdown	Pre-pandemic vs Pandemic (data are frequency with proportion in the parentheses unless specified)	Absolute change in proportion (unless specified)
Amornsiripanitch 2021, US [3]	ASI	17/06/2019 to 16/08/2019	Shutdown: 17/03/2020 to 16/06/2020; Reopen: 17/06/2020 to 16/08/2020	17/03/2020-16/06/2020	NR	Adjusted relative risk* of failure to reschedule missed mammogram: Pre vs Shutdown: 25th percentile: 0.59 (95%CI: 0.56-0.62); 50th percentile: 0.60 (95%CI: 0.57-0.63); 75th percentile: 0.60 (95%CI: 0.57-0.64); p=0.57. Pre vs Reopen: 25th percentile: 1.17 (95%CI: 1.12-1.23); 50th percentile: 1.22 (95%CI: 1.16-1.27); 75th percentile: 1.27 (95%CI: 1.20-1.25); p=0.014. Adjusted relative risk* of screening cancellation: Pre vs Reopen: 25th percentile: 1.20 (95%CI: 1.16-1.24); 50th percentile: 1.27 (95%CI: 1.24-1.31); 75th percentile: 1.36 (95%CI: 1.31-1.41); p<0.001.
Amran 2021, US [4]	HCS	01/04/2019 to 31/12/2019	01/04/2020 to 31/12/2020	NR	< 50 years: 9020 (16.2%) vs 3748 (13.9%); 50-64 years: 22343 (40.1%) vs 10871 (39.5%); ≥65 years: 24315 (43.7%) vs 12903 (46.9%)	*< 50 years: ↓2.3%* *50-64 years: ↓0.6%;* *≥65 years: ↑3.2%.*
Chou 2020, Taiwan [16]	ASI	Week1, 2019 to Week 22, 2019	Week 1, 2020 to Week 22, 2020	NR	Mean age (± SD) of all women: 55.45 ± 7.27 vs 55.74 ± 7.52 Women aged 45-69: 45-49 years: 997 (30.1%) vs 563 (31.7%); 50-54 years: 656 (20.1%) vs 366 (20.6%); 55-59 years: 592 (18.2%) vs 343 (19.3%); 60-64 years: 557 (17.1%) vs 284 (16.0%); 65-69 years: 452 (13.9%) vs 218 (12.3%).	Mean age: p=0.72. Women aged 45-69: *45-49 years: ↑1.6%;* *50-54 years: ↑0.5%;* *55-59 years: ↑1.1% ;* *60-64 years: ↓1.1%;* *65-69 years: ↓1.6%;* p=0.32.
Jidkova 2022, Belgium [33]	BCSP	01/01/2019 to 31/12/2019	01/01/2020 to 31/12/2020	23/03/2020-28/06/2020	NR	50-54 years: ↓0.5% (95% CI: 0.1-1.0%); 55-59 years: ↓1.7% (95% CI: 1.2-2.2%);

						60-64 years: ↓1.0% (95% CI: 0.6-1.5%); 65-69 years: ↓1.5% (95% CI: 1.0-2.0%).
Miller 2021, US [49]	ASI	16/03/2019 to 31/10/2019	16/03/2020 to 31/10/2020	09/03/2020-26/04/2020	<65 years: *6164* (57.3%) vs *5274* (58.2%); ≥65 years: *4589 (42.7%)* vs *3788 (41.8%)*.	Odds Ratio**: 1.28 (95%CI: 1.17-1.41), p<0.001
Tsai 2020, Taiwan [68]	BCSP	01/01/2019 to 30/04/2019	01/01/2020 to 30/04/2020	No suspension	40-44 years: 1368 *(0.34%)* vs 1099 *(0.36%)*; 45-50 years: 67502 *(16.97%)* vs 53274 *(17.21%)*; 51-55 years: 74808 *(18.81%)* vs 56775 *(18.34%)*; 56-60 years: 83044 *(20.88%)* vs 65892 *(21.29%)*; 61-65 years: 85791 *(21.57%)* vs 65431 *(21.14%)*; 66-70 years: 85226 *(21.43%)* vs 67091 *(21.67%)*.	*40-44 years: ↑0.01%;* *45-50 years: ↑0.24%;* *51-55 years: ↓0.47%;* *56-60 years: ↑0.41%;* *61-65 years: ↓0.43%;* *66-70 years: ↑0.25%.* p<0.001
Velazquez 2021, US [71]	ASI	01/09/2019 to 31/01/2020	1st shutdown: 01/02/2020 to 31/05//2020; Reopen: 01/06/2020 to 30/11/2020; 2nd shutdown: 01/12/2020 to 31/01/2021	NR	Proportion of screening mammograms completed within the screening appointments: 40-49 years: 77% vs 58% vs 70% vs 58%; 50-59 years: 77% vs 61% vs 65% vs 62%; 60-69 years: 83% vs 65% vs 66% vs 62%; ≥70 years: 77% vs 68% vs 70% vs 54%.	40-49 years: - Pre vs 1st shutdown: ↓*19%,* p<0.05; - Pre vs Reopen: ↓*7%,* p>0.05; - Pre vs 2nd shutdown: ↓*19%,* p<0.05; 50-59 years: - Pre vs 1st shutdown: ↓*16%,* p<0.05; - Pre vs Reopen: ↓*12%,* p<0.05; - Pre vs 2nd shutdown: ↓*15%,* p<0.05; 60-69 years: - Pre vs 1st shutdown: ↓*18%,* p<0.05; - Pre vs Reopen: ↓*17%,* p<0.05; - Pre vs 2nd shutdown: ↓*21%,* p<0.05; ≥70 years: - Pre vs 1st shutdown: ↓*9%,* p<0.05; - Pre vs Reopen: ↓*7%,* p<0.05; - Pre vs 2nd shutdown: ↓*23%,* p<0.05;
Walker 2021, Canada [73]	BCSP	01/03/2019 to 31/12/2019	01/03/2020 to 31/12/2020	Mid 03/2020-End 05/2020	30-39 years: 2488 (0.4%) vs 2022 (0.7%); 40-49 years: 4265 (0.7%) vs 3756 (1.3%); 50-59 years: 268114 (44.3%) vs 125028 (44.0%); 60-69 years: 246329 (40.7%) vs 114685 (40.3%); 70-74 years: 84693 (14.0%) vs 38751 (13.6%).	30-39 years: ↑0.3%; 40-49 years: ↑0.6%; 50-59 years: ↓0.3%; 60-69 years: ↓0.4%; 70-74 years: ↓0.4%.

BCSP= Breast cancer (or cancer) screening program, HCS=Healthcare (or community-based) system/network/database, ASI=A single institution or department, NR=Not reported, CI=Confidence interval.

Light grey cells: plot-extracted data (see Appendix C); *Italics*: computed data (see Appendix C).

* Adjusted for insurance provider, race, chronic disease, and location.

** Controlled for race, ethnicity, breast density, insurance status, imaging site type, called back from screening in 2019, history of breast cancer, requires interpreter, travel time to imaging centre, median household income, and percent living below poverty level.

AppxTable F.5: Summary of screening by ethnicity or race

Study, Country/Region (n=10)	Health service setting	Pre-pandemic	Pandemic		Screening or cancellation rate by ethnicity or race	
		Time period	Time period	Services suspension/ lockdown	Pre-pandemic vs Pandemic (data are in proportion (%) unless specified)	Absolute change in outcome (unless specified)
Amornsiripanitch 2021, US [3]	ASI	17/06/2019 to 16/08/2019	17/06/2020 to 16/08/2020	NR	Cancellation rate by race: Non-white: 40% vs 53%; White: 36% vs 44%.	Adjusted relative risk* Non-white: 1.34 (95%CI: 1.27-1.41); White: 1.25 (95%CI: 1.21-1.29); p=0.025.
Fedewa 2021, US [27]	HCS	01/07/2019 to 31/07/2019	01/07/2020 to 31/07/2020	NR	Screening rate by black people distribution: Low: 52.5% vs 49.9%; Medium: 53.9% vs 49.7%; High: 55.3% vs 48.9%. Screening rate by Hispanic people distribution: Low: 45.1% vs 41.5%; Medium: 52.2% vs 47.7%; High: 57.9% vs 54.1%	Screening Rate Ratio (95%CI) by black people distribution: Low: 0.95 (0.94-0.97); Medium 0.92 (0.91-0.93); High: 0.88 (0.87-0.90). Screening Rate Ratio (95%CI) by Hispanic people distribution: Low: 0.92 (0.90-0.94); Medium 0.91 (0.90-0.92); High: 0.93 (0.92-0.94).
Labaki 2021, US [41]	HCS	Pre-peak: 01/12/2019 to 02/03/2020	1st peak: 02/03/2020 to 02/06/2020; Period between two peaks: 03/06/2020 to 03/09/2020; 2nd peak: 04/09/2020 to 05/12/2020.	NR	Proportion of patients undergoing mammography: Pre-peak vs 1st Peak: Non-Hispanic white: 79.0% vs 79.7%; Non-Hispanic black: 6.3% vs 6.1%. Pre-peak vs Period between two peaks: Non-Hispanic white: 79.0% vs 83.2%; Non-Hispanic black: 6.3% vs 5.2%; Hispanic/Latino: 3.3% vs 2.4%. Pre-peak vs 2nd Peak: Non-Hispanic white: 79.0% vs 82.0%; Non-Hispanic black: 6.3% vs 5.3%; Hispanic/Latino: 3.3% vs 2.6%.	Pre-peak vs 1st Peak: Non-Hispanic white: ↑*0.7%;* Non-Hispanic black: ↓*0.2%.* Pre-peak vs Period between two peaks: Non-Hispanic white: ↑*4.2%,* p<0.001; Non-Hispanic black: ↓*1.1%,* p<0.001; Hispanic/Latino: ↓*0.9%,* p<0.001. Pre-peak vs 2nd Peak: Non-Hispanic white: ↑*3.0%,* p<0.001; Non-Hispanic black: ↓*1.0%,* p<0.001; Hispanic/Latino: ↓*0.7%,* p<0.001.
Patt 2022, US [55]	HCS	01/03/2019 to 30/09/2019	01/03/2020 to 30/09/2020	NR	NR	Monthly change in screening rate: White: ↓6.2% (Apr) - ↑0.7% (Sep), coverage in Aug at 0.0%; Black/African American: ↓5.7% (Apr) - ↑0.6% (Sep),

						coverage in Jun at 0.0%; Asian/Native Hawaiian/Pacific Islander: ↓4.5% (Apr) - ↓0.3% (Sep), coverage in Sept at ↓0.3%; Hispanic/Latino: ↓3.5% (May) - ↓0.2% (Sep), coverage in Sept at ↓0.2%; American Indian/Alaska Native: ↓2.5% (May) - ↑0.3% (Sep), coverage in Sept at 0.3%.
Velazquez 2021, US [71]	ASI	01/09/2019 to 31/01/2020	1st shutdown: 01/02/2020 to 31/05//2020; Reopen: 01/06/2020 to 30/11/2020; 2nd shutdown: 01/12/2020 to 31/01/2021	NR	Proportion of completed screening appointments by race/ethnicity: White: 71% vs 62% vs 65% vs 61%; Asian: 87% vs 73% vs 74% vs 72%; Latinx: 81% vs 64% vs 73% vs 61%; Black/African American women: 59% vs 45% vs 43% vs 38%.	Proportion of completed screening appointments by race/ethnicity: White: - Pre vs 1st shutdown: ↓*9%,* p<0.05; - Pre vs Reopen: ↓*6%,* p>0.05; - Pre vs 2nd shutdown: ↓*10%,* p<0.05; Asian: - Pre vs 1st shutdown: ↓*14%,* p<0.05; - Pre vs Reopen: ↓*13%,* p<0.05; - Pre vs 2nd shutdown: ↓*15%,* p<0.05; Latinx: - Pre vs 1st shutdown: ↓*17%,* p<0.05; - Pre vs Reopen: ↓*8%,* p<0.05; - Pre vs 2nd shutdown: ↓*20%,* p<0.05; Black/African American women: - Pre vs 1st shutdown: ↓*14%,* p<0.05; - Pre vs Reopen: ↓*16%,* p<0.05; - Pre vs 2nd shutdown: ↓*21%,* p<0.05.
Whaley 2020, US [74]	HIC	01/03/2019 to 30/04/2019.	01/03/2020 to 30/04/2020.	NR	NR	Adjusted absolute change** of utilisation rate of mammogram by race in March/April: ≤20% non-white: ↓249.2 per 10000 women, p<0.01. 79%-21% non-white: ↓242.8 per 10000 women, p>0.05. ≥80% non-white: ↓243.7 per 10000 women, p>0.05.
Number of women having screening by ethnicity or race						
					Pre-pandemic vs Pandemic (data are in frequency (N) unless shown as proportion (%))	**Relative change in outcome**
Amran 2021, US [4]	HCS	01/04/2019 to 31/12/2019	01/04/2020 to 31/12/2020	NR	Hispanic: 1727 vs 619; American Indian/Alaska Native: 215 vs 84; Mixed race: 1892 vs 828; Native Hawaiian/Pacific Islander: 365 vs 166; Asian: 2779 vs 1265; Black: 2320 vs 1069; White: 45572 vs 23163.	Hispanic: ↓64.2%; American Indian/Alaska Native: ↓60.9%; Mixed race: ↓56.2%; Native Hawaiian/Pacific Islander: ↓54.5%; Asian: ↓54.5%; Black: ↓53.9%;

						White: ↓49.2%; p<0.001
DeGroff 2021, US [23]	BCSP	01/01/2015-2019 to 30/06/2015-2019	01/01/2020 to 30/06/2020	NR	NR	In April: -White: ↓87%; -Black: ↓90%; -Asian/Pacific Islander: ↓97%; -American Indian/Alaskan Native: ↓98%; -Multiracial: ↓94%; -Hispanic: ↓84%. In June: -White: ↓40%; -Black: ↓44%; -Asian/Pacific Islander: ↓65%; -American Indian/ Alaskan Native: ↓70%; -Multiracial: ↓57%; -Hispanic: ↓32%.
Miller 2021, US [49]	ASI	16/03/2019 to 31/10/2019	16/03/2020 to 31/10/2020	09/03/2020-26/04/2020	Race: White: 77.8% vs 79.8%; Other: 22.2% vs 20.2%. Ethnicity: Non-Hispanic: 93.2%% vs 95.6%%; Hispanic: 3.0% vs 2.8%	Race: Odds Ratio***: 0.90 (95%CI: 0.80-1.01), p=0.067. Ethnicity: Odds Ratio**: 0.78 (95%CI: 0.55-1.11), p=0.171.
Sprague 2021, US [64]	CIR	01/01/2019 to 31/07/2019	01/01/2020 to 31/07/2020	NR	NR	In July: White: ↓7.1% (95% CI****: -17.1% to 4.0%); Black: ↓3.3% (95% CI****: -11.9% to 6.1%); Hispanic: ↓27.3% (95% CI****: -6.4% to -43.5%); Asian: ↓48.7% (95% CI****: -33.8% to -60.3%);

BCSP= Breast cancer (or cancer) screening program, HCS=Healthcare (or community-based) system/network/database, ASI=A single institution or department, CIR=Cancer or imaging registry, HIC=Health insurance claims, NR=Not reported, CI=Confidence interval.
Light grey cells: plot-extracted data (see Appendix C); *Italics*: computed data (see Appendix C).
* Adjusted for age, insurance provider, chronic disease, and location.
** Controls for the age categories, state, year, and month.
*** Controlled for age, breast density, insurance status, imaging site type, called back from screening in 2019, history of breast cancer, requires interpreter, travel time to imaging centre, median household income, and percent living below poverty level.
**** Adjusted for imaging registry site.

AppxTable F.6: Summary of diagnosis by detection mode

Study, Country/Region (n=9)	Health service setting	Pre-pandemic	Pandemic		Distribution of detection mode	
		Time period	Time period	Services suspension/ lockdown	Pre-pandemic vs Pandemic (data are in proportions (%) or frequency with proportion in the parentheses)	Absolute change in proportion
Bonadio 2021, Brazil [10]	ASI	01/09/2019 to 31/01/2020	01/09/2020 to 31/01/2021	NR	Screening: 25.5% vs 13.7%; Symptomatic: 74.5% vs 86.3%.	Screening: ↓*11.8%,* Symptomatic: ↑*11.8%;* p<0.001.
Borsky 2022, UK [11]	ASI	01/05/2019 to 31/10/2019	01/05/2020 to 31/10/2020	01/05/2020-31/07/2020	Screening: 121 (43.8%) vs 15 (9.2%); Referral (for symptomatic): 155 (56.2%) vs 148 (90.8%).	Screening: ↓*34.6%.* Referral (for symptomatic): ↑*34.6%;* p<0.0001.
Citgez 2021, Turkey [17]	ASI	Pre-peak: 01/12/2019 to 29/02/2020	Peak: 01/03/2020 to 31/05/2020; After-peak: 01/06/2020 to 31/08/2020.	NR	Screening: 20 (27.77%) vs 2 (9.09%) vs 3 (6.52%); Symptomatic: 52 (72.22%) vs 20 (90.9%) vs 43 (93.47%).	*Pre-peak vs Peak:* *Screening: ↓18.68%;* *Symptomatic: ↑18.68%.* *Pre-peak vs After-peak:* *Screening: ↓21.25%;* *Symptomatic: ↑21.25%.* *Peak vs After-peak:* *Screening: ↓2.57%;* *Symptomatic: ↑2.57%.*
Guven 2021, Turkey [32]	ASI	01/03/2019 to 31/12/2019	01/03/2020 to 31/12/2020	No lockdown	Screening: No: 106 (47.7%) vs 72 (61.0%); Yes: 116 (52.3%) vs 46 (39.0%). Symptomatic: No: 44 (20.1%) vs 22 (19.0%); Yes: 175 (79.9%) vs 94 (81.0%).	*Screening:* *No: ↑13.3%* *Yes: ↓13.3%.* *Symptomatic:* *No: ↓1.1%* *Yes: ↑1.1%.*
Linck 2022, France [45]	ASI	Reference: average 36 working days between 27/01/2019 and 01/07/2019.	Pre-lockdown: 27/01/2020 to 16/03/2020; Lockdown: 17/03/2020 to 05/05/2020; After-lockdown:	17/03/2020-11/05/2020	Proportion of symptomatic cancers: 57% vs 47% vs 75% vs 86%	Reference vs Lockdown: ↑*18%,* p=0.07; Reference vs Post-lockdown: ↑*29%,* p<0.0001; Pre-lockdown vs Lockdown: ↑*28%,* p=0.02; Pre-lockdown vs Post-lockdown: ↑*39%,* p<0.0001.

			11/05/2020 to 01/07/2020.			
Tachibana 2021, Brazil [66]	ASI	Comparison 1: 24/03/2019 to 21/06/2019; Comparison 2: 22/06/2019 to 31/12/2019	Comparison 1 (during social isolation): 24/03/2020 to 21/06/2020; Comparison 2 (after social isolation): 22/06/2020 to 31/12/2020	26/03/2020-21/06/2020	Proportion of breast cancer in patients presenting symptoms or elevated risk: Comparison 1 (during social isolation): 55.6% vs 88.9%; Comparison 2 (after social isolation): 61.2% vs 60.0%	Comparison 1 (during social isolation): ↑*33.3%,* p=0.016; Comparison 2 (after social isolation): ↓*1.2%* p=0.857
Tang 2022, US [67]	HCS	17/03/2019 to 17/05/2019	17/03/2020 to 17/05/2020	17/03/2020-17/05/2020	Screening: 440 (63%) vs 54(22%); Symptomatic: 263 (37%) vs 193 (78%).	Screening: ↓*41%,* Symptomatic: ↑*41%;* p<0.001.
					Number of diagnoses by detection mode **Pre-pandemic vs Pandemic (data are in frequency (N))**	**Relative change in outcome**
Eijkelboom 2021*, Netherlands [26]	CIR	Week 9, 2018-2019 to Week 35, 2018-2019	Week 9, 2020 to Week 35, 2020	16/03/2020-05/07/2020 (weeks 12-27)	Screen-detected tumours: 3030 vs 1034. Non-screen-detected tumours: 2722 vs 2591.	Screen-detected tumours: ↓67%. Non-screen-detected tumours: ↓7%.
Lowry 2021*, US [48]	CIR	01/03/2019 to 30/09/2019	01/03/2020 to 30/09/2020	NR	Screen-detected tumours: 1169 vs 722. Symptomatic tumours: 965 vs 895.	Screen-detected cancers: ↓38% (95% CI: 31-45%), p<0.001. Symptomatic cancers: ↓7% (95% CI: -19% to 6%), p=0.27.

HCS=Healthcare (or community-based) system/network/database, ASI=A single institution or department, CIR=Cancer or imaging registry, NR=Not reported, CI=Confidence interval.
Italics: computed data (see Appendix C).
* Study sample also contains in situ tumour, and/or benign tumour cases.

AppxTable F.7: Summary of stage distribution

Study, Country/Region (n=16)	Health service setting	Pre-pandemic	Pandemic		Stage at diagnosis or stage at presentation (Numbering/TNM stage or Stage group)	
		Time period	Time period	Services suspension/ lockdown	Pre-pandemic vs Pandemic (data are frequency with proportion in the parentheses unless specified)	Absolute change in proportion
Bonadio 2021, Brazil [10]	ASI	01/09/2019 to 31/01/2020	01/09/2020 to 31/01/2021	NR	Stage I: 94 (29.6%) vs 25 (9.3%); Stage II: 198 (43.3%) vs 101 (37.7%; Stage III: 106 (23.2%) vs 100 (37.3%); Stage IV: 59 (12.9%) vs 42 (15.7%)	*Stage I: ↓20.3%;* *Stage II: ↓5.6%;* *Stage III: ↑14.1%;* *Stage IV: ↑2.8%;* p<0.001
Borsky 2022, UK [11]	ASI	01/05/2019 to 31/10/2019	01/05/2020 to 31/10/2020	01/05/2020-31/07/2020	For all diagnoses: Stage 0: 39 vs 10; Stage 1a: 111 vs 45; Stage 1b: 21 vs 4; Stage 2a: 44 vs 43; Stage 2b: 30 vs 29; Stage 3a: 16 vs 16; Stage 3b: 3 vs 0; Stage 3c: 2 vs 3; Stage 4: 10 vs 13. Node positive: 65 (23.6%) vs 59 (36.2%). Metastatic: 8 (2.9%) vs 13 (8%). For diagnoses through referral: Stage 0: 16 vs 9; Stage 1a: 51 vs 39; Stage 1b: 11 vs 4; Stage 2a: 32 vs 39; Stage 2b: 22 vs 27; Stage 3a: 11 vs 15; Stage 3b: 3 vs 0; Stage 3c: 1 vs 3; Stage 4: 8 vs 12. For diagnosis through screen-detection: Stage 0: 23 vs 1; Stage 1a: 60 vs 6; Stage 1b: 10 vs 0; Stage 2a: 12 vs 4;	For all diagnoses: median stage at detection, 1a → 2a, p<0.0001. Node positive: ↑*12.6%,* p=0.0063. Metastatic: ↑*5.1%,* p=0.0295. For diagnoses through referral: median stage at detection, 1b → 2a, p = 0.0184. For diagnoses through screen-detection: median stage at detection: 1a → 2a, p=0.0445.

					Stage 2b: 8 vs 2; Stage 3a: 5 vs 1; Stage 3b: 0 vs 0; Stage 3c: 1 vs 0; Stage 4: 2 vs 1.	
Chou 2021*, Taiwan [15]	ASI	21/01/2019 to 31/07/2019	21/01/2020 to 31/07/2020	NR	Stages 0-1: 71% vs 49%; *Stages 2-4: 29% vs 51%*.	*Stages 0-1: ↓22%;* *Stages 2-4: ↑22%.* p<0.001
Citgez 2021, Turkey [17]	ASI	Pre-peak: 01/12/2019 to 29/02/2020	Peak: 01/03/2020 to 31/05/2020; After-peak: 01/06/2020 to 31/08/2020.	NR	Stage 1: 20 (27.77%) vs 5 (22.72%) vs 4 (8.69%); Stage 2: 32 (44.44%) vs 8 (36.36%) vs 21 (45.65%); Stage 3: 16 (22.22%) vs 7 (31.81%) vs 16 (34.78%); Stage 4: 4 (5.55%) vs 2 (9.09%) vs 5 (10.86%).	*Stage1:* *Pre-peak vs Peak: ↓5.05%;* *Pre-peak vs After-peak: ↓19.08%;* *Stage 2:* *Pre-peak vs Peak: ↓8.08%;* *Pre-peak vs After-peak: ↑1.21%;* *Stage 3:* *Pre-peak vs Peak: ↑9.59%;* *Pre-peak vs After-peak: ↑12.56%;* *Stage 4:* *Pre-peak vs Peak: ↑3.54%;* *Pre-peak vs After-peak: ↑5.31%.*
Eijkelboom 2021*, Netherlands [26]	CIR	Week 2, 2018-2019 to Week 35, 2018-2019	Week 2, 2020 to Week 35, 2020	16/03/2020-05/07/2020 (weeks 12-27)	For all tumours: DCIS: 1200 (*16.47%*) vs 764 (*14.40%*); Stage I: 3514 (*48.24%*) vs 2343 (*44.16%*); Stage II: 1863 (*25.57%*) vs 1567 (*29.53%*); Stage III: 327 (*4.49%*) vs 289 (*5.45%*); Stage IV: 306 (*4.20%*) vs 301 (*5.67%*); Unknown: 75 (*1.03%*) vs 42 (*0.79%*). For screen-detected tumours: DCIS: 853 (*22.16%*) vs 446 (*23.76%*); Stage I: 2213 (*57.50%*) vs 1049 (*55.89%*); Stage II: 674 (*17.51%*) vs 334 (*17.79%*); Stage III: 48 (*1.25%*) vs 23 (*1.23%*); Stage IV: 21 (*0.55%*) vs 13 (*0.69%*); Unknown: 40 (*1.04%*) vs 12 (*0.64%*). For non-screen-detected tumours: DCIS: 350 (*10.14%*) vs 318 (*9.43%*); Stage I: 1304 (*37.78%*) vs 1289 (*38.24%*); Stage II: 1191 (*34.50%*) vs 1196 (*35.48%*); Stage III: 280 (*8.11%*) vs 254 (*7.53%*); Stage IV: 288 (*8.34%*) vs 285 (*8.45%*); Unknown: 39 (*1.13%*) vs 29 (*0.86%*).	*For all tumours:* *DCIS: ↓2.07%;* *Stage I: ↓4.08%;;* *Stage II: ↑3.96%;* *Stage III: ↑0.96%;;* *Stage IV: ↑1.47%;;* *Unknown: ↓0.24%.* *For screen-detected tumours:* *DCIS: ↑1.60%;* *Stage I: ↓1.61%;;* *Stage II: ↑0.28%;* *Stage III: ↓0.02%;;* *Stage IV: ↑0.14%;;* *Unknown: ↓0.40%.* *For non-screen-detected tumours:* *DCIS: ↓0.71%;* *Stage I: ↑0.46%;;* *Stage II: ↑0.98%;* *Stage III: ↓0.58%;;* *Stage IV: ↑0.11%;;* *Unknown: ↓0.27%.*

Guven 2021, Turkey [32]	ASI	01/03/2019 to 31/12/2019	01/03/2020 to 31/12/2020	No lockdown	Stage I: 45 (20.7%) vs 17 (14.3%); Stage II: 110 (50.5%) vs 47 (39.5%); Stage III: 42 (19.2%) vs 30 (25.2%); Stage IV: 21 (9.6%) vs 25 (21%).	*Stage I: ↓6.4%;* *Stage II: ↓11.0%;* *Stage III: ↑6.0%;* *Stage IV: ↑11.4%.*
Kaltofen 2021*, Germany [34]	ASI	01/01/2019 to 30/06/2019	01/01/2020 to 30/06/2020	22/03/2020-05/05/2020	Tis: 12 (7%) vs 11 (7%); T1: 53 (31%) vs 46 (31%); T2-4: 45 (27%) vs 30 (20%); N+: 41 (24%) vs 46 (31%); M1: 19 (11%) vs 17 (11%).	Tis: 0%; T1: ↓1%; T2-T4: ↓7%; N+: ↑7%; M1: 0%.
Kang 2021*, Korea [35]	HCS	Comparison 1: 01/02/2019 to 30/04/2019; Comparison 2: 01/05/2019 to 31/07/2019	Comparison 1 (peak): 01/02/2020 to 30/04/2020; Comparison 2 (after-peak): 01/05/2020 to 31/07/2020	NR	Comparison 1 (peak): Stage 0: 88 (17.4%) vs 98 (22.0%); Stage I: 171 (33.9%) vs 123 (27.6%); Stage IIA: 109 (21.6%) vs 120 (26.9%); Stage IIB: 84 (16.4%) vs 61 (13.5%); Stage IIIA: 21 (4.2%) vs 14 (3.1%); Stage IIIB: 2 (0.4%) vs 4 (0.9%); Stage IIIC: 8 (1.6%) vs 9 (2.0%); Stage IV: 22 (4.6%) vs 18 (4.0%). Comparison 2 (after-peak): Stage 0: 90 (16.7%) vs 144 (25.0%); Stage I: 172 (31.9%) vs 127 (22.1%); Stage IIA: 139 (25.8%) vs 132 (22.9%); Stage IIB: 71 (13.2%) vs 99 (17.0%); Stage IIIA: 25 (4.6%) vs 27 (4.7%); Stage IIIB: 4 (0.7%) vs 3 (0.5%); Stage IIIC: 14 (2.6%) vs 13 (2.3%); Stage IV: 24 (4.5%) vs 31 (5.6%).	Comparison 1 (peak): *Stage 0: ↑4.6%;* *Stage I: ↓6.3%;* *Stage IIA: ↑5.3%;* *Stage IIB: ↓2.9%;* *Stage IIIA: ↓1.1%;* *Stage IIIB: ↑0.5%;* *Stage IIIC: ↑0.4%;* *Stage IV: ↓0.6%;* p=0.115. Comparison 2 (after-peak): *Stage 0: ↑8.3%;* *Stage I: ↓9.8%;* *Stage IIA: ↓2.9%;* *Stage IIB: ↑3.8%;* *Stage IIIA: ↑0.1%;* *Stage IIIB: ↓0.2%;* *Stage IIIC: ↓0.3%;* *Stage IV: ↑1.1%;* p<0.001.
Knoll 2021*, Austria [39]	ASI	Comparison 1: 16/03/2019 to 30/04/2019, and 01/11/2019 to 31/12/2019. Comparison 2: 01/05/2019 to 02/11/2019;	Comparison 1 (two lockdowns): 16/03/2020 to 30/04/2020, and 03/11/2020 to 31/12/2020. Comparison 2 (periods	16/03/2020-30/04/2020 & 03/11/2020-31/12/2020	Comparison 1 (two lockdowns): Tis: 10 (9%) vs 2 (4%); T1: 72 (62%) vs 24 (43%); T2: 17 (15%) vs 13 (24%); T3: 7 (6%) vs 6 (11%); T4: 1(1%) vs 3 (6%); Unknown: 8 (7%) vs 7 (12%). Comparison 2 (periods between 2 lockdowns): Tis: 14 (9%) vs 11 (7%); T1: 78 (53%) vs 81 (52%);	Comparison 1 (two lockdowns): Tis: ↓5%; T1: ↓19%; T2: ↑9%; T3: ↑5%; T4: ↑5%. p=0.047. Comparison 2 (periods between 2 lockdowns):

			between 2 lockdowns): 01/05/2020 to 02/11/2020.		T2: 34 (23%) vs 33 (21%); T3: 13 (9%) vs 23 (15%); T4: 7 (5%) vs 7 (4%); Unknown: 2 (1%) vs 2 (1%).	Tis: ↓2%; T1: ↓1%; T2: ↓2%; T3: ↑6%; T4: ↓1%. p=0.708.
Linck 2022, France [45]	ASI	Reference: average 36 working days between 27/01/2019 and 01/07/2019.	Pre-lockdown: 27/01/2020 to 16/03/2020; Lockdown: 17/03/2020 to 05/05/2020; After-lockdown: 11/05/2020 to 01/07/2020.	17/03/2020-11/05/2020	T1: 66 (55%) vs 29 (67%) vs 13 (40%) vs 20 (34%); T2: 37 (31%) vs 13 (30%) vs 13 (40%) vs 23 (39%); T3: 9 (8%) 1 (2%) vs 1 (3%) vs 9 (15%); T4: 8 (7%) vs 0 (0%) vs 5 (16%) vs 7 (12%); N+: 39 (33%) vs 12 (28%) vs 16 (50%) vs 32 (54%); M+: 3 (3%) vs 2 (5%) vs 3 (9%) vs 5 (8%).	*Reference vs Lockdown:* *T1: ↓15%;* *T2: ↑9%;* *T3: ↓5%* *T4: ↑9%* *N+: ↑17%;* *M+: ↑6%.* Reference vs After-lockdown: T1: ↓*21%,* p=0.01; *T2: ↑8%;* T3 & T4: ↑*12%,* p=0.04; N+: ↑*21%,* p=0.006; M+: ↑*5%,* p=0.12. *Pre-lockdown vs Lockdown:* *T1: ↓27%;* *T2: ↑10%;* *T3: ↑1%;* *T4: ↑16%;* *N+: ↑22%;* *M+: ↑4%.* *Pre-lockdown vs After-lockdown:* *T1: ↓33%;* *T2: ↑9%;* *T3: ↑13%;* *T4: ↑12%;* *N+: ↑26%;* *M+: ↑3%.*
London 2022*, US [46]	HCS	01/01/2019 to 31/12/2019	01/01/2020 to 31/12/2020	01/03/2020-30/04/2020	Stage I: 71.6% vs 72.3%; Stage II: 14.7% vs 15.2%; Stage III: 8.8% vs 8.2%; Stage IV: 4.9% vs 4.3%	*Stage I: ↑0.7%;* *Stage II: ↑0.5%;* *Stage III: ↓0.6%;* *Stage IV: ↓0.6%;* p>0.10.

Morais 2022, Portugal [50]	ASI	02/03/2019 to 01/07/2019	02/03/2020 to 01/07/2020	18/03/2020-02/05/2020	Stage I: 263 *(71.1%)* vs 120 *(52.9%)*; Stage II: 65 *(17.6%)* vs 61 *(26.9%)*; Stage III: 20 *(5.4%)* vs 23 *(10.1%)*; Stage IV: 13 *(3.5%)* vs 14 *(6.2%)*; Unknown: 9 *(2.4%)* vs 9 *(4.0%)*.	*Stage I: ↓18.2%;* *Stage II: ↑9.3%;* *Stage III: ↑4.7%;* *Stage IV: ↑2.7%;* *Unknown: ↑1.6%;* P<0.001.
Purushotham 2021, UK [58]	HCS	01/10/2019 to 31/03/2020	01/04/2020 to 30/09/2020	20/03/2020-NR	Stage 1: 93 (39.9%) vs 55 (31.4%); Stage 2: 69 (29.6%) vs 66 (37.7%); Stage 3: 46 (19.7%) vs 31 (17.7%); Stage 4: 25 (10.7%) vs 23 (13.1%).	*Stage 1: ↓8.5%;* *Stage 2: ↑8.1%;* *Stage 3: ↓2.0%;* Stage 4: ↑2.4%; p>0.05.
Ruiz-Medina 2021, Spain [60]	HCS	13/03/2019 to 13/03/2020	13/03/2020 to 13/03/2021	NR	Stage I-II: 587 (80.3%) vs 410 (76.6%); Stage III-IV: 144 (19.7%) vs 125 (23.4%)	*Stage I-II: ↓3.7%;* *Stage III-IV: ↑3.7%;* p>0.05.
Tang 2022, US [67]	HCS	17/03/2019 to 17/05/2019	17/03/2020 to 17/05/2020	17/03/2020-17/05/2020	Tis: 95 (14%) vs 21 (9%); T1mi: 16 (2%) vs 6 (2%); T1a: 46 (7%) vs 7 (3%); T1b: 90 (13%) vs 19 (8%); T1c: 177 (25%) vs 66 (27%); T2: 217 (31%) vs 98 (40%); T3: 37 (5%) vs 18 (7%); T4: 21 (3%) vs 10 (4%); Tx/T0: 4 (0%) vs 2 (1%). N1: 125 (69%) vs 60 (68%); N1m: 20 (11%) vs 8 (9%); N2: 14 (8%) vs 9 (10%); N3: 21 (12%) vs 11 (13%). M0: 685 (97%) vs 227 (92%); M1: 17 (2%) vs 18 (7%); Mx: 1 (0%) vs 2 (1%).	*Tis: ↓5%;* *T1mi: 0%.* *T1a: ↓4%;* *T1b: ↓5%;* *T1c: ↑2%;* *T2: ↑9%;* *T3: ↑2%;* *T4: ↑1%;* *Tx/T0: ↑1%;* p=0.02. *N1: ↓1%;* *N1m: ↓2%;* *N2: ↑2%;* *N3: ↑1%;* p=0.88. *M0: ↓5%;* *M1: ↑5%;* *Mx: ↑1%;* p=0.001.
Tsibulak 2020, Austria [69]	HCS	16/03/2019 to 31/05/2019	16/03/2020 to 31/05/2020	16/03/2020-31/05/2020	Tis: 34 (10%) vs 17 (8.5%); T1: 149 (43%) vs 64 (32%); T2-T4: 118 (34%) vs 48 (24%); Tx: 48 (14%) vs 71 (35%).	*Tis: ↓1.5%;* *T1: ↓11%;* *T2-T4: ↓10%;* *Tx: ↑21%;* p<0.001.

					N0: 190 (54%) vs 87 (43%); N1-3: 102 (29%) vs 33 (16%); Nx: 59 (17%) vs 81 (40%).	*N0: ↓11%;* *N1-3: ↓13%;* *Nx: ↑23%;* p<0.001.

HCS=Healthcare (or community-based) system/network/database, ASI=A single institution or department, CIR=Cancer or imaging registry, NR=Not reported, DCIS=Ductal carcinoma in situ.
Italics: computed data (see Appendix C).
* Study sample also contains in situ tumour, and/or benign tumour cases.

AppxTable F.8: Summary of mammography volume

Study, Country/Region (n=9)	Health service setting	Pre-pandemic	Pandemic		a. Volume of mammography exams*	
		Time period	Time period	Services suspension/ lockdown	Pre-pandemic vs Pandemic (data are frequency (N) unless specified)	Relative change in outcome (unless specified)
Alelyani 2021, Saudi Arabia [2]	HCS	01/01/2019 to 31/12/2019	01/01/2020 to 31/12/2020	23/03/2020-NR	Mean monthly volume (95%CI): 77.58 (4.14-151.0) vs 64.42 (-11.28-140.1). Jan-Mar: 217 vs 262; Apr-Jun: 147 vs 57; Jul-Sep: 231 vs 80; Oct-Dec: 336 vs 374.	Mean monthly volume: ↓*16.96%,* p=0.39. Jan-Mar: ↑20.74%; Apr-Jun: ↓61.22%; Jul-Sep: ↓65.37%; Oct-Dec: ↑11.31%.
Chou 2020, Taiwan [16]	ASI	Week1, 2019 to Week 22, 2019	Week 1, 2020 to Week 22, 2020	NR	4816 vs 3041	↓37%, p<0.001
Crisan 2021, Romania [19]	ASI	01/03/2019 to 30/10/2019	01/03/2020 to 30/10/2020	22/03/2020-14/05/2020	1439 vs 1169	↓19.4%, p=0.97
Doshi 2021, US [24]	HCS	02/01/2019 to 19/07/2019	02/01/2020 to 17/07/2020	22/03/2020-08/06/2020	Total: 22109 vs 14594. Average daily volume: Pre-peak (03/02-02/03) vs Peak (01/04-28/04) vs After-peak (19/06-17/07): 168.8 vs 13.3 vs 142.9.	*Total: ↓34.0%* *Average daily volume:* *Pre-peak vs Peak: ↓92.1%.* *Pre-peak vs After-peak: ↓15.3%.*
Lacson 2021, US [42]	ASI	Before shutdown: 01/01/2020 to 08/03/2020	After shutdown: 07/06/2020 to 15/07/2020	NR	Proportion of mammography among total imaging examinations: All care settings: 12.5% (7386/59080) vs 17.3% (3385/19594); Outpatients only: 14.7% (7383/50194) vs 20.0% (3383/16946).	Absolute change in proportion of mammography among total imaging examinations: All care settings: ↑*4.8%,* p<0.001; Outpatients only: ↑*5.3%,* p<0.001.
Lang 2020, US [43]	ASI	05/01/2020 to 07/03/2020	22/03/2020 to 16/05/2020	NR	Average weekly volume (95%CI): Main hospital: 815 (764-866) vs 69 (51-86); Affiliated imaging centres: 1471 (1390-1553) vs 118 (74-162)	Average weekly volume: Main hospital: ↓92%, p<0.001; Affiliated imaging centres: ↓92%, p<0.001.
Le Bihan Benjamin 2022, France [44]	HCS	01/01/2019 to 31/12/2019	01/01/2020 to 31/12/2020	17/03/2020-11/05/2020; 28/10/2020-15/12/2020	5132158 vs 4639622	↓9.6%
Naidich 2020, US [51]	HCS	Week 1, 2019 to Week 16, 2019	Week 1, 2020 to Week 16, 2020	27/03/2020-NR	Total: 14320 vs 11232.	Total: ↓21.56%. Mean weekly volume during weeks 10-16: ↓*58.42%,* p<0.013

					Mean weekly volume (95%CI) during weeks 10-16: 919.0 (95%CI: 829.6-1008.4) vs 382.1 (95%CI: 4.5-759.8)	
Patt 2020, US [54]	HCS	01/03/2019 to 31/07/2019	01/03/2020 to 31/07/2020	NR	NR	Mar: ↓49.83%; Apr: ↓84.77%; May: ↓38.59%; Jun: ↑9.19%; Jul: ↓8.91%.
Study, Country/Region (n=6)	**Health service setting**	**Pre-pandemic** **Time period**	**Pandemic** **Time period**	**Services suspension/ lockdown**	**b. Volume of diagnostic mammography exams** **Pre-pandemic vs Pandemic (data are frequency (N) unless specified)**	**Relative change in outcome**
Chou 2020, Taiwan [16]	ASI	Week1, 2019 to Week 22, 2019	Week 1, 2020 to Week 22, 2020	NR	NR	↓6%, p=0.14
Collado-Mesa 2020, US [18]	HCS	1/04/2018-2019 to 30/04/2018-2019	01/04/2020 to 30/04/2020	20/03/2020-Mid May to Early June 2020	1807 vs 354	*↓80%*
Kang 2021, Korea [35]	HCS	01/02/2019 to 31/07/2019	01/02/2020 to 31/07/2020	NR	Total volume of both mammography and breast sonography: 43288 vs 34354. Peak (Feb-Apr): 19388 vs 13546; After-peak (May-Jul): 23900 vs 20808	*Total: ↓20.6%.* *Peak (Feb-Apr): ↓30.1%;* *After-peak (Feb-Apr): ↓12.9%.*
Norbash 2020, US [52]	HCS	Week 1, 2019 to Week 21, 2019	Week 1, 2020 to Week 21, 2020	NR	NR	Weekly change range: Weeks 1-10: ↑9%-17%; Weeks 11-13: ↓0%-53%; Weeks 14-17: ↓71%-80% (Nadir: ↓80% in week 16); Weeks: 18-21: ↓47%-68%.
Sprague 2021, US [64]	CIR	01/01/2019 to 31/07/2019	01/01/2020 to 31/07/2020	NR	44610 vs 35647	↓20.1% (95%CI**: 15.4-24.6%)
Tachibana 2021, Brazil [66]	ASI	Comparison 1: 24/03/2019 to 21/06/2019;	Comparison 1 (during social isolation): 24/03/2020 to 21/06/2020;	26/03/2020-21/06/2020	Comparison 1 (during social isolation): 5844 vs 948;	Comparison 1 (during social isolation): ↓83.8%;

		Comparison 2: 22/06/2019 to 31/12/2019	Comparison 2 (after social isolation): 22/06/2020 to 31/12/2020		Comparison 2 (after social isolation): 10379 vs 9891.	Comparison 2 (after social isolation): ↓4.7%

HCS=Healthcare (or community-based) system/network/database, ASI=A single institution or department, CIR=Cancer or imaging registry, NR=Not reported, CI=Confidence interval.
Light grey cells: plot-extracted data (see Appendix C)*; Italics*: computed data (see Appendix C).
* Refers to data came from medical imaging studies, or from studies with a mixed screening and symptomatic population.
** Adjusted for imaging registry site.

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