**The impact of morbidity and disability on attendance at organised breast cancer screening programmes: A systematic review and meta-analysis**

**Supplementary material content**

Supplementary Table 1: Quality Assessment of Included Studies

Supplementary Table 2: Characteristics of Included Studies

Supplementary Table 3: Reasons for Exclusion of Ineligible Studies

Breast Cancer Screening Search Terms

References of Included and Excluded Studies

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| **Supplementary Table 1: Quality Assessment of Included Studies**  |
| **Study** | **Selection** | **Comparability** | **Outcome** | **Total** |
|  | Representativeness of the exposed cohort | Selection of the non-exposed cohort | Ascertainment of exposure | Temporality Established | Controls for Age | Controls for Additional factors  | Assessment of outcome | Was follow-up long enough for outcomes to occur | Adequacy of follow up of cohorts |  |
| Chan 2014 | \*  | \*  | \*  | \* | \* | \* | \*  | \*  | \* | 9 |
| Chochinov 2009 | \* | \* | \*  | \* | \* | \* | \*  | \*  | - | 8 |
| Cobigo 2013 | \*  | \*  | \* | \* | \* | \* | \*  | \* | \* | 9 |
| Czwikla 2019 | - | -  | \*  | - | \* | \* | \* | \* | -  | 5 |
| Floud 2017 | - | \* | - | \* | \* | \* | \* | \* | \* | 7 |
| Grunfeld 2012  | \*  | \*  | \*  | \* | - | - | \*  | \*  | - | 6 |
| Hellmann ‎2015 | - | \* | \*  | \* | \* | \* | \*  | \* | - | 7 |
| Jensen 2015, 2016, Virgilsen 2018 | \* | \* | \* | \* | \* | \* | \* | \* | \* | 9 |
| Katz 2018 | \* | \*  | \* | - | \* | \* | \* | \*  | - | 7 |
| Kendall 2017 | \* | \* | \* | \* | \* | \* | \* | \* | \* | 9 |
| Khan 2010 | \*  | \*  | \* | \* | \* | \* | \* | \*  | -  | 8 |
| Lagerlund 2015 | -  | \* | \* | \* | \* | \* | \* | \* | \* | 8 |
| MB Larsen 2020 | \* | \* | \*  | \* | \*  | - | \* | \* | \* | 8 |
| M Larsen 2020 | \* | \*  | - | - | \* | \* | \* | \* | - | 5 |
| McCowan ‎2019 | \* | \* | \*  | - | \* | \* | \* | \*  | \* | 8 |
| Osborn 2012 | \* | \* | \* | \* | \* | \* | \* | \* | - | 8 |
| Ouellette-Kuntz ‎2015 | \* | \* | \* | \* | - | - | \* | \* | \* | 7 |
| Ross 2019 | \* | \* | - | \* | \* | \* | \* | \* | - | 7 |
| Shin 2020b | \* | \* | \* | - | \* | \* | \* | \* | \* | 8 |
| Singh 2011 | \* | \* | \* | \* | \* | \* | \* | \* | - | 8 |
| Vigod 2011 | - | \* | - | \* | \* | \* | \* | \* | \* | 7 |
| Viuff 2020 | \* | \* | \* | \* | \* | \* | \* | \* | \* | 9 |
| Werneke 2006 | \* | \* | \* | - | - | - | \* | \* | \* | 6 |
| Widdifield 2017 | \* | \* | \* | - | - | - | \* | \* | \* | 6 |
| Woodhead 2016 | - | \* | \* | - | \* | \* | \* | \* | - | 6 |

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| **Supplementary Table 2: Characteristics of Included Studies**  |
| **Author** | **Country/ Region** | **Screening time period (years)**  | **Study type**  | **Location of morbidity data**  | **Morbidity cluster** | **Specific morbidity; duration (time); severity** | **N with morbidity** | **N Controls**  | **N Total (Extracted for primary outcome)** | **Age Range** | **Adjusted Odds Ratios Y/N** | **Adjusted variables** | **Multimorbidity measurement Y/N**  | **Impact on Stage Measured Y/N** |
| Chan 20141 | Ontario Canada | 1999-2010 (One opportunity) | Cohort | Ontario Diabetes Database | Renal/ Endocrine | Diabetes; at least 2 years; not measured | 188,759 | 315,529 | 504,288  | 50-69 | Y | Age, socio-economic status quintile, rural residence, recent immigration into Ontario, comorbidity | N | N |
| Chochinov 20092 | Manitoba Canada | 2002-2004 (One opportunity) | Data linkage | Medical records and claims data | Psychiatric  | Schizophrenia ; not specified; classified as ‘severe mental illness’ | 1,448 | 108,792 | 110,240 | 50-69 | Y | Region, age, average household income, continuity of care, physical comorbidities | N | N |
| Cobigo20133 | Ontario Canada | 2008-2010 (One opportunity) | Cohort  | Medical records and claims data  | Disability | Intellectual and developmental disabilities; not specified; based on ‘Resource Utilization Bands’, expected use of healthcare resources | 5,171 | 488,545  | 493,716 | 50-69 | Y | Age, rurality, income quintile, Resource Utilization Bands | N | N  |
| Czwikla 20194 | Lower Saxony Germany | 2011-2014 (Multiple screening opportunities) | Cohort  | Medical Records  | Cardiovascular Neurological Respiratory Renal/ EndocrineGastrointestinalRheumatologic/ImmunologicMalignancy Psychiatric | Congestive heart failure; Cardiac arrhythmias; Valvular disease; Pulmonary circulation disorders; Peripheral vascular disorders; Hypertension; Obesity; not specified; not measuredParalysis; Other neurological disordersChronic Pulmonary diseaseDiabetes;Hypothyroidism; Renal failure disease; Fluid and electrolyte disorders Liver & peptic ulcer disease AIDS/HIV, Rheumatoid arthritis/collagen vascular diseasesLymphoma; Metastatic cancer; Solid tumor without metastasisAlcohol abuse; Drug abuse; Psychoses; Depression | Not stated  | Not stated | 96,273 | 50-66 | Y (unable to use in analyses) | Individual and contextual predictors  | N | N |
| **Author** | **Country/ Region** | **Screening time period (years)**  | **Study type**  | **Location of morbidity data**  | **Morbidity cluster** | **Specific morbidity duration (time); severity**  | **N with morbidity** | **N Controls**  | **N Total (Extracted for primary outcome)** | **Age Range** | **Adjusted Odds Ratios Y/N** | **Adjusted variables** | **Multimorbidity measurement Y/N**  | **Impact on Stage Measured Y/N** |
| Floud 20175 | England United Kingdom | 2006-2011 (One opportunity) | Cohort (Million Women study) | Self-reported | Disability Neurological  | Hearing Disability; not specified; not measuredMobility DisabilityVision DisabilitySelf-care Disability Memory Disability | 14,55579,1216,49324,25310,535 | 343,952 | 442,244 | 50-70 | Y (unable to use in analyses) | Age, region, deprivation, ethnicity, marital status, car availability, body mass index, and smoking | Y | N |
| Grunfeld 20126 | Ontario Canada | 1992-2000 (One opportunity) | Cohort  | Ontario Cancer Registry  | Malignancy  | Previous Colorectal Cancer; between 1-5 years from date of diagnosis; not measuredPrevious Endometrial Cancer Previous Hodgkin Lymphoma  | 1,4892,713151 | 7,44113,993762 | 26,549 | 50-79 | N | Not applicable | N | N  |
| Hellmann ‎20157 | Copenhagen Denmark  | 1993-2008 (One opportunity)  | Cohort (Danish Diet, Cancer, and Health cohort) | Measured by researchers | Cardiovascular  | Obesity; up to two years; by BMI category | 907 | 2,381 | 3,288 | 50-69 | Y (unable to use in analyses) | Age, birth cohort, education, menarche age, menopausal status & age, hormone replacement therapy use, oral contraceptives use, parity, age first childbirth, breastfeeding, smoking, alcohol, sports, comorbidity | N | N |
| **Author** | **Country/ Region** | **Screening time period (years)**  | **Study type**  | **Location of morbidity data**  | **Morbidity cluster** | **Specific morbidity; duration (time); severity**  | **N with morbidity** | **N Controls**  | **N Total (Extracted for primary outcome)** | **Age Range** | **Adjusted Odds Ratios Y/N** | **Adjusted variables** | **Multimorbidity measurement Y/N**  | **Impact on Stage Measured Y/N** |
| Jensen 20158Jensen 20169Virgilsen 201810 | Central Denmark Region Denmark  | 2008-2009 (One opportunity) | Cohort | National Patient RegistryNational PsychiatricCentral Research RegisterNational Cancer Registry | Cardiovascular Renal and endocrineRespiratory Neurological Rheumatologic/ImmunologicGastrointestinalPsychiatric Malignancy | Cardiovascular diseases; not specified; severe multimorbidity specified as having 3+ diseases HypertensionDiabetesChronic kidney diseaseCOPDChronic neurological disordersChronic arthritisChronic bowel diseaseChronic liver diseaseSchizophrenia; no minimum; not measured Affective disordersAnxiety Substance AbusePrevious Cancer; no minimum; ‘previous cancer, in treatment, in follow-up, in palliative care’  | 6,4633,8702,8542542,1161,1371,2131,0873541,0223,4536701,4276,638 | 111,706 | 144,264 | 50-69 | Y (unable to use in analyses) | Age, ethnicity, marital status, educationAge, ethnicity, marital status, education, co-occurrence of other psychiatric diagnoses  | Y | N |
| Katz 201811 | Israel  | 2008-2014 (Multiple screening opportunities) | Cohort | Medical records  | Cardiovascular Renal/ EndocrinePsychiatric  | Obesity; not specified; not measured Ischemic heart diseaseDiabetesDepression  | 3,6143,6085,3012,510 | 10,193 | 25,226 | 56-74 | Y (unable to use in analyses) | Age, SES, smoking, clinic visits, other comorbidities, physician factors | N | N |
| Kendall 201712 | Ontario Canada | 2011-2013 (One opportunity) | Cross-sectional  | Ontario Registered Persons Database | Rheumatologic/Immunologic | HIV; not specified; not measured | 623 | 1,446,392 | 1,447,015 | 50-74 | Y (unable to use in analyses) | Age, income quintile, rurality, comorbidity, immigrant status, physician factors, primary care model  | Y | N |
| Khan 201013 | United Kingdom  | 2003-2006 (One opportunity) | Cohort  | Medical records | Malignancy | Previous Breast cancer; at least 5-year survival; CCI adjusted Previous Colorectal cancer | 2,317513 | 9,9742,055 | 14,859 | 50-69 | Y (unable to use in analyses) | Charlson comorbidity score, history of mastectomy, death | N | N |
| **Author** | **Country/ Region** | **Screening time period (years)**  | **Study type**  | **Location of morbidity data**  | **Morbidity cluster** | **Specific morbidity; duration; severity**  | **N with morbidity** | **N Controls**  | **N Total (Extracted for primary outcome)** | **Age Range** | **Adjusted Odds Ratios Y/N** | **Adjusted variables** | **Multimorbidity measurement Y/N**  | **Impact on Stage Measured Y/N** |
| Lagerlund 201514 | Malmö Sweden  | 1992-2009(Multiple screening opportunities) | Cohort (Malmö Diet and Cancer Study) | Measured by researchers  | Cardiovascular  | Obesity; range from 0 to 17 years; BMI category | 1,534 | 5,979 | 7,513 | 44-70 | Y | Age, baseline year, season, number of screening invitations after baseline, having been invited to screening before baseline, education, employment status, cohabitation, and country of birth, health-related variables | N | N |
| Larsen 201815 | Central Denmark Region | 2008-2009 (One opportunity) | Cohort | National Administrative Database | Composite morbidity score | CCI; not specified; score of 0, 1 & 2 | 13,653 (not included in total) | 62,867 (not included in total) | Participant data not extracted for analysis | 50-64 | Y (unable to use in analyses) | Age, ethnicity, marital status, household income, education level, CCI score | N | N |
| MB Larsen 202016 | Denmark | 2015-2016 (One opportunity) | Cohort  | Danish National Cancer Register | Malignancy | Previous breast cancer; ‘no breast imaging within the past 21 months’; not measured | 17,822 | 662,168 | 679,990 | 50-69 | N | Not applicable | N | N |
| M Larsen 202017 | Norway | 1996-2019 (Multiple screening opportunities) | Cohort  | Self-reported  | Cardiovascular  | Obesity; not specified; BMI category  | 5,662 | 16,613 | 22,275 | 50-69 | Y | Education, physical activity, smoking status | N | N |
| McCowan ‎201918 | Scotland United Kingdom  | 2009-2013 (One opportunity) | Cohort  | Medical records  | DisabilityMalignancyPsychiatric | Learning Disability; not specified; not measuredMalignancyNon-malignant neoplasmDepression  | 62912,82711,64633,427 | 101,464 | 159,993 | 40+ | Y (unable to use in analyses) | Age, index of multiple deprivation quintile, care home residency, other comorbidities | N | N |
| Osborn 201219 | United Kingdom  | 1999-2009 (Multiple screening opportunities)  | Cohort  | Medical records | Disability | Learning Disability; not specified; not measured | 2,956 | 17,354 | 20,310 | 50-64 | Y (unable to use in analyses)  | Age, time period, country | N | N |
| **Author** | **Country/ Region** | **Screening time period (years)**  | **Study type**  | **Location of morbidity data**  | **Morbidity cluster** | **Specific morbidity; duration; severity**  | **N with morbidity** | **N Controls**  | **N Total (Extracted for primary outcome)** | **Age Range** | **Adjusted Odds Ratios Y/N** | **Adjusted variables** | **Multimorbidity measurement Y/N**  | **Impact on Stage Measured Y/N** |
| Ouellette-Kuntz ‎201520 | Ontario Canada  | 2009-2012 (One opportunity) | Cohort  | Disability support programme database | Disability | Intellectual and developmental disabilities; not specified; not measured | 7022 | 402,589 | 409,611 | 50-64 | N | Not applicable | N | N |
| Ross 201921 | Northern Ireland United Kingdom  | 2011-2014(One opportunity) | Cohort (Northern Ireland Longitudinal Study) | Self-reported | DisabilityNeurological Respiratory  | Communication; self-reported ‘have lasted or are expected last at least 12 months’; not measured Blindness /partial sight lossMobility /dexterity Deafness /partial hearing Learning/ intellectual/ social/ behavioural Frequent confusion or memory lossShortness of breath or difficulty breathing | 55192011,6952,9754831,2456,999 | 36,787 | 61,655 (total n in sample is 57,328 so acknowledge some have multiple morbidities) | 50-70 | Y (unable to use in analyses) | Age, marital status, NSSEC, housing tenure, number of cars, educational attainment, area of residence, presence of other disabilities  | Y | N  |
| Shin 202022 | South Korea | 2014-2015 (One opportunity) | Data linkage  | National disability register | Disability Neurological PsychiatricRenal/ EndocrineCardiovascular Respiratory Gastrointestinal  | Physical disability; unknown; disability by ‘grade’Visual disabilityHearing disabilitySpeech/language disabilityIntellectual disabilityDisability - facial disfigurementAutismDisability - brain injuryEpilepsyDisability - mental disorderDisability - renal failureDisability - heart problemsDisability - respiratory problemsDisability - liver diseaseDisability – ostomies | 472,19283,31792,5733,61927,3968303777,8822,49039,19323,0152,1982,5821,9714,394 | 11,522,435 | 12,356,124 | 40+ | Y | Age, sex, income level, place of residence, calendar year | N | N |
| **Author** | **Country/ Region** | **Screening time period (years)**  | **Study type**  | **Location of morbidity data**  | **Morbidity cluster** | **Specific morbidity; duration; severity**  | **N with morbidity** | **N Controls**  | **N Total (Extracted for primary outcome)** | **Age Range** | **Adjusted Odds Ratios Y/N** | **Adjusted variables** | **Multimorbidity measurement Y/N**  | **Impact on Stage Measured Y/N** |
| Singh 201123 | Manitoba Canada  | 2002-2008 (Multiple screening opportunities) | Cohort  | University of Manitoba IBD Epid. Database | Gastrointestinal | Inflammatory Bowel Disease; defined as 5 physician contacts and/or hospitalisation, not time; presented as healthcare utilisation in 4 quartiles | 860 | 6,563 | 7,423 | 50-69 | Y | Socioeconomic status and prior unilateral mammogram utilization | N | N |
| Vigod 201124 | Ontario Canada  | 2002-2004 (One opportunity) | Cohort (Canadian Community Health Survey) | Self-reported | Psychiatric  | Depression; at time of data collection only; not measured | 67 | 1,331 | 1,398 | 50-70 | Y | Age, income level, level of education, geographical variability (urban/rural), medical/ psychiatric comorbidity | N | N |
| Viuff 202025 | Denmark | 2007-2010 (One opportunity) | Cross-sectional  | Danish National Patient Registry | Cardiovascular Neurological RespiratoryRheumatologic/ ImmunologicGastrointestinalRenal/ EndocrineMalignancy  | Myocardial infarctionCongestive heart failurePeripheral vascular diseaseCerebrovascular diseaseDementiaHemiplegiaChronic pulmonary diseaseConnective tissue diseaseAIDSUlcer diseaseMild liver diseaseModerate to severe liver disease Diabetes 1 and 2Diabetes with end organRenal diseaseAny TumourLeukaemiaLymphoma Metastatic cancer; stratified data by year of diagnosis; presented data in order of placement in the CCI i.e. greater severity if greater score  | 5,4684,4988,71018,0381,01971626,58813,9121457,1044,80197418,4037,6113,56918,8226631,6971,927 | 541,538 | 650,003 (using CCI scores to account for individuals having multiple conditions) | 50-69 | Y (unable to use in analyses) | Age, region of residence, other CCI diseases | N | N |
| **Author** | **Country/ Region** | **Screening time period (years)**  | **Study type**  | **Location of morbidity data**  | **Morbidity cluster** | **Specific morbidity; duration; severity**  | **N with morbidity** | **N Controls**  | **N Total (Extracted for primary outcome)** | **Age Range** | **Adjusted Odds Ratios Y/N** | **Adjusted variables** | **Multimorbidity measurement Y/N**  | **Impact on Stage Measured Y/N** |
| Werneke 200626 | England United Kingdom | 1996–1998 (One opportunity) | Data linkage | Medical records | Psychiatric  | Psychosis; not specified; enhanced care described as proxy measure of severity  | 49 | 44,195 | 44,244 | 50-64 | N | Not applicable | N | N |
| Widdifield 201727 | Ontario Canada | 1990–2013 (One opportunity) | Cohort  | Medical records  | Rheumatologic/Immunologic | Rheumatoid Arthritis; not specified; not measured | 451 | 4,440 | 4,891 | 50+ | N | Not applicable | N  | N  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Woodhead 201628 | England United Kingdom  | 2013(One opportunity) | Data linkage  | Medical records  | Psychiatric  | Serious mental illness (Schizophrenia, Bipolar, Other non-organic Psychoses); not specified; severity defined as inpatient stay, being sectioned, records of difficulty managing physical health and record of emergency healthcare access episodes | 625 | 25,385 | 26,010 | 50-70 | Y | Age, ethnicity, borough-level deprivation, mean annual number of primary consultations | N  | N  |
|  |  |  |  |  |  | **Totals** | 16,250,556 | 1,408,246 | 17,755,075 |  |  |  |  |  |
| CCI, Charlson Comorbidity Index Score; BMI, Body Mass Index |

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| **Supplementary Table 3: Reasons for Exclusion of Ineligible Studies** |
| **Study** | **Reason** |
| Burton 199829 | Comorbidity measured after screening opportunity  |
| Spithoff 201930 | Comorbidity measured after screening opportunity  |
| Aro 199931 | Data not Extractable/ Available |
| Banks 200232 | Data not Extractable/ Available |
| Franck 202033 | Data not Extractable/ Available |
| Aarts 201134 | Impact of comorbidity on attendance not measured |
| Aro 200135 | Impact of comorbidity on attendance not measured |
| Bansal 201236 | Impact of comorbidity on attendance not measured |
| Borrell 199937 | Impact of comorbidity on attendance not measured |
| Dresner 201038 | Impact of comorbidity on attendance not measured |
| Eisinger ‎201539  | Impact of comorbidity on attendance not measured |
| Hafslund 201240 | Impact of comorbidity on attendance not measured |
| Kisley 201341 | Impact of comorbidity on attendance not measured |
| Murto 201842 | Impact of comorbidity on attendance not measured |
| Sutradhar ‎201643 | Impact of comorbidity on attendance not measured |
| Acuna 201744 | Missing/inappropriate control  |
| Biswas 200545 | Missing/inappropriate control  |
| Castledine 201246 | Missing/inappropriate control  |
| Cheung 201847 | Missing/inappropriate control  |
| Corkum 201448 | Missing/inappropriate control |
| Goutard 200949 | Missing/inappropriate control |
| Inagaki 201850 | Missing/inappropriate control  |
| Kellen 202051 | Missing/inappropriate control  |
| Kung 201252 | Missing/inappropriate control |
| Lai 201453 | Missing/inappropriate control |
| Lofters 201954 | Missing/inappropriate control |
| MacLurg 200455 | Missing/inappropriate control |
| Pinto 201056 | Missing/inappropriate control  |
| Plourde 201857 | Missing/inappropriate control  |
| Sullivan 200358 | Missing/inappropriate control |
| Tesch 201959 | Missing/inappropriate control |
| Wong 201760 | Missing/inappropriate control |
| Yen 201561 | Missing/inappropriate control |
| Duffin 200962 | Not a research publication |
| Glover 201463 | Not a research publication |
| Joel 201664 | Not a research publication |
| Brody 200065 | Not organised programme  |
| Castellano ‎200166 | Not organised programme |
| Enright 201867 | Not organised programme |
| Giuliani 201668 | Not organised programme |
| Heyding ‎200569 | Not organised programme |
| Lipscombe 200570 | Not organised programme |
| Lu 201171 | Not organised programme |
| Meguerditchian 201272 | Not organised programme |
| Aguilar Shea 201173 | Self-reported screening |
| Alsuwaida 201374 | Self-reported screening |
| Bao 201875 | Self-reported screening |
| Barbosa 201976 | Self-reported screening |
| Bates 201977 | Self-reported screening |
| Bussiere 201478 | Self-reported screening |
| Choi 201379 | Self-reported screening |
| Fujiwara 201880 | Self-reported screening |
| Lai 201281 | Self-reported screening |
| Maltais 202082 | Self-reported screening |
| Mandelzweig 201783 | Self-reported screening |
| O'Brien ‎202084 | Self-reported screening |
| Park 201285 | Self-reported screening |
| Perea  ‎201286 | Self-reported screening |
| Sakellariou ‎201787  | Self-reported screening |
| Tron 201788 | Self-reported screening |
| Urbanoski ‎200389 | Self-reported screening |
| Wang 201890 | Self-reported screening |
| Guilcher ‎201491  | Specific condition/ composite score not used  |
| Jensen 201592 | Specific condition/ composite score not used  |
| Majeed 199593 | Specific condition/ composite score not used  |
| Mead 201594 | Specific condition/ composite score not used  |
| O'Brien 201895 | Specific condition/ composite score not used  |
| Rebolj 202096 | Specific condition/ composite score not used  |
| Ross 202097 | Specific condition/ composite score not used  |
| Yen 201498 | Specific condition/ composite score not used  |

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| **Reason For Exclusion**  | **Study Count**  |
| Comorbidity measured after screening opportunity | **2** |
| Not a research publication  | **2** |
| Data not Extractable/ Available | **3** |
| Specific condition/ composite score not used | **8** |
| Not organised programme | **8** |
| Impact of comorbidity on attendance not measured | **10** |
| Missing/inappropriate control  | **18** |
| Self-reported screening | **19** |

**Supplementary File: Breast Cancer Screening Search Terms**

#1

Breast and (cancer OR neoplasm OR carcinoma OR tumor\* OR tumour\* OR malig\*) OR \*Breast Neoplasms/ [mesh] OR Mammo\*

#2

Screen\* adj2 (breast OR cancer) OR Breast AND ultrasonogra\* OR 3D mammogr\* OR \*Mammography [MESH]/ or mammogr\* OR "breast tomosynthesis" OR "breast magnetic resonance imaging"

#3

attend\* OR non-attend\* OR adher\* OR non-adher\* OR participat\* OR non-participat\* OR uptake OR utilis\* OR utiliz\* OR compliance OR comply OR non-complet\* OR underutiliz\* OR underutilis\* OR usage OR nonreceipt OR receipt OR disparit\* OR take-up OR access OR (up-to-date) OR (rate\* or recei\*) adj3 (screening) OR (hav\* or recei\*) adj2 (mammog\*) OR (Screening or mammog\*) adj (patterns or practices OR behavio?r\*) OR “mammog\* use”

#4

(Comorbid\* OR co-morbid\* OR multimorbid\* OR multi-morbid\*) OR (concomitant adj2 disease\*) OR (chronic\* adj2 (disease\* OR ill\* OR condition\*)) comorbidity/ [MESH] OR multimorbidity/ [MESH]

Hypertens\* OR angina OR obesity OR BMI OR (arterial OR artery OR cardiovascular OR cerebrovascular OR venous OR heart OR coronary) adj1 disease\* OR “Heart attack\*” OR "myocardial infarction" OR “atrial fibrillation" OR “body mass index”

Asthma OR COPD OR bronchitis OR (Respiratory OR lung OR pulmonary) adj2 disease\* OR “Chronic Obstructive Pulmonary Disease"

Dementia OR Alzheimer\* OR epilep\* OR stroke OR paralys\* OR hemiplegi\* OR paraplegi\* OR (cogniti\* OR Neuromuscular OR neurodegenerative OR neurologic\* OR neurocog\*) adj2 (disorder\* OR disease\* OR impair\* OR condition\*) OR "multiple sclerosis"

HIV OR arthrit\* OR osteoarthritis OR "Human Immunodeficiency Virus" OR ("Connective tissue”) adj (disease\* or disorder\*) OR “osteomuscular disease\*” OR “acquired immune deficiency syndrome”

((renal OR kidney) adj2 (fail\* OR disease\* OR insufficiency OR dysfunction\*)) OR (dialysis OR diabet\* OR CKD) OR “thyroid disease\*”

Dyslipid?emia OR IBD OR hepatitis OR pancreatitis OR ulcer OR (digest\* adj2 disease\*) OR (liver adj2 disease\*) OR (bowel adj2 disease\*)

((mental\* or psychiatric or mood OR affective) adj (ill\* or disorder\* or health or condition\*))

Depress\* OR schiz\* OR psychosis OR psychoses OR psychotic) OR ((substance OR drug OR opioid OR alcohol) adj1 (misu\* OR abus\* OR disorder\* OR addict\* OR depend\*)) OR "substance use disorder\*” OR “anxiety disorder\*”

“Metastatic cancer” OR “Metastatic solid tumo?r” OR “Hodgkin's disease” OR “previous cancer” OR “cancer survivors” OR “secondary cancer”

Development\* disab\* OR deaf\* OR autis\* OR disabilit\* OR ((disab\* OR impair\* OR limitation\* OR defect\*) adj (learning OR intellect\* OR physical OR mobility OR neurodevelopmental OR hearing OR visual OR vision OR sensory OR functional)) OR (spinal adj2 injur\*) OR (Brain adjInjur\*) OR "cerebral palsy"

#1 AND #2 AND #3 AND #4AND Publication date from 01.01.1998-16.09.20

**Supplementary File: References of included and excluded studies**

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