Recall to assessment rates and interval cancer risk --indications from an Australian experience --

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(s2) National Accreditation Standard Measures (2022)

RECALL FOR ASSESSMENT

- **Measure 2.6.3:** <10% of women screened at aged 50-69 years are recalled for assessment following round 1 screening
- **Measure 2.6.4:** <5% of women screened at aged 50-69 years are recalled for assessment following round 2+ screening

Note: Monitoring of recall % for ages 40-49 and 75+ years respectively

INTERVAL CANCERS

- **Measure 2.3.1b**: <7.5/10,000 screened at age 50-69 years have an interval invasive breast cancer in the 12 months following round 1 screening
- **Measure 2.3.2b:** ≤15/10,000 screened at age 50-69 years have an interval invasive breast cancer in the 12-24 months following round 2 screening

Note: Monitoring of interval breast cancers required for ages 40-49 and 75+ years without specific measures

(S3) % Recall for assessment of women screened by screening round and age*

Calendar years	Round 1 recall % Ages 50-69 years (NAS<10%)	Round 2+ recalls % Ages 50-69 years (NAS<5%)	Round 1 recall % Ages 50-74 years	Round 2+ recall% Ages 50-74 years
1996-1999	6.8	3.7	NA	NA
2000-2004	8.9	4.0	NA	NA
2005-2009	**10.0**	4.0	NA	NA
2010-2014	**11.3**	3.9	12.2 (2014 only)	4.0 (2014 only)
2015-2019	**11.4**	3.6	11.5	3.7

*Data source: Cancer Australia NCCI & AIHW

(S4) % Recall for assessment of women screened by screening round and 5-year age group*

*Data source: AIHW

Round 1 (NAS <10%)	50-54 years	55-59 years	60-64 years	65-69 years	70-74 years
1996-1999	7.3	6.7	6.6	6.3	NA
2000-2004	9.4	9.0	8.8	8.3	NA
2005-2009	**10.9**	**10.0**	9.5	9.2	NA
2010-2014	**11.6**	**11.1**	**11.3**	**11.2**	NA
2015-2019	**11.6**	**11.3**	**11.0**	**11.6**	12.7
Round 2+ (NAS<5%)	50-54 years	55-59 years	60-64 years -	65-69 years	70-74 years
1996-1999	4.0	3.7	3.5	3.4	NA
2000-2004	4.2	4.0	4.0	3.8	NA
2005-2009	4.5	3.8	3.8	3.9	NA
2010-2014	4.3	3.6	3.6	3.8	NA
2015-2019	4.1	3.4	3.4	3.7	3.9

(S5) Age-standardized interval cancer rates (0-24 months) per 10,000 women: BREASTCREEN Australia*

Diagnostic period	First screening round - rate (95% CI)	Subsequent screening rounds - rate (95% CI)
1996-1998	9.5 (8.8, 10.2)	10.3 (9.8, 10.8)
1998-2000	10.7 (9.8 11.6)	10.7 (10.3, 11.2)
2000-2002	9.5 (8.6, 10.6)	10.1 (9.7, 10.5)
2002-2004	8.8 (7.8, 9.9)	9.4 (9.0, 9.7)
2004-2006	9.1 (8.0, 10.3)	9.3 (9.0, 9.7)
2006-2008	**8.7 (7.7, 9.9)**	**9.0 (8.7, 9.4)**
2008-2010	**7.8 (6.8, 8.9)**	**9.0 (8.7, 9.4)**
2010-2012	**8.0 (7.0, 9.1)**	**9.3 (9.0, 9.6)**
2012-2014	**8.1 (6.9, 9.3)**	**9.1 (8.8, 9.5)**
2013-2015	**7.9 (6.9, 9.1)**	**8.9 (8.6, 9.2)**
2016-2018	**8.1 (7.2, 9.1)**(est.)	**9.1 (8.8,9.4)**(est.)

*Age 50-69 years at diagnosis

(S6) Prognostic characteristics of screen-detected (n=1642) and interval cancers (n=660),[1] and breast cancer mortality in 19-year follow-up[2]

Characteristic	Screen-detected (%)	Interval (%)	p value
Age at diagnosis (years)			
<50 (n=406)	14.6 (12.9, 16.4)	25.3 (22.0, 28.8)	
50-59 (n=720)	30.3 (28.1. 32.6)	33.6 (30.0, 37.4)	p<0.001
60-69 (n=843)	39.7 (37.3, 42.1)	28.9 (25.5, 32.6)	(chi-square)
70-79 (n=333)	15.4 (13.7, 17.3)	12.1 (9.7, 14.9)	
Total (n=2302)	100	100	
TNM stage			
I (n=1314)	66.2 (63.9. 68.5)	35.9 (32.2, 39.8)	p<0.001
II-IV (n=964)	33.8 (31.5, 36.1)	64.1 (60.2, 67.8)	(chi-square)
Total (n=2278)	100	100	
Grade			
Low-intermediate (n=1644)	77.5 (75.4, 79.2)	58.2 (54.3, 62.0)	p<0.001
High (n=639)	22.5 (20.5, 24.6)	41.8 (38.0, 45.7)	(chi-square)
Total (n=2283)	100	100	
Triple negative			
Yes (n=176)	5.6 (4.6, 6.9)	14.0 (11.3, 17.0)	p<0.001
No (n=2034)	94,4 (93.1, 95,4)	86.0 (83.0, 88.7)	(chi-square)
Total ((n=2210)	100	100	
Breast-cancer mortality hazard ratio (19 years FU):		Unadjusted competing risk analysis:	Unadjusted competing risk analysis:
(1) interval within 0-12m (n=324)	1.00	1.92 (1.39, 2.65)	p<0.001
(2) interval within 12-30m (n=726)	1.00	1.20 (0.90, 1.58)	p=0.190

Derived from Qld cohort study[1]; Data source: Woman's Health Initiative Trials[2]

References:

1.Kou K et al. Severity and risk factors of interval breast cancer in Queensland Australia: a population-based study. Breast Cancer 2023; 30: 466-477.

2. Irvin VL et al. Comparison among participants of woman's Health Initiative Trials with screen-detected breast cancers versus interval breast cancers. JAMA Network Open 2020; 3(6): e207227.

(S7) Risk of breast-cancer-specific mortality in Manitoba for Jan 2004-June 2010 diagnoses (invasive) with median 7-year follow-up

Analyzed by detection type: screening program (n=705); interval (n=206); non-compliance n=275; non-screening program (n=501)

Metric: Hazards ratio (95% CI) derived from competing risk regression

MODEL 1	No sojourn time assumed	2-year sojourn time assumed
Detection type		
Screening program	1.00	1.00
Interval	5.44 (3.08, 9.60) p<0.001	3.55 (2.01, 6.28) p<0.001
Non-compliant	3.31 (1.85, 5.93) p<0.001	2.18 (1.21, 3.95) p=0.002
Non-Screening program	10.00 (5.98, 16.75) p<0.001	6.14 (3.73, 10.11) p<0.001
Interaction (non-screening x log-time)	0.52 (0.36, 0.74) p<0.001	0.56 (0.41, 0.76) p<0.001

MODEL 1 (adj income/age at diag.)	No sojourn time assumed		2-year sojourn time assumed	
Detection type				
Screening program	1.00		1.00	
Interval	5.41 (3.06, 9.58)	p<0.001	3.54 (2.00, 6.26)	p<0.001
Non-compliant	3.17 (1.77, 5.70)	p=0.001	2.09 (1.15, 3.80)	p=0.020
Non-Screening program	9.91 (5.92, 16.58)	p<0.001	6.10 (3.70, 10.04)	p<0.001
Interaction (non-screening x log-time)	0.52 (0.36, 0.74)	p<0.001	0.56 (0.41, 0.76)	p<0.001

Note: non-breast cancer mortality (screen-detected and interval similar) at HR 1.33 (0.43, 4.15)

Data sources: Manitoba Cancer Registry, Breast Screening registry, Census

Reference: Niraula S et al. Incidence, characteristics, and outcomes of interval breast cancers compared with screen-detected breast cancers. JAMA Netw Open 2020; 3(9): e2018179

(S8) Study report:

Boyle T, Reintals M, Holmes A, Buckley E, Roder D. Interval cancers as related to frequency of recalls to assessment in the population-based SA screening program. *Cancer Epidemiology* 2022; 79:102183

Rationale:
Breast cancer screening aims to detect breast cancers early and reduce numbers of interval cancers.
Recall to assessment standards are tradeoffs between achieving this and limiting unnecessary recalls.
Interval cancers tend more to have more unfavorable prognostic indicators and survival outcomes.
Present recall standards of <10% (round 1) and <5% (round 2+) are unchanged since screening commencement (circ 1991). Should there be minimum as well as maximum limits for standards?

Case -control study design:
Cases - 3,016 BREASTSCREEN participants having interval cancers (0-24 months) since 1991.
Controls - 15,080 cancer-free BREASTSCREEN controls (randomly selected/age and screening year matched).

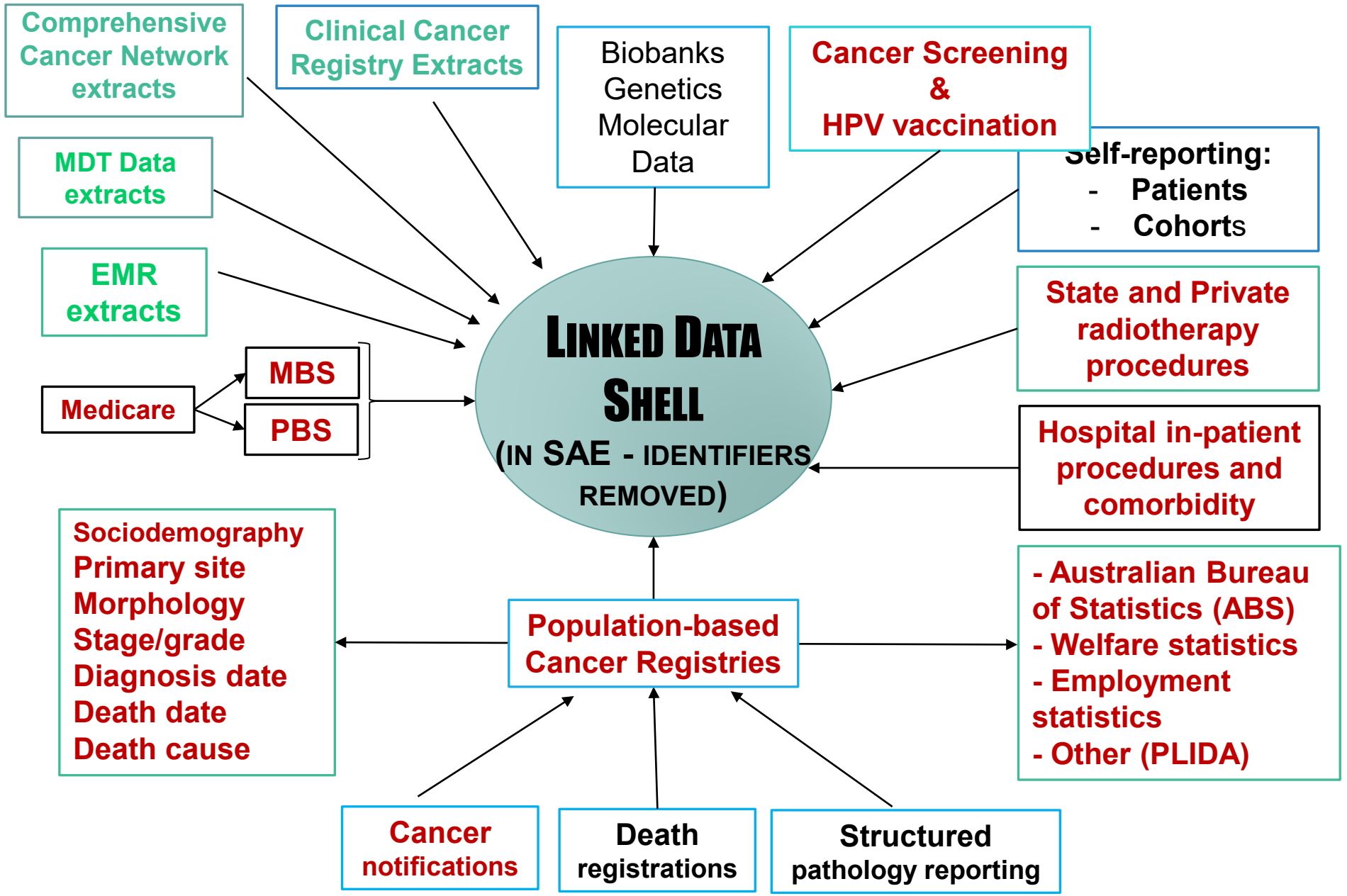
Analysis: Conditional logistic regression.
Outcome=odds ratios (95% CIs) of interval cancer by service recall to assessment rate.
Sub-classified by analogue/digital screen, screening round, and age (40-49, 50-69, 70-74 years). Covariates - age (years); Indigenous status; remoteness of residence; SEIFA IRSD quintile; use of HRT (last 6m); strong family history of breast cancer; fixed or mobile clinic; number of prior screens per year (clinic means).

Results:
Association between recall to assessment (RTA) percentages (Round 1 and Round 2+) and odds ratios (95% CI) for interval cancers by age for all screens and by film type, with RTA modelled as a continuous variable: BREASTSCREEN South Australia, 1990-2016*

RTA %	All unadjusted	All adjusted	Analogue adjusted	Digital adjusted
40-49 years:				
Round 1 RTA (n=185)	1.00 (0.81, 1.25)	0.94 (0.72, 1.22)	1.20 (0.86, 1.66)	**0.47 (0.23, 0.97)**
Round 2+ RTA (n=258)	1.07 (0.80, 1.43)	1.03 (0.70, 1.53)	1.36 (0.82, 2.24)	0.98 (0.45, 2.12)
50-69 years:				
Round 1 RTA (n=294)	0.98 (0.80, 1.20)	0.89 (0.70, 1.13)	1.10 (0.77, 1.56)	0.93 (0.66, 1.30)
Round 2+ RTA (n=2086)	0.95 (0.79, 1.14)	**0.78 (0.63, 0.97)**	1.11 (0.71, 1.73)	**0.71 (0.54, 0.93)**
70-74 years:				
Round 1 RTA (n=4)	NA	NA	NA	NA
Round 2+ RTA (n=189)	1.15 (0.86, 1.54)	1.14 (0.71, 1.84)	0.68 (0.24, 1.70)	1.76 (0.87, 3.57)

* Derived from conditional logistic regression

(S9) A CANCER DATA FRAMEWORK – POPULATION & HEALTH SYSTEM COMPONENT



(S10) SUMMARY COMMENTS

- Recall to assessment and interval cancer NAS have been largely unchanged since BREASTSCREEN rollout circa 1991.
- Recall to assessment for round 1 has increased across calendar years for all ages in the 50-69 year range, now exceeding the NAS. No such increase is evident for round 2+. Why?
- Evidence points to lower interval cancer rates for diagnoses from circa 2006-2008 to 2016-2018 pre-covid years.
- Interval cancers show different features consistent with increased BCA mortality risk. That said, would outcomes have been better if screen detected?

SUMMARY COMMENTS (cont.)

- **We found higher recall to assessment frequency in the SA study to be associated with lower odds of interval cancer for digital but not analogue screens. Why?** [Should a minimum as well as maximum recall NAS be set for digital screens?]
- **The lowest odds of interval cancer for digital screens applied to the highest quintiles of recall to assessment at 0.6/0.47 for Q3/4 and 0.33 (0.14, 0.75) for Q5 compared with Q1. All quintiles met within the NAS.**
- **What are the implications? Should a multijurisdictional study be done to validate the exploratory study findings in SA?.**
- **Should cancer data across Australia be linked for monitoring the entire screening, treatment, and outcome pathway as part of the ACP implementation?**
- **Should greater use be made of ABS-managed PLIDA(MADIP) data to monitor Indigenous, CALD subgroup, and household socioeconomic, and other sociodemographic determinants of screening and health services to evaluate equity?**