



Inequalities in cancer outcomes by Indigenous status and socioeconomic quintile:

An integrative review

Authors: Annie Bygrave, Kate Whittaker,
Professor Sanchia Aranda AM
Cancer Council Australia

For more information contact:
cancercontrolpolicy@cancer.org.au

Abstract

Objective:

To utilise current Australian research to identify inequalities in cancer outcomes by Indigenous status and socioeconomic quintile and discuss the influencing factors.

Methods:

Whittemore and Knaf's (2005) methodology for an integrative review was applied.

Results:

A total of 48 papers were included. First Nations people and people living in the most disadvantaged areas were 39% and 33% more likely to die from cancer, respectively. The disparity in cancer mortality among First Nations people has widened by 82 deaths (per 100,000) since 1998.

Differences in cancer treatment reported by First Nations people increased their risk of death from breast, lung and colorectal cancer, which was also influenced by the presence of comorbidities, stage at diagnosis, and participation in diagnostic and treatment services.

Implications for public health:

Recognising that inequalities in cancer outcomes exist is important in enabling health service and system responses, particularly the identification of where and why disparities occur across the cancer control continuum.

Conclusions:

Inequalities in cancer mortality exist among disadvantaged populations, differing by cancer type. Differences in treatment influence risk of cancer death and therefore, improving accessibility to health services by addressing social determinants, must be a priority to reduce inequalities in cancer mortality.

Keywords:

First Nations people, Socioeconomic, Cancer, Inequalities, Access to healthcare

Background

Cancer survival rates in Australia are among the highest in the world,^[1] improving by 18.9% since 1986.^[2] This may be due to population-wide cancer prevention, screening and early detection initiatives, and universal health coverage, which have supported Australians to access best practice cancer treatment and care. However, inequalities in cancer outcomes persist among certain groups of people.

First Nations people and those living in the most disadvantaged areas report higher cancer incidence and mortality, and lower survival than other Australians and those living in the least disadvantaged areas.^[2] Higher prevalence of risk factors and presence of comorbidities, more advanced cancer at diagnosis, and less participation in national cancer screening programs and receipt of treatment have been reported as possible factors that influence higher cancer mortality for particular populations.^[3-6] While these factors relate to accessibility to health services, the social, economic and cultural environments within which these populations

live and interact influence outcomes. This could include personal beliefs, fears and attitudes about cancer, lower cancer symptom awareness, poor health literacy, discrimination based on race or socioeconomic status, communication difficulties and geographic isolation. More research is needed to identify clear associations between individual or combined factors and higher cancer mortality for these populations.

While potential reasons for inequalities in cancer outcomes have been posed by descriptive literature, minimal synthesis has been done. This integrative review aimed to utilise current Australian research to identify inequalities in cancer outcomes by Indigenous status and socioeconomic quintile, and discuss the factors influencing them. The approach enabled the use of different sources of information to develop a comprehensive understanding of where inequalities in cancer outcomes exist, and the variability and extent of these disparities among these disadvantaged populations.^[7]

Methods

Whittemore and Knafl's (2005) methodology guided this integrative review. It consists of five stages: (1) problem identification; (2) literature search; (3) data evaluation; (4) data analysis; and (5) presentation.

Aboriginal and Torres Strait Islander peoples engaged with Cancer Council Australia, provided advice that the terminology 'First Nations people' is used when describing their experiences with cancer and outcomes.

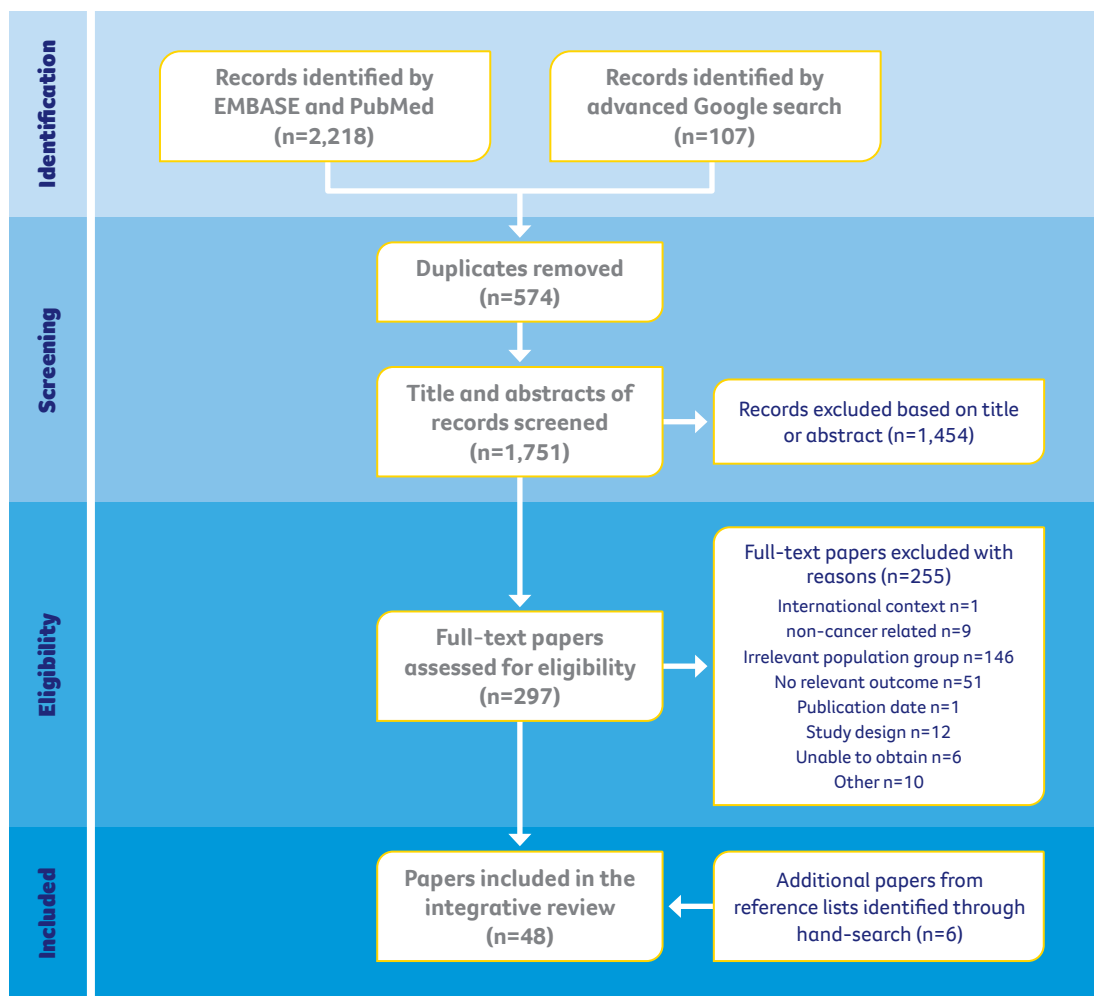
An area-based measure (the Index of Relative Socioeconomic Disadvantage [IRSD]) of socioeconomic status was chosen because it summarises information about the environmental, social and geographical conditions of people and households in a specified area, including individual-level information on income and employment.^[8] IRSD is one of four Socioeconomic Indexes for Areas (SEIFA) developed by the Australian Bureau of Statistics and indicates the relative disadvantage of specified areas. It reports on Census Collection Districts level data – the smallest geographic unit of SEIFA information.^[8]

Problem identification

The poorer cancer outcomes reported for First Nations people and those living in the most disadvantaged areas compared to the general Australian population indicate that a combination of factors may be contributors. To gain a better understanding of the factors and their influence, this review focused on issues within the health system and their impact on risk of cancer death by Indigenous status and socioeconomic quintile.

Figure 1:

Process of inclusion and exclusion.



Literature search

To identify papers for inclusion, three electronic databases were searched: EMBASE, PubMed and Google (Figure 1). Key search terms included *cancer*, *inequality*, *Indigenous*, *socioeconomic* and *Australia*. The search was conducted in April 2018.

Inclusion and exclusion criteria:

Criteria for inclusion were: (i) First Nations participants and/or participants living in the most disadvantaged areas in Australia as defined by IRSD; (ii) participants diagnosed with cancer or a subset disease of cancer; (iii) cancer outcomes within a First Nations and/or socioeconomic disadvantaged population; (iv) peer-reviewed and grey literature papers; (v) papers published between 2008 and 2018, unless trend data in grey literature were available; and (vi) papers available in English.

Non-empirical studies including editorials, letters, commentaries and narrative reviews were excluded.

Search results:

The electronic database search yielded 2,325 records. Duplicates were removed, and 1,751 titles and abstracts were screened. Applying the inclusion and exclusion criteria above, 297 full-text papers were reviewed. Reference lists of the included papers (n=42) were scanned and 6 additional papers were included. Forty-eight papers were included, a combination of peer-reviewed and grey literature.

Data evaluation

The National Health Medical and Research Council's level of evidence and Cochrane's risk of bias tool used to evaluate the quality of peer-reviewed literature were considered however, not formally applied to the review.^[9-10] Given the heterogeneity of both populations, and the clinical and healthcare settings of the studies, it was not practical or of value to this review to use these appraisal tools. Instead, a narrative synthesis was adopted to better understand the quality of evidence, largely focusing on participant sample sizes, the completeness of data, and whether outcomes were measurable. No papers were removed based on quality appraisal.

The quality of literature in the review was mixed. Thirteen peer-reviewed papers found 20 associations between factors and higher cancer mortality for First Nations people or those living in the most disadvantaged areas. These papers were relatively high-quality, contributing more to the analysis of findings compared to low-quality papers. A low-quality paper identified a potential factor but did not further investigate its interaction with cancer mortality.

Data analysis and presentation

Whittemore and Knaf's (2005) model for an integrative review demonstrates data analysis consists of multiple phases and constant comparison between different population groups.^[7] Data were extracted from peer-reviewed and grey literature papers and summarised into two separate tables. Data extracted included information on the aim, data source, cancer diagnosis, outcome measures and key findings.

Conceptual maps were developed to organise and display data to identify where inequalities in cancer mortality existed for both populations, and the extent and variability of these disparities. Data comparison helped identify the key themes including patient characteristics (e.g. presence of comorbidities) and health systems issues, which were defined as areas where health services play a role to improve outcomes and patient choices (e.g. stage at diagnosis, treatment received).

Findings were presented by theme. A narrative synthesis approach was used to summarise the findings, and where appropriate identify and explain associations, including potential associations.

Results

Eighteen papers were Australia-wide, and 30 were representative of different states: Queensland (n=13), New South Wales (n=11), South Australia (n=3), Victoria (n=2) and Western Australia (n=1). There were 36 cohort studies, 2 cross-sectional studies and 10 grey literature papers.

Extent of inequalities in cancer outcomes

For all cancers combined, mortality was 39% higher for First Nations people,^[11] and 33% higher for people living in the most disadvantaged areas.^[12] Since 1998 the inequality in mortality has widened by 82 deaths (per 100,000) between First Nations people and other Australians, due to rates increasing for First Nations people (>51 deaths per 100,000) and decreasing for

other Australians (<31 deaths per 100,000).^[11] During this time, the inequality in lung cancer mortality widened the most between First Nations people and other Australians (>17 deaths per 100,000) also because of disproportionate improvements.^[11] Age-standardised lung cancer mortality rates increased for First Nations people (>10 deaths per 100,000) and decreased for other Australians (<7 deaths per 100,000).^[11] No national trend data was available by socioeconomic quintile.

Another pattern identified was in cervical cancer mortality, where First Nations women were 3.8 times more likely to die from cervical cancer,^[11] and women living in the most disadvantaged areas were 2.5 times.^[12]

Patient characteristics

Comorbidities:

Three peer-reviewed papers reported an association between higher presence of comorbidities and poorer cancer survival for First Nations people in Queensland.^[13-15] Two investigated this association for breast and lung cancer.^[13-15]

The crude risk of dying from breast cancer was higher for First Nations women (HR 1.88, 95% CI 1.00-3.56) but when adjusted for comorbidities the survival differential reduced (HR 1.54, 95% CI 0.79-3.02).^[15] The same effect was found for First Nations people with lung cancer: The hazard ratio (HR) reduced from 1.10 (95% CI 0.83-1.44) to 1.02 (95% CI 0.77-1.35), after accounting for comorbidities.^[13]

Health systems issues

Stage at cancer diagnosis:

An association between advanced cancer and poorer cancer survival for First Nations people and those living in the most disadvantaged areas were reported in 10 peer-reviewed papers,^[3-6,14-22] but only two found significant associations.^[16,21]

After adjusting for stage at diagnosis, an association between advanced cancer and risk of cancer death for First Nations people living in the most disadvantaged areas in New South Wales was found (SHR 1.56, 95% CI 1.42-1.73).^[3] This pattern was more pronounced before adjusting for stage (SHR 1.88, 95% CI 1.72-2.06), but it was identified that First Nations people had an elevated risk of cancer death, irrespective of socioeconomic disadvantage.^[3]

Treatment:

Four peer-reviewed papers reported that differences in receipt of treatment was a predictor of poorer cancer survival for First Nations people.^[13,15,23-25] Two investigated this association for breast cancer,^[15,24] 2 for lung cancer,^[13,23] and one for colorectal cancer.^[25]

First Nations women diagnosed with breast cancer had higher mastectomy rates, but lower breast conserving surgery plus radiotherapy rates than other Australian women.^[15,24] An association was found between treatment differences and risk of breast cancer death for First Nation women, after adjustment.^[15,24] The crude risk of dying from breast cancer in Queensland was higher for First Nations than other Australian women (HR 1.88, 95% CI 1.00-3.56), but adjusting for any treatment received reduced this differential (HR 1.39, 95% CI 0.71-2.76).^[15] Supramaniam et al. (2014) identified First Nations women had a 69% higher unadjusted risk of breast cancer death in New South Wales compared to other Australian women however, reduced after accounting for surgical treatment (HR 1.39 95% CI 1.01-1.86).^[24]

First Nations people were less likely to receive active treatment (chemotherapy, radiotherapy or surgery) for non-small cell lung cancer (NSCLC) compared to other Australians.^[13,23] After adjusting for differences in treatment, receipt of less treatment largely explained the lower lung cancer survival rates reported for First Nations people.^[13,23] Coory et al. (2008) reported that in Queensland the unadjusted HR was 48% higher for First Nations people compared to other Australians, but when treatment differences were accounted for, this reduced (HR 1.10 95% CI 0.83-1.44).^[13]

Distance to health services:

A single peer-reviewed paper found distance to treatment did not explain survival inequalities for those living in the most disadvantaged areas with breast (RER 1.51, 95% CI 1.33-1.72) or colorectal cancer (RER 1.29, 95% CI 1.20-1.39), even after adjustment for age and area disadvantage (breast: RER 1.50, 95% CI 1.32-1.71; colorectal: RER 1.29, 95% CI 1.19-1.39).^[26]

Discussion

Improving inequalities in cancer mortality is a major health priority in Australia, but to do so, requires a better understanding of where and why these inequalities occur. Available data on inequalities in cancer mortality by Indigenous status and socioeconomic quintile identified that accessibility to health services, both availability and utilisation, contribute to their increased likelihood of cancer death.

Cancer mortality rates are decreasing overall in Australia, therefore, widening inequalities in mortality in many cancer types among First Nations people is concerning. Although no national trend data was available by socioeconomic quintile, a peer-reviewed literature paper reported that in New South Wales the gap in risk of cancer death between those living in the most and least socioeconomic disadvantaged areas widened from 7% to 24% over an 18-year period.^[5] The higher cancer mortality rates experienced by both populations were well-reported, but studies had difficulties in providing reasons for these inequalities. Small cohort numbers potentially limited the ability to detect associations between factors and risk of cancer death by Indigenous status and socioeconomic quintile.

A population-based study found First Nations people living in the most disadvantaged areas had an increased risk of cancer death compared to other Australians living in the same area, with the most pronounced elevations identified before adjustment for stage.^[3] This indicated that Indigenous status was a strong predictor of higher risk of cancer death and advanced stage at diagnosis, regardless of socioeconomic disadvantage.^[3] The fact the interaction between Indigenous and socioeconomic status remained after adjusting for stage highlights the complexity of the underlying factors.

A national report found that patients diagnosed with colorectal, breast or cervical cancer through screening programs had a lower risk of dying.^[27] As cervical cancer was found to be the leading cause of excess mortality for First Nations women and women living in the most disadvantaged areas it could suggest that they have less interaction with services, and are possibly not benefiting from the *National Cervical Screening Program*. Available *National Cervical Screening Program* data demonstrates participation rates for women living in the most disadvantaged areas were lower compared to their comparator (50% vs. 62%, respectively).^[27] The *National Cervical Screening Program* does not currently collect information on Indigenous status, which limits

understandings on the interaction First Nations women have with this program. First Nations adolescents, and adolescents living in the most disadvantaged areas aged 12–13 years have lower 3-dose coverage for human papillomavirus than the general Australian population,^[28–29] potentially affecting increased incidence and mortality. An association between early detection and cervical cancer death was not found in either population, and it is unlikely that lower screening rates alone account for the high mortality; it is a triple issue (lower vaccination, poorer screening and poorer access to services). The successfulness of the *National Cervical Screening Program* and human papillomavirus vaccine in improving incidence and mortality from cervical cancer in the general Australian population indicates that opportunities exist to review the program to reduce inequalities in cervical cancer mortality. This may require better engagement with disadvantaged populations, addressing enablers and barriers to accessibility.

Type of treatment First Nations people or people living in the most disadvantaged areas with cancer received varied. Associations between treatment and cancer death were found for First Nations people, however, this was not observed for people living in the most disadvantaged areas. First Nations women had a higher likelihood of undergoing a mastectomy, instead of breast conserving surgery plus radiotherapy.^[15,24] This had a large effect on their risk of breast cancer death, which halved when surgical treatment was controlled for.^[24] Although a definite explanation for this difference in surgery remains unknown, a combination of factors are likely influencing, including more advanced breast cancer at diagnosis and poorer access to adjuvant therapies.^[15,24] A high proportion of First Nations women in rural areas had a mastectomy, indicating that place of residence impacts treatment uptake potentially due to a lack of local services.^[24] The addition of radiotherapy to breast conserving surgery requires additional treatment visits, which may explain why First Nations women chose a one-off surgical procedure. Reasons for making these treatment decisions could be due to travel-related factors, such as the need for transportation, accommodation or childcare facilities, increased financial costs and more time off work.^[30] Higher presence of multimorbidities identified among First Nations breast cancer patients may also restrict treatment and adjuvant therapy options available.

^[15,24,31]

Lower rates of active treatment increased First Nations people risk of lung cancer death.^[13,23] Differences in lung cancer treatment are probably related to the increased likelihood of First Nations people being daily smokers,^[32] having more advanced stage at diagnosis and higher presence of comorbidities.^[13,22-23] The factors in this scenario complicates available treatment options. Instead of First Nations people with lung cancer undergoing surgery (“optimal treatment”), palliative treatment (“sub-optimal treatment”) would be recommended.

Mortality for colorectal cancer remains equivalent between First Nations people and other Australians until 18 months after diagnosis.^[25,33] This suggests that First Nations people may have lower rates of diagnostic colonoscopies to detect new tumours early,^[25,34] higher rates of late-stage disease recurrence due to poorer follow-up or lower rates of adjuvant therapies.^[25] However, no obvious differences in the treatment received by First Nations people, including surgery and adjuvant chemotherapy or radiotherapy were found.^[25] It was not clear where this mortality inequality was confined to, but delays along the cancer pathway due to accessibility barriers, including cultural issues may contribute.^[35] There is also evidence that First Nations people are 26% less likely to participate in the *National Bowel Cancer Screening Program* than other Australians, and First Nations people that receive positive immunochemical faecal occult blood test results are nearly half as likely to not follow-up.^[11]

While comorbidity, and poorer service access and treatment may affect the inequality in cancer mortality for both populations, there are probably factors relating to their cultural, social and economic environments underpinning the disparity. Population-wide cancer initiatives and programs continue to improve outcomes for the general Australian population, but emphasis should remain on understanding the factors contributing to the inequalities experienced by First Nations people and those living in the most disadvantaged areas.

Study limitations

This review has some limitations to consider. First, availability of national data on cancer stage or spread of disease was limited and made it difficult to understand the variations in mortality and inform where future research and targeted cancer strategies could be applied. Second, quality of information on Indigenous status varied across jurisdictions, and national data was only reflective of the states and territories where information was considered adequate for reporting. Third, Indigenous status is a self-reported measure, and therefore conclusions are limited to the population that identified themselves as ‘Aboriginal and/or Torres Strait Islander’ on healthcare information. Fourth, SEIFA measure used for this project was based on Collection Districts, and as a result, information on individual-level factors are not available and disparities may have been under-estimated. Lastly, most peer-reviewed literature was limited to New South Wales or Queensland, which restricted the generalisability of outcomes to the entire Australian population because of social, cultural and healthcare differences across jurisdictions.

Implications for public health

This was the first integrative review to synthesise existing evidence on inequalities in cancer outcomes by Indigenous status and socioeconomic quintile. Recognising that inequalities in cancer outcomes exist, particularly the identification of where and why disparities occur across the cancer control continuum, from early detection and diagnosis to survivorship and end-of-life care is important in enabling health service and system responses. Although Australia's health system offers quality services to all, to narrow

the inequality gap in cancer outcomes, finding opportunities to better support every person to access the health services they need is required. Future research should focus on understanding the impact of health system factors and patient decision-making behaviour on cancer outcomes. Further insights would inform interventions that are culturally and socially appropriate, meeting the specific needs of disadvantaged populations.

Conclusion

The higher cancer mortality rates First Nations people and those living in the most disadvantaged areas experience, largely reflected in preventable cancers, warrant urgent attention. Accessibility to health services underpins inequalities in cancer mortality, but greater consideration of the complex interplay that social determinants of health have on inequalities is required.

This review contributes to an existing body of research, creating a comprehensive understanding of the potential impact specific factors can have on cancer mortality for these disadvantaged populations. Future research should focus on addressing accessibility to health services and the social determinants of health to facilitate and support increased engagement from members of disadvantaged populations.

Reference list

1. Arnold M, Rutherford M, Bardot A et al. Progress in cancer survival, mortality, and incidence in seven high-income countries 1995–2014 (ICBP SURVMARK-2): A population-based study. *The Lancet Oncology* 2019.
2. Australian Institute of Health and Welfare. Cancer in Australia 2019 [Cancer series No.119. Cat. No.: CAN 123]. Canberra: AIHW; 2019. <https://www.aihw.gov.au/getmedia/8c9fcf52-0055-41a0-96d9-f81b0feb98cf/aihw-can-123.pdf.aspx?inline=true> (viewed Oct 2019).
3. Tervonen H, Aranda S, Roder D et al. Differences in impact of Aboriginal and Torres Strait Islander status on cancer stage and survival by level of socio-economic disadvantage and remoteness of residence: A population-based cohort study in Australia. *Cancer Epidemiology* 2016;41:132–138.
4. Tervonen H, Walton R, Roder D et al. Socio-demographic disadvantage and distant summary stage of cancer at diagnosis: A population-based study in New South Wales. *Cancer Epidemiology* 2016;40:87–94.
5. Tervonen H, Aranda S, Roder D et al. Cancer survival disparities worsening by socio-economic disadvantage over the last 3 decades in New South Wales, Australia. *BMC Public Health* 2017;17(1).
6. Tervonen H, Walton R, You H et al. After accounting for competing causes of death and more advanced stage, do Aboriginal and Torres Strait Islander peoples with cancer still have worse survival? A population-based cohort study in New South Wales. *BMC Cancer* 2017;17(1).
7. Whittemore R, Knaf K. The integrative review: Updated methodology. *Journal of Advanced Nursing* 2005;52(5):546–553.
8. Australian Bureau of Statistics. Census of population and housing: Socio-economic indexes for areas (SEIFA), Australia 2016 [Internet]. Belconnen ACT: Australian Bureau of Statistics; 2018 [updated Mar 2018; cited Oct 2019]. Available from: <https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/2033.0.55.001~2016~Main%20Features~IRSD~19>
9. National Health and Research Medical Council. NHRMC additional levels of evidence and grades for recommendations for developers of guidelines. Canberra: NHRMC; 2008. <https://www.mja.com.au/sites/default/files/NHRMC.levels.of.evidence.2008-09.pdf> (viewed Oct 2019)
10. Higgins J, Thomas J. Cochrane handbook for systematic reviews of interventions [Internet]. London UK: Cochrane; 2019 [updated 2019; cited Oct 2019]. Available from: <https://training.cochrane.org/handbook/current>

11. Australian Institute of Health and Welfare. Cancer in Aboriginal and Torres Strait Islander peoples of Australia [Cat. No.: CAN 109]. Canberra: AIHW; 2018. <https://www.aihw.gov.au/reports/cancer/cancer-in-indigenous-australians/contents/summary> (viewed Oct 2019)
12. Australian Institute of Health and Welfare. Cancer in Australia 2017 [Cancer series No.101. Cat. No.: CAN 100]. Canberra: AIHW; 2019. <https://www.aihw.gov.au/getmedia/3da1f3c2-30f0-4475-8aed-1f19f8e16d48/20066-cancer-2017.pdf.aspx?inline=true> (viewed Oct 2019)
13. Coory M, Green A, Stirling J, et al. Survival of Indigenous and non-Indigenous Queenslanders after a diagnosis of lung cancer: A matched cohort study. *Medical Journal of Australia* 2008; 188(10).
14. Moore S, Green A, Bray F, et al. Survival disparities in Australia: An analysis of patterns of care and comorbidities among Indigenous and non-Indigenous cancer patients. *BMC Cancer* 2014;14(517).
15. Moore S, Soerjomataram I, Green A, et al. Breast cancer diagnosis, patterns of care and burden of disease in Queensland, Australia (1998–2004): Does being Indigenous make a difference? *International Journal of Public Health* 2015;61(4):435–442.
16. Baade P, Turrell G, Aitken J. Geographic remoteness, area-level socio-economic disadvantage and advanced breast cancer: A cross-sectional, multilevel study. *Journal of Epidemiology and Community Health* 2011;65(11):1037–1043.
17. Banham D, Roder D, Keefe D, et al. Disparities in cancer stage at diagnosis and survival of Aboriginal and non-Aboriginal South Australians. *Cancer Epidemiology* 2017;48:131–139.
18. Beckmann K, Bennett A, Young G, et al. Sociodemographic disparities in survival from colorectal cancer in South Australia: a population-wide data linkage study. *BMC Health Services Research* 2015;16(24).
19. Cramb S, Garvey G, Valery P, et al. The first-year counts: Cancer survival among Indigenous and non-Indigenous Queenslanders, 1997–2006. *Medical Journal of Australia* 2012;196(4):270–274.
20. Dasgupta P, Youl P, Aitken J, et al. Geographical differences in risk of advanced breast cancer: Limited evidence for reductions over time, Queensland, Australia 1997–2014. *The Breast* 2017;36:60–66.
21. Gibberd A, Supramaniam R, Dillon A, et al. Are Aboriginal people more likely to be diagnosed with more advanced cancer?. *Medical Journal of Australia* 2015;202(4):195–199.
22. Whop L, Bernardes C, Kondalsamy-Chennakesavan S, et al. Indigenous Australians with non-small cell lung cancer or cervical cancer receive suboptimal treatment. *Asia-Pacific Journal of Clinical Oncology* 2016;13(5):e224–e231.
23. Gibberd A, Supramaniam R, Dillon A, et al. Lung cancer treatment and mortality for Aboriginal people in New South Wales, Australia: Results from a population-based record linkage study and medical record audit. *BMC Cancer* 2016;16(289).
24. Supramaniam R, Gibberd A, Dillon A, et al. Increasing rates of surgical treatment and preventing comorbidities may increase breast cancer survival for Aboriginal women. *BMC Cancer* 2014;14(163).
25. Weir K, Supramaniam R, Gibberd A, et al. Comparing colorectal cancer treatment and survival for Aboriginal and non-Aboriginal people in New South Wales. *Medical Journal of Australia* 2016;204(4):156.
26. Cramb S, Garvey G, Valery P, et al. The first-year counts: Cancer survival among Indigenous and non-Indigenous Queenslanders, 1997–2006. *Medical Journal of Australia* 2012;196(4):270–274.
27. Australian Institute of Health and Welfare. Analysis of cancer outcomes and screening behaviour for national cancer screening programs in Australia [Cancer series No. 111. Cat. No.: CAN 115]. Canberra: AIHW; 2018. <https://www.aihw.gov.au/getmedia/d29dfe9e-894b-4d24-91f6-a465713bcff8/aihw-can-115.pdf.aspx?inline=true> (viewed Oct 2019)
28. National Cancer Control Indicators [Internet]. Sydney NSW: Cancer Australia; 2019. Cancer mortality; 2018 [cited 2019 Oct 14]. Available from: <https://ncci.canceraustralia.gov.au/outcomes/cancer-mortality/cancer-mortality>
29. Brotherton J, Winch K, Chappell G, et al. HPV vaccination coverage and course completion rates for Indigenous Australia adolescents, 2015. *Medical Journal of Australia* 2019; 211(1):31–36.
30. Thompson S, Shahid S, Bessarab D, et al. Not just bricks and mortar: Planning hospital cancer services for Aboriginal people. *BMC Research Notes* 2011;4(62).
31. Stavrou E, Lu C, Buckley N, et al. The role of comorbidities on the uptake of systemic treatment and 3-year survival in older cancer patients. *Annals of Oncology* 2012;23(9):2422–2428.
32. Australian Institute of Health and Welfare & Cancer Australia. Lung cancer in Australia: an overview [Cancer series No. 64. Cat. No.: CAN 58]. Canberra: AIHW;2011. <https://www.aihw.gov.au/getmedia/60a20708-55e4-4dc0-a9c4-d5430c096b6c/12466.pdf.aspx?inline=true> (viewed Oct 2019)
33. Tomita Y, Karapetis C, Roder D, et al. Comparable survival outcome of metastatic colorectal cancer in Indigenous and non-Indigenous patients: Retrospective analysis of the South Australian metastatic colorectal cancer registry. *Australian Journal of Rural Health* 2015;24(2):85–91.
34. Australian Institute of Health and Welfare. National Bowel Cancer Screening Program: Monitoring report 2018 [Cat. No.: CAN 112]. Canberra: AIHW;2018. <https://www.aihw.gov.au/getmedia/df120b1a-1bda-49c1-8611-17a7256e61d0/aihw-can-12.pdf.aspx?inline=true> (viewed Oct 2019)
35. Hill S, Sarfati D, Robson B, et al. Indigenous inequalities in cancer: What role for health care? *ANZ Journal of Surgery* 2012;83(1–2):36–41.