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The emerging burden of triple-negative breast cancer in Australia: universal care does not guarantee equitable access

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Abstract

Triple-negative breast cancer (TNBC) is an aggressive breast cancer subtype associated with early onset, limited targeted treatment options, and disproportionately high mortality. Although Australia operates a universal health-care system, inequities in TNBC outcomes persist. We synthesise contemporary clinical, epidemiological, and policy evidence to examine how structural, socioeconomic, and social determinants of health shape access to diagnosis, treatment initiation, treatment completion, and benefit from emerging TNBC therapies. Although public subsidy has reduced direct healthcare costs, particularly following the introduction of peri-operative immunotherapy, financial protection alone has not translated into equitable outcomes. Persistent barriers related to cultural safety, health literacy, geographic remoteness, housing insecurity, indirect costs, and fragmented service delivery continue to limit effective access for priority populations, including Aboriginal and Torres Strait Islander (ATSI) communities, and those experiencing socioeconomic disadvantage. These inequities are further compounded by variations in clinical pathways, workforce availability, and clinical trial participation. TNBC therefore illustrates the limitations of universal coverage models that priorities funding equity without addressing broader structural constraints on care. Achieving population-wide benefit will require policy responses that integrate medicine funding with system-level reforms targeting service accessibility, culturally safe care, and social support mechanisms across the cancer care continuum.

Keywords:

Triple-negative breast cancer (TNBC), Universal health coverage (UHC), Financial toxicity, Health equity, Social determinants of health, Cancer policy

Introduction

TNBC accounts for approximately 10–15% of breast cancer diagnoses, which equates to around 3,000 new cases annually. Despite its relatively low incidence, TNBC is estimated to contribute ~ 30% of breast cancer-related deaths, that is, an estimated population-wide share of breast cancer mortality attributable to TNBC, reflecting its aggressive tumour biology and historically limited targeted treatment options.[1-4] Compared with hormone receptor–positive and HER2-positive subtypes, TNBC contributes disproportionately to breast cancer–related mortality, reflecting both rapid disease progression and historically constrained treatment pathways.[3,5] These features position TNBC as a major contributor to cancer burden globally and within Australia.[2-5]

Australia has been internationally recognised for its commitment to universal health care through Medicare Benefits Schedule (MBS), the Pharmaceutical Benefits Scheme (PBS), and publicly funded cancer services designed to minimise financial barriers to care.[6] This strategy collectively aim to address the three core dimensions of the WHO universal health coverage (UHC) framework: service coverage (breadth), population coverage (depth), and financial protection (height).[7] Despite achieving universal entitlement, persistent inequities in breast cancer outcomes are well documented in Australia. Aboriginal and Torres Strait Islander (ATSI) women experience later-stage diagnosis and poorer survival than non-ATSI women, particularly in rural and socioeconomically disadvantaged settings.[8-9] These disparities expose the tension between UHC cube with subsidy of novel therapies and equitable access to timely, culturally safe, and effective cancer care. (Supplementary Figure and Supplementary Material 1)

TNBC provides a stringent 'stress test' for the structural resilience of Australia's universal cancer system. As treatment becomes increasingly complex and resource intensive (requiring prolonged peri-operative immunotherapy and close toxicity monitoring), TNBC raises critical questions about whether women facing structural, geographic, or socioeconomic barriers can initiate, sustain, and benefit from modern therapies. However, TNBC-specific Australian outcomes stratified by key equity variables (e.g., Indigenous status, remoteness, socioeconomic disadvantage) are not routinely reported, limiting direct quantification of inequity gradients for TNBC in the current evidence base. We therefore use treatment complexity as a policy-relevant risk mechanism, grounded in well-documented Australian disparities in cancer care access and treatment burden, to identify where 'universal' entitlement fails to translate into 'equitable' effective coverage across the care continuum.

Evolving TNBC treatment and policy context

The standard of care for early-stage TNBC in Australia is multimodal, combining definitive surgery with neoadjuvant and/or adjuvant chemotherapy using anthracycline- and taxane-based regimens, often incorporating platinum agents for high-risk disease.[3] From the lens of the WHO UHC framework, the Australian policy response has focused heavily on the service and financial protection dimensions. However, 'service coverage' is not determined by PBS listing alone; it is also defined by the restriction criteria that specify which early-stage patients qualify for reimbursement. These eligibility thresholds shape effective coverage by determining who can access the subsidised regimen in practice.

The phase III KEYNOTE-522 trial marked a major therapeutic advance, demonstrating that peri-operative pembrolizumab added to chemotherapy significantly improves pathological complete response, event-free survival, and overall survival compared with chemotherapy alone.[10,11] However, PBS reimbursement is restricted to defined 'high-risk' early-stage

populations based on staging/clinical criteria, meaning not all patients with early-stage TNBC qualify. These findings have reshaped international and Australian clinical guidelines, establishing chemo-immunotherapy as the standard of care for eligible patients with high-risk early-stage TNBC.[10,11] However, PBS eligibility is restricted by specific staging thresholds.12 These impose secondary inequities, as patients with high-risk biology who fall outside these administrative definitions face prohibitive out-of-pocket (OOP) costs.[12-14] In UHC terms, restrictive eligibility criteria can narrow the service package (breadth) and constrain population coverage (depth), even when financial protection is improved for those who qualify.

In Australia, PBS listing of peri-operative pembrolizumab for selected high-risk early-stage TNBC strengthens financial protection (UHC 'height') by substantially reducing direct out-of-pocket drug costs at the point of prescribing and expands the funded package of care (service coverage/breadth).[12] Complementary MBS items support essential diagnostic and monitoring components (e.g., pathology, imaging, and biomarker testing). However, within the UHC cube, subsidy does not ensure population coverage (depth) or service accessibility required for effective coverage, because women must still access infusion-capable oncology services, undergo toxicity monitoring, and complete a prolonged peri-operative regimen. Accordingly, our study focuses on downstream points in the care continuum, treatment initiation, completion, and benefit realisation, where structural barriers (geography, culturally safe care, workforce availability, indirect costs, and housing stability) can drive attrition despite medicine subsidy.[13] Therefore, one important dimension of the UHC cube, population coverage (especially underprivileged) remains the most vulnerable in rigorous policy analysis. The remaining structural barriers indicate that service is equitable but population coverage is not guaranteed.

Equity lens 1: First Nations women

Aboriginal and Torres Strait Islander (ATSI) women experience persistent inequities in breast cancer outcomes, characterised by lower incidence but higher mortality compared with non-Indigenous women.[8] Within the UHC Cube, this lens is primarily a failure of population coverage (depth): universal entitlement does not translate into equitable, culturally safe access to timely diagnosis and treatment**.** These disparities are driven by later-stage diagnosis, higher prevalence of comorbid conditions, and barriers to accessing definitive treatment, compounded by geographic remoteness and experiences of culturally unsafe care.[8-9]

A critical limitation in the Australian TNBC context is the absence of routinely reported, subtype-specific breast cancer data stratified by Indigenous status and we acknowledge the inferential limits of this conceptual synthesis.[8,9] Operationally, addressing this gap requires (i) mandatory recording of an Indigenous identifier alongside tumour receptor status/subtype in routine cancer reporting, and (ii) routine linkage of cancer registry and hospital records with MBS and PBS claims to quantify stage at diagnosis and care-cascade transitions (treatment initiation, completion, and benefit realisation). Implementing this linkage under Indigenous data sovereignty/governance arrangements would enable community-led monitoring of 'leakage' points and support policy action to improve effective coverage. Where subtype-stratified data are unavailable, we draw on Australian evidence describing inequities in breast cancer outcomes and structural barriers to care for First Nations women; however, we do not infer TNBC-specific incidence, stage at diagnosis, treatment uptake/completion, or effect sizes from these sources. Accordingly, our TNBC-specific implications are framed as plausible risks that warrant empirical testing using linked cancer registry and hospital records with MBS/PBS data, implemented under Indigenous data governance and in partnership with Aboriginal Community Controlled Health Organisations. By making it a rule to record, we can ensure truly effective coverage. As TNBC treatment becomes more complex, requiring multiple treatment cycles, intensive monitoring, and coordinated multidisciplinary input,

there is concern that existing access barriers may amplify inequities in treatment initiation and completion.[10,11] This remains a critical question for future empirical research which must be tested using the aforementioned linked national datasets.

To align with the UHC goal of equitable service delivery, evidence supports the development of culturally safe cancer care pathways in partnership with Aboriginal Community Controlled Health Organisations. Embedding Aboriginal and TSI health workers and patient navigators within oncology services moves beyond the nominal financial protection toward effective coverage.[8,9] Such models improve coordination, communication, and patient experience and are essential for equitable implementation of modern TNBC therapies to yield successful outcome.

Equity lens 2: Low-income patients and financial toxicity

Although Australian cancer care is formally universal, many patients incur substantial out-of-pocket (OOP) costs, including gap payments, transport and parking fees, accommodation for income loss.[13,14] In New South Wales, OOP spending in the preceding 12 months exceeded $1,000 for 55% of people diagnosed with cancer in the past two years, and 9% reported costs exceeding $10,000; among those with recent breast cancer diagnoses, 6% reported costs exceeding $10,000.14 Complementing this distributional evidence, Medicare-based analysis in Queensland estimated a two-year median OOP cost of $4,192 for breast cancer (IQR $1,165–$7,459).[14] While peri-operative TNBC regimen–specific median OOP costs are not routinely reported in Australia, these magnitudes demonstrate that financial protection can remain incomplete during intensive treatment phases. For patients with TNBC, these costs are likely amplified by prolonged and intensive treatment pathways, including peri-operative immunotherapy. For patients with TNBC, these costs are amplified by prolonged and intensive treatment pathways, including peri-operative immunotherapy. Importantly,

universal coverage does not imply complete financial protection in Australia's mixed public–private oncology ecosystem: patterns of private sector utilisation in breast cancer care can introduce systematic cost-sharing through specialist gap payments and ancillary charges. For some patients, the need for rapid clinical turnaround in TNBC may increase reliance on private diagnostics and consultations, thereby widening out-of-pocket exposure. Within the UHC cube, this represents a shortfall in the financial protection (height) dimension despite nominal universal entitlement.

TNBC disproportionately affects younger, pre-menopausal women who are more likely to be in insecure employment or lack paid leave, increasing vulnerability to treatment-related financial distress.[15, 16] Within the UHC Cube, this lens primarily reflects gaps in financial protection (height): even where subsidised services exist, indirect and opportunity costs can undermine effective coverage through delayed initiation, missed visits, or incomplete treatment. Australian and international evidence links financial toxicity to treatment delays, missed appointments, non-adherence to supportive medications, psychological distress, and reduced quality of life.[14,15] Financial toxicity therefore represents both an economic and clinical risk, particularly for patients undergoing intensive TNBC regimens.

Financial toxicity must be viewed as both an economic and clinical risk from the rigorous policy lens. Policy-relevant responses include routine financial toxicity screening using validated tools, integration of social workers and financial counsellors into multidisciplinary teams, and targeted support for non-medical costs for patients undergoing high-intensity treatment.[14-17]

Equity lens 3: Homelessness and housing insecurity

Housing stability is a fundamental enabler of effective TNBC care in the lens of service dimension of UHC cube. While a patient may be eligible for a TNBC treatment service (e.g.,

pembrolizumab infusions), their effective coverage is predicated on housing stability. Treatment depends on predictable attendance for infusions, blood tests, toxicity reviews, surgery planning, and follow-up. Many TNBC regimens cause immunosuppression, making safe housing essential for infection prevention, medication storage, and recovery.[15-17]

Women experiencing homelessness or housing insecurity often intersects with deeper structural vulnerabilities, including mental health and substance use disorders.[17,18] Within the UHC Cube, this lens most directly constrains service coverage (breadth) in practice by disrupting continuity, safety, and feasibility of treatment delivery thereby increasing attrition at treatment initiation and completion stages of the care continuum. Evidence from general oncology populations consistently links housing instability with delayed presentation, missed appointments, treatment interruption, and poorer cancer care continuity.[15-16] However, TNBC-specific Australian estimates linking housing insecurity to subtype-stratified outcomes are not currently available, and we therefore distinguish established associations from TNBC-specific implications. We hypothesise that these risks may be magnified in TNBC because care is time-critical and treatment is resource intensive, requiring predictable attendance for infusions, blood tests, toxicity review, peri-operative planning, and follow-up; disruptions can plausibly translate into delayed initiation, incomplete treatment, and reduced benefit realisation. Yet housing status is rarely captured in routine cancer datasets, rendering homelessness an “invisible” driver of inequity and limiting empirical evaluation in the Australian TNBC context.

Integrating oncology services with housing and social support systems—through patient navigation, flexible scheduling, and short-term accommodation support during high-intensity treatment phases—may therefore improve care continuity for this highly vulnerable population and represents a feasible system-level equity response.[15-17]

Synthesis of Care cascade gaps

By integrating the evidence from these three equity lenses, we present Figure 1 as a conceptual synthesis of where effective coverage may 'leak' across the TNBC care continuum in Australia. The cascade was constructed in three steps: first, we defined sequential stages spanning symptom recognition, diagnostic work-up, referral, treatment initiation, treatment completion, and benefit realisation; second, we identified barriers supported by the cited evidence within each equity lens; and third, we mapped each barrier to the stage(s) at which it plausibly generates attrition, aligned to the UHC cube dimensions. This is not an empirical cascade model with estimated transition probabilities; rather, it is an analytic framework designed to make structural inequities and attrition points explicit for policy interpretation.. This cascade is presented as a structured conceptual synthesis grounded in empirical evidence on Australian and international cancer-care barriers (e.g. financial toxicity, housing instability, geographic access constraints), rather than as a quantified TNBC-specific pathway model. We use the cascade to make explicit where 'effective coverage' may leak, while noting that TNBC-specific Australian cascade attrition (by equity strata) requires dedicated linkage and reporting infrastructure. While the UHC cube defines the theoretical dimensions of coverage, the care cascade illustrates the 'real-world' leakage from the system through an analytical framework. This synthesis identifies the sequential stages where systemic and individual barriers from inequitable screening and geographic isolation to financial toxicity, housing instability intersect to drive patient non-adherence, diagnostic delay and poor treatment outcome.[18] From the policy perspective, the cascade reveals that the financial protection height of the UHC cube is insufficient if the service delivery infrastructure does not account for the social realities of the population coverage dimension. These gaps provide the evidentiary basis for the targeted policy reforms required to ensure equitable immunotherapy access.

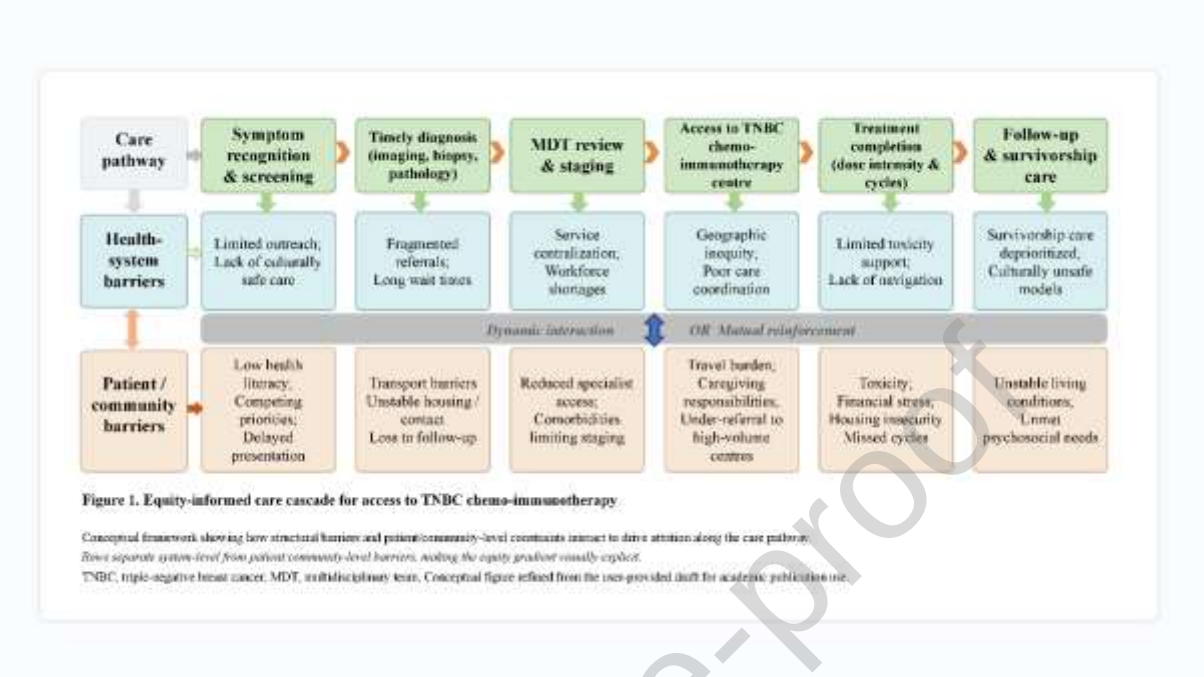

Figure 1. Equity-informed care cascade for access to TNBC chemo-immunotherapy

Conceptual framework showing how structural barriers and patient/community-level constraints interact to drive attrition along the care pathway. *Rows separate system-level from patient/community-level barriers, making the equity gradient visually explicit.* TNBC, triple-negative breast cancer; MDT, multidisciplinary team. Conceptual figure refined from the user-provided draft for academic publication use.

Policy recommendations for structural equity

To achieve equitable TNBC immunotherapy outcomes, three strategic reforms are key to driving a paradigm shift toward structural equity in Australia. First, for the population dimension (depth), national cancer registries must mandate stratified social determinant (Indigenous status, geographic remoteness, and housing stability) data collection, leveraging existing investment in the National Cancer Data Framework (2025) to identify care gaps.[18, 19] Second, for the service dimension (breadth), reallocated "Closing the Gap" funds should prioritize Aboriginal and TSI patient navigators to ensure culturally safe adherence, alongside shared-care models to bridge rural geographic service gaps.[9] Finally, for the financial protection dimension (height), policy-makers must implement mandatory financial toxicity screening at treatment initiation, streamlining access to safety nets like the Patient Assisted

Travel Schemes (PATS); this should include emergency housing subsidies for patients experiencing housing instability to prevent costs-driving treatment discontinuation.[12,14]

Conclusion

Australia has made substantial progress in reducing the direct financial barriers to modern TNBC therapies through public subsidies. However, TNBC demonstrates that universal coverage alone is insufficient to achieve equitable cancer outcomes. Persistent disparities driven by Indigeneity, socioeconomic disadvantage, and housing insecurity continue to squeeze the population breadth of who truly benefits from therapeutic innovation.

In the treatment and management of TNBC, equity must be treated as a core clinical and policy objective rather than an ancillary social concern. By using the UHC cube as an analytical lens, we see that the true measure of a universal system is the effective coverage of its most vulnerable citizens with equity. TNBC offers a timely opportunity for Australia to translate the principle of universal care into equitable outcomes, using health equity, not access alone, as the primary metric of success.

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Highlights

- Australian TNBC care is impacted by systemic and individual structural barriers.
- A care cascade framework identifies significant gaps in cancer care journey.
- Inequities in immunotherapy access persist for rural and Indigenous women.
- Social determinant data collection is vital to map and bridge cancer care gaps.
- Structural reforms in financial and cultural safety are key to equitable TNBC care.

Declaration of interests

☒ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☐ The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: