

Does affirmative action reduce disparities in healthcare use by Indigenous peoples? Evidence from Australia's Indigenous Practice Incentives Program

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Abstract

Globally, Indigenous populations experience poorer health but use less primary healthcare than their non-Indigenous counterparts. In 2010, the Australian government introduced a targeted reform aimed at reducing these disparities. The reform reduced, or abolished prescription medicine co-payments and provided financial incentives for GPs to better manage chronic disease care for Indigenous peoples. Exploiting the framework of a natural experiment, we investigate how the reform affected these health disparities in primary and specialist healthcare utilization using longitudinal administrative data from 75,826 Australians, including 1896 Indigenous peoples, with cardiovascular disease. The differences-in-differences estimates indicate that the reform increased primary healthcare use among Indigenous peoples, including 12.9% more prescription medicines, 6.6% more GP services, and 34.0% more chronic disease services, but also reduced specialist attendances by 11.8%. Increases in primary care were larger for those who received the largest co-payment relief and lived in metropolitan regions, whereas the reduction in specialist attendances was concentrated among lower income Indigenous patients. Affirmative action can reduce inequalities in Indigenous use of primary healthcare, albeit careful design is required to ensure that benefits are equitable and do not lead to substitution away from valuable, or necessary, care.

KEYWORDS

cardiovascular disease, co-payment, cost-sharing, healthcare, incentives, Indigenous, price

JEL CLASSIFICATION

J18, I14, I18

1 | INTRODUCTION

Worldwide, there are an estimated 370–500 million Indigenous peoples living across more than 90 countries (Hall & Patrinos, 2012; United Nations, 2009). With a life expectancy of up to 22 years less than their non-Indigenous counterparts,

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a significant proportion of these Indigenous populations experience poorer health, including an increased prevalence of both acute and chronic conditions (Anderson et al., 2016; King et al., 2009; Marrone, 2007; Ring & Brown, 2003). Indigenous peoples also experience unique barriers to engaging with mainstream healthcare and use less preventative healthcare than their non-Indigenous counterparts (Marrone, 2007). In addition to experiences of discrimination and racism, including in the healthcare setting (Allan & Smylie, 2015; Kitching et al., 2020), intergenerational trauma associated with colonial history and past injustices have led to a lack of trust of, and a reluctance to engage with, mainstream healthcare (Ellison-Loschmann & Pearce, 2006). Indigenous peoples are more likely to be geographically isolated, socioeconomically disadvantaged, and speak languages distinct from the official language/s of the countries in which they reside (Jatrana et al., 2011; Marrone, 2007; United Nations, 2009). Consequently, the costs associated with accessing care, which may not be culturally inclusive, can discourage timely and appropriate utilization of healthcare among Indigenous peoples.

Numerous initiatives have been implemented to try and close the gap in health and healthcare use among Indigenous peoples (The General Assembly, 2015). These include provision of Indigenous-led healthcare services, cultural awareness training, and embedding more Indigenous health workers into mainstream practice (AIHW, 2020a; Allen et al., 2020; Anonson et al., 2008; Cromer et al., 2019; Downing & Kowal, 2011; Ratima et al., 2007). Other policies have focused on broader barriers to healthcare access which have likely benefited specific Indigenous populations, such as policies targeting socioeconomic disadvantage or geographic isolation (Essien et al., 2021; Korda et al., 2009; Kruse et al., 2016; Rosenbaum, 2002; Schaafsma et al., 2007). While studies have highlighted the potential for multifaceted approaches to improve Indigenous healthcare use, data and sample size limitations have hindered robust evaluation (Anstey et al., 2011; Gibson & Segal, 2015; Shepherd, 2019). Understanding the causal effects of interventions among Indigenous populations remains vital given persistent global disparities in Indigenous health and the unique barriers these populations face in accessing mainstream healthcare.

To contribute to this evidence base, here we explore the impact of a targeted reform which aimed to improve chronic disease healthcare use among the Indigenous populations of Australia; Aboriginal and Torres Strait Islander peoples. The reform, “the Indigenous Practice Health Incentive Program” (IPIP), was introduced in May 2010, and comprised (a) a reduction, or abolishment, of prescription medicine co-payments for Indigenous peoples living with, or at risk of developing, a chronic disease, and (b) the introduction of financial incentives for primary care practices to deliver and coordinate chronic disease in their Indigenous patients. Altogether, reduced patient cost-sharing and increased subsidization of primary care practice is expected to increase script use and chronic disease management in the primary care setting. This may, in turn, reduce the use of relatively more costly specialist services, due to substitution away from, or reduced need for, specialist services.

In this paper, we explore whether the reform was successful in closing the disparities in healthcare use among Indigenous populations. We focus on Indigenous peoples living with cardiovascular disease (CVD)—a priority cohort that were likely to benefit from the program. Using longitudinal administrative data on healthcare utilization and death records from 75,826 Indigenous and non-Indigenous Australians that were first hospitalized with CVD in 2010, our identification approach exploits the framework of a natural experiment. Focusing on GP services, CVD scripts, chronic disease services, and specialist care services, we compare healthcare use among Indigenous peoples (treatment group) pre and post reform to non-Indigenous Australians (control group) over the same time period. We then explore reform dynamics and heterogeneous effects, including by the level of prescription medicine co-payment relief received, IPIP availability relative to each individual's first hospitalization, and rurality. Finally, as research indicates that engagement with primary care and medication adherence is critical in the immediate aftermath of a major CVD-related hospitalization¹ (Fors et al., 2015), we explore whether earlier versus later access to the IPIP, relative to each individual's first hospitalization, impacted subsequent hospitalizations and survival.

We find that the IPIP significantly increased primary healthcare use among Indigenous peoples, including a 13.7% increase in prescription medicines, 7.1% more GP services, and 36.6% more chronic disease healthcare services. The reform also saw a 12.6% reduction in the utilization of specialist services among Indigenous peoples, altogether suggesting that the increase in routine and preventative forms of healthcare may have led to substitution away from, or “offset” the need for, specialist services. The reform effects were realized predominantly in the second and subsequent years after its introduction, with the largest increase in primary healthcare observed among Indigenous peoples who lived in major cities. This suggests that access to the IPIP was lacking in the first year after it was introduced and that remote regions may have needed additional support to deliver the program. Indigenous patients who received the greatest co-payment relief had the greatest increase in scripts and primary healthcare services, whereas the reduction in specialist attendances was concentrated among lower income Indigenous patients. Indigenous patients' overall change in health expenditure was important for maintaining regular contact with GPs and linkage to follow-up chronic disease care. The larger reduction in specialist care among lower income Indigenous peoples further suggests that capacity to pay for specialist services was driving substitution rather than offsetting the need for such care. Finally, we show that after their first CVD hospitalization, Indigenous peoples with earlier access to the IPIP relative to their admission initially used more scripts and GP services than those with later access. This suggests that availability of IPIP at the time of

index hospitalization served as a trigger for registration with the IPIP and initial improvements in adherence to chronic disease primary care. However, this earlier access did not impact subsequent hospitalization nor overall survival.

These results demonstrate that targeted initiatives can close gaps in primary care utilization among Indigenous peoples. Our findings are generally consistent with the broader literature on the effects of financial incentives and cost-sharing in healthcare (Card et al., 2008; Chalkley & Listl, 2018; Feng et al., 2020; Liu et al., 2009; Scott et al., 2008; Shigeoka, 2014; Thavam, 2019) and that, in particular, reducing script co-payments can increase doctor visits (Winkelmann, 2004). However, distorting the relative price of different forms of care (doctor vs. specialists) may also have unintended health consequences.

Our finding that hospitalization and survival among Indigenous peoples were not affected by earlier versus later access to the reform relative to an individual's first hospitalization, is contrary to previous research that shows improved management of CVD and other chronic disease with prescription medication can reduce adverse events (Afendulis et al., 2011; Goldman et al., 2007). However, this may stem from the Indigenous peoples in our sample experiencing a maximum “delay” of 4 months from their first hospitalization to IPIP availability. This lag may be insufficient to effectively translate into changes in long-term outcomes. Another potential explanation is that substitution away from specialist care may result in unintended health consequences. Subsequently, more work is required to understand whether these broader improvements in primary care led to substantive changes in acute care utilization and health outcomes among Indigenous peoples. Nevertheless, our findings indicate that this targeted policy achieved its objective to improve Indigenous peoples' use of chronic disease care in the primary setting, albeit with some groups benefiting more than others. Future iterations and similar policies should consider how benefits can be realized efficiently and equitably among targeted populations.

2 | INSTITUTIONAL SETTING AND POLICY CONTEXT

2.1 | Healthcare in Australia

All Australian citizens and permanent residents are entitled to free or subsidized healthcare under Australia's universal health insurance scheme, Medicare. Medicare subsidizes private inpatient services, out-of-hospital medical services, and prescription medicines to varying degrees (Krassnitzer, 2020; Van Doorslaer et al., 2008) and fully covers all costs for public patients admitted to public hospitals, with funding being a shared responsibility between State/Territory and Commonwealth governments (Krassnitzer, 2020). Out-of-hospital medical services are provided by medical practitioners on a fee-for-service basis, whereby all service providers can set their own fees (Van Doorslaer et al., 2008). Individuals incur out-of-pocket costs for services if service providers charge a fee above the government-stipulated Medicare benefit. If the medical provider accepts the Medicare benefit as the full fee, this service is said to be “bulk billed” and the patient incurs no out-of-pocket cost. Bulk billing rates are much lower among specialists than GPs and patients can incur significant out-of-pocket costs for specialist consultations (Freed & Allen, 2017). In 2010–11, the average out-of-pocket cost for a GP visit was AUD25.88 and 80.2% of visits were bulk billed, whereas for a specialist attendance, patients incurred on average AUD49.56 out-of-pocket and only 27.2% of attendances were bulk billed (Department of Health, 2020).² In the community, all individuals pay co-payments for prescription medicines, with lower fees for welfare recipients, aged pensioners, and low income earners (“concessional” patients). In 2010, the prescription medicine co-payment was AUD5.40 for concessional patients and AUD33.30 for general patients. Indigenous peoples living in remote areas are also able to access prescription medicines free of charge through Aboriginal and Torres Strait Islander Health Services (Services Australia, 2021).

2.2 | Indigenous health and healthcare use in Australia

Indigenous peoples represent approximately 3% of Australia's population, with 62% living in regional and remote areas (AIHW, 2020c). Relative to their non-Indigenous counterparts, Indigenous Australians have poorer self-reported health and wellbeing, a higher burden of chronic conditions and comorbidities, and an 8-year reduced life expectancy (AIHW, 2020b; Bramley et al., 2004; Hill et al., 2007). These disparities are even greater in remote areas (Rheault et al., 2021). The leading contributor to this life expectancy and morbidity gap is CVD, which encompasses a broad range of cardiovascular pathologies including acute myocardial infarction, angina pectoris, cerebrovascular disease, hypertension, and congestive heart failure (AIHW, 2020b; Agostino et al., 2020; Reath & O'Mara, 2018).

Despite experiencing poorer health, Indigenous peoples use less out-of-hospital healthcare services and prescription medicines than non-Indigenous Australians (AIHW, 2013a; Canuto et al., 2018; Hayman, 2011; Snowdon, 2010). Additionally,

Indigenous Australians are hospitalized at much higher rates for CVD and other chronic conditions and potentially preventable conditions (conditions which could have been prevented through timely and appropriate provision of out-of-hospital care) (AHMAC, 2011; AIHW, 2014b; Calabria et al., 2018; Harrold et al., 2014). Hospitalization rates are even higher for Indigenous peoples living in remote areas (AIHW, 2014a).

Structural and cultural barriers go some way in explaining these disparities. With 10% of the Indigenous population reporting they do not speak English well or at all (ABS, 2011a; Amery, 2017). Indigenous peoples can experience difficulties accessing mainstream services which are primarily delivered in English. Injustices stemming from colonialism and ongoing racial discrimination further affect quality and accessibility of mainstream healthcare among Indigenous peoples (AIHW, 2013b; Bastos et al., 2018). These challenges are compounded by disparate supply of culturally safe and diverse care (AIHW, 2020a).

As well as being a geographically disparate population, Indigenous Australians also experience disproportionate levels of poverty and socioeconomic disadvantage (Hayman, 2011). The cost, in terms of both the price and time required, to access different types of healthcare is therefore an important consideration. For example, treatment in public hospitals is free for public patients, whereas out-of-pocket costs for prescription medicines and non bulk billed healthcare, particularly specialist services, pose a significant barrier to their use (COAG, 2007; Mitrou et al., 2014; Yusuf & Leeder, 2019). The financial burden associated with medication adherence is even greater for Indigenous peoples living with chronic conditions, which commonly require ongoing, multiple and frequent (near-everyday) use of medications (Whitty et al., 2014). There are also more costs associated with accessing care for Indigenous peoples living in more rural areas with lower healthcare supply (AIHW, 2014a; Callander et al., 2019; Rankin et al., 2001).

2.3 | The Indigenous Practice Health Incentives Program

In May 2010, the Australian government introduced the IPIP with the aim of improving chronic disease management in the primary care setting for Indigenous Australians living with, or at risk of developing, a chronic disease (a disease that has been, or is likely to be, present for at least 6 months) (Bailie et al., 2013; Couzos et al., 2011). The IPIP provided both a supply- and demand-side intervention by providing practices with financial incentives to deliver chronic disease care and reducing co-payments for prescription medicines under the Closing the Gap (CTG) PBS Co-payment Measure. Specifically, under this measure, prescription medicine co-payments were reduced to the concessional rate for general patients, from AUD33.30 to AUD5.40 (i.e., by 84%) whereas, concessional patients had their co-payments waived entirely, from AUD5.40 to AUD0.00 (i.e., by 100%). The CTG PBS Co-payment Measure started on July 1, 2010.

On top of standard fee-for-service payments, practices that registered for the IPIP were provided with additional funding if they met certain levels of care provision for registered Indigenous patients (Couzos & Delaney-Thiele, 2010). Each patient could only register with one practice under the condition that the practice was deemed to be their “usual care provider”; that is, provided, or was expected to provide, the majority of care to the patient in a given year. To be eligible, each practice needed to complete the following:

- a) register each Indigenous patient, with or at risk of developing a chronic condition, with the IPIP and provide an Indigenous-specific health assessment service;
- b) ensure registered Indigenous patients are followed up;
- c) undertake cultural awareness training within 12 months; and
- d) ensure all scripts are annotated under the CTG PBS Co-payment Measure so that registered patients can receive reduced prescription medicine co-payments (i.e., a “CTG script”).

For practices that delivered the IPIP, the incentive provided:

- a) AUD1,000 when practices agreed to participate in IPIP;
- b) AUD250 for each Indigenous Australian registered for chronic disease management per calendar year;
- c) outcomes-based payments for each registered patient that reaches a certain level of care in a given year (up to AUD250 per patient per year: AUD100 payment per patient that receives a chronic disease management plan and an additional payment of AUD150 if that practice provided the majority of care to that patient).

Although the IPIP was implemented at a national level from May 2010, there was variation in uptake by practices over time and across regions (Bailie et al., 2013). Importantly, the requirements for practices to deliver the IPIP were introduced 1 month

before the reform's introduction (i.e., April 1, 2010) and therefore some practices needed to complete cultural awareness training and establish systems to manage patient information and appropriate follow-up, before they could deliver the IPIP (Bailie et al., 2013; RACGP, 2010). To this end, larger practices with more administrative support were more likely to deliver the IPIP and practices in more remote areas were less likely to participate (Bailie et al., 2013; Kecmanovic & Hall, 2015; Trivedi et al., 2017).

Evaluation of the IPIP to date has relied upon evidence from a small number of studies. Trivedi and Kelaher (2020) showed that among Indigenous Australians aged 45 and over, those who received CTG scripts, relative to a matched sample that did not, increased their use of prescription medicines, particularly for scripts related to CVD and diabetes. Additionally, they showed that the increase in script use was greater for ordinary patients, who received the largest absolute reduction in prescription medication co-payments, than it was for concessional patients. One other study also showed that there were downward trends in hospitalization for chronic conditions, relative to other hospitalizations, in areas with higher levels of CTG script uptake (Trivedi et al., 2017). Although these studies provide important evidence, there remain challenges for causal interpretation. For example, unobservable selection issues into the program may bias results. Indigenous peoples who participated in the program might have had a poorer health trajectory, been more health literate or otherwise more engaged with the healthcare system than those who did not participate (Gibson et al., 2005; Rice & Matsuoka, 2004). Moreover, although those receiving CTG scripts attended practices delivering the IPIP, the other incentives for doctors to better manage Indigenous peoples' chronic disease could also have affected healthcare use. Thus, in addition to potential selection issues, using CTG script receipt as a proxy for IPIP registration could underestimate the overall impact of the IPIP, particularly on service use (e.g., if individuals registered but did not receive scripts).

Altogether, no studies have estimated the causal effect of the IPIP on broader disparities in Indigenous health and healthcare use. Here we aim to address this gap and explore how the reform affected disparities in healthcare utilization among a specific priority population; Indigenous peoples living with CVD. As CVD guidelines recommend frequent (near-everyday) use of multiple types of prescription medications, as well as increased engagement with primary care to prevent adverse CVD events (Abdullah et al., 2018; Idänpään-Heikkilä et al., 2006; Piepoli et al., 2017; Pittman et al., 2011; Scandinavian Simvastatin Survival Study Group, 1994; Schoenberger, 1980), the IPIP is likely to be particularly beneficial for this population. By exploiting differences in admission timing, we further contribute to the evidence base by estimating whether access to the IPIP at the time of an individual's first hospitalization affected subsequent acute care utilization and overall survival.

3 | POTENTIAL IMPLICATIONS FOR INDIGENOUS AUSTRALIANS WITH CVD

The reform could affect healthcare use and health among Indigenous Australians with CVD via several channels (Figure 1). At a high level, improved cultural safety and increased subsidization of care in the primary setting—via additional incentives to GPs and reduced script co-payments—is expected to increase utilization of primary care services among registered Indigenous patients. In turn, this increased engagement with primary care may lead to improved health outcomes and reduced need for, or substitution away from, relatively costly specialist care.

First, after practices register with the IPIP, it is anticipated that the mandated cultural awareness training would improve cultural safety for Indigenous peoples seeking primary healthcare. Previous literature has indicated that cultural inclusivity and diversity in healthcare delivery is important for enhanced engagement and improved health outcomes for culturally and linguistically diverse populations (Li, 2017; Davy et al., 2016; Govere & Govere, 2016; Hill et al., 2012). It follows that improvements in cultural inclusivity among IPIP practices could lead to similar improvements in outcomes among Indigenous peoples.

Consistent with the substantive body of literature demonstrating the link between cost-sharing and demand for healthcare (Atella et al., 2006; Becker, 2018; Finkelstein, 2007; Winkelmann, 2004), reducing prescription medication co-payments is expected to increase script use. As GPs serve as gatekeepers for scripts in Australia, increased demand for prescription medicines may encourage registered patients to see their GP more often. Improved adherence to CVD-related medications is subsequently expected to improve outcomes by reducing CVD risk factors (e.g., through moderating high blood pressure or high cholesterol/sugar levels) and reduces adverse CVD events (Ho et al., 2006; Mihaylova et al., 2012).

Again, in line with previous research on healthcare providers changing their service provision in response to financial incentives (Chalkley & Listl, 2018; Liu et al., 2009; Scott et al., 2008; Thavam, 2019), GPs at practices registered with the IPIP are expected to increase their provision of chronic disease services to eligible patients. Beyond standard GP consultations, health assessments and chronic disease management plans aim to provide patients with advice and information about self-management and lifestyle moderating strategies. In particular, for CVD patients, guidelines recommend that patients are consulted through primary care about lifestyle factors (smoking, diet, physical activity) and self-management strategies (Smith et al., 2011). This may lead patients to have improved health literacy and help them to better manage their condition.

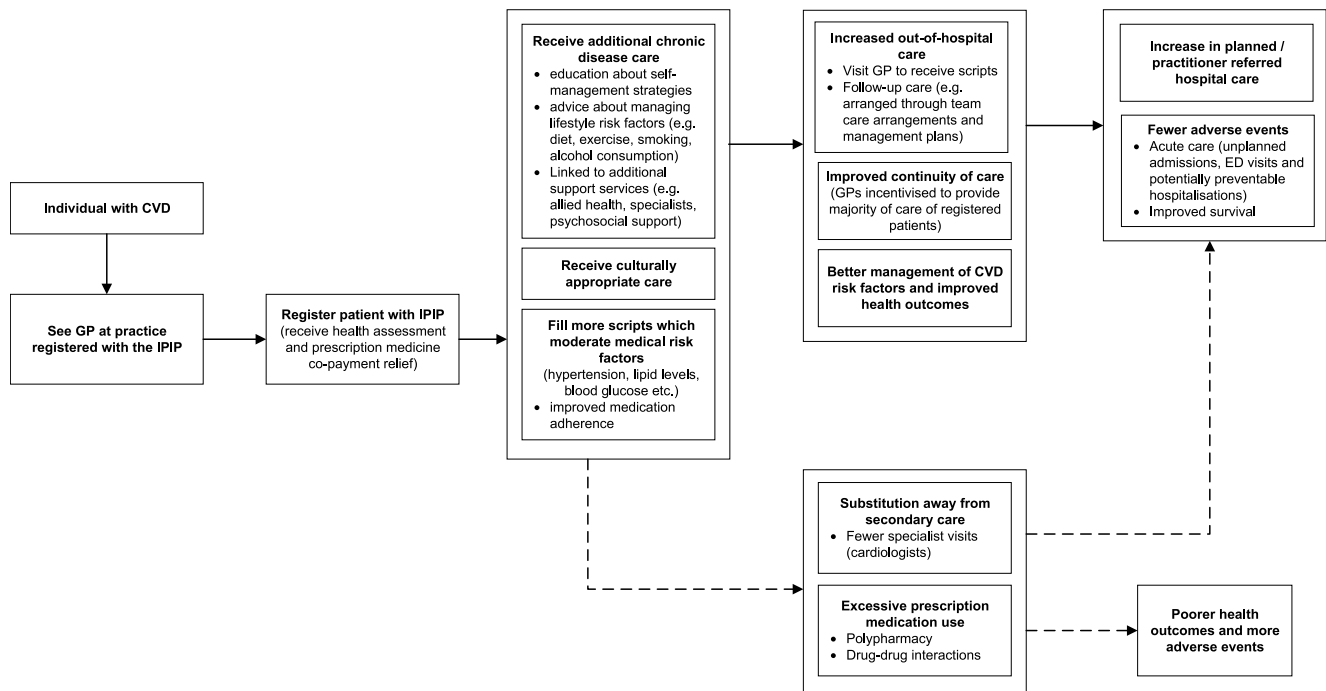


FIGURE 1 Potential mechanisms through which the IPIP could influence healthcare utilization and health outcomes in Indigenous peoples with CVD. CVD, cardiovascular disease; IPIP, Indigenous Practice Health Incentive Program.

The IPIP incentive structure also encourages GPs to coordinate follow-up services and promote continuity of care. If the GP considers that secondary care is needed, we may see an increase in specialist attendances, including cardiologist appointments. However, as specialist care services are generally associated with high out-of-pocket costs, increased subsidization of chronic disease care in the primary care setting might induce GPs and their patients—particularly socioeconomically disadvantaged patients—to substitute away from these more costly specialist services. Alternatively, if enhanced primary care, including medication adherence, leads to better management of CVD, the IPIP may actually reduce the need for additional specialist care.

There is also the potential for unintended consequences, such as drug-related side effects and harmful “Drug-Drug Interactions,” if reduced prescription medication costs lead to inappropriate drug use or polypharmacy (prolonged use of five or more medications) (Abolbashari et al., 2017; Degenhardt et al., 2019; Volpe et al., 2010). This may be a particular issue for CVD patients with comorbidities. However, we expect that improved chronic disease literacy and disease management may, to an extent, moderate these outcomes.

Altogether, improved prescription medicine adherence combined with improved health literacy and other preventative care, is expected to lead to improved health outcomes and positive flow-on effects for acute care utilization in Indigenous Australians with CVD. For example, reduced patient cost-sharing has led to improvements in self-reported health (Courtemanche & Zapata, 2014; Finkelstein et al., 2012) and survival (Card et al., 2009; Myerson et al., 2020). Similarly, reduced subsidization of primary care has been shown to be offset by more adverse events (emergency department [ED] visits, hospitalizations, mortality) (Chandra et al., 2010; Tamblyn et al., 2001; Trivedi et al., 2010). If these effects translate for Indigenous peoples, those registered with the IPIP might also experience fewer adverse events.

4 | DATA

4.1 | The Queensland Cardiovascular Data Linkage

The Queensland Cardiovascular Data Linkage (QCard) is a series of linked longitudinal administrative datasets which includes information on government subsidized medical services and prescription medicines, hospitalizations (hospital admissions and ED visits), and death records for all individuals that were admitted to a Queensland hospital for a CVD event in 2010 ($n = 135,386$). The dataset has been described in more detail elsewhere (Afoakwah et al., 2020; Byrnes et al., 2020). In QCard, information on government subsidized medical services and prescription medicines is provided through Medicare records (via

Medicare Benefits Schedule [MBS] and Pharmaceutical Benefits Scheme [PBS] datasets, respectively) and runs from January 1, 2004 to December 31, 2015. In order to understand how the policy affected utilization of preventative healthcare and primary care services pertaining to chronic disease management, we explore changes in utilization of GP services and chronic disease services.³ Additionally, we explore prescription medication changes within the Anatomical Therapeutic Chemical (ATC) classes pertaining to “cardiovascular system” and “blood and blood forming organs.” The PBS data also includes information on patient category for co-payment (i.e., ordinary, concessional) and whether a script was dispensed under the Closing the Gap Co-Payment Measure; that is, a “CTG script.” As only practices registered with the IPIP could provide CTG scripts (Baillie et al., 2013), this measure can serve as a proxy for when individuals attended an IPIP practice.⁴ Finally, we explore whether the reform led to changes in secondary care by looking at changes in specialist services (which includes cardiologist appointments). Information on all hospital admissions (both public and private admissions) and ED visits is available subsequent from each individual's first CVD admission in 2010 and runs between January 1, 2010 to December 31, 2015. CVD hospitalization are classified based on the International Statistical Classification of Diseases and Related Health Problems 10th Revision Australian Modification (ICD10-AM) codes I00-I99 (Joshy et al., 2015). QCard also records whether the individual had been admitted for a CVD-related hospitalization prior to 2010 (date of prior event), although further information on hospitalization prior to 2010, including event type, is not provided. Admissions data includes information on the primary reason for admission, the mode of referral (e.g., via ED, medical practitioner, outpatient etc.), whether the individual was in the intensive care unit (ICU), their length of stay, and basic sociodemographic details (e.g., age, sex, residential postcode at time of admission). Death records include exact date, and cause of, death through until December 31, 2015. To explore the role of regional characteristics, we additionally link in information on rurality and socioeconomic resources at the “Statistical Area 4 (SA4 level)” to each individual's location at index admission. SA4 regions represent labor market regions and generally contain between 100,000 to 500,000 residents (ABS, 2011b, 2011c, 2013).

In our main analysis, we exclude 59,560 individuals with a prior CVD admission (including those who were admitted before 2010 but were still hospitalized in 2010). In this way, we are able to minimize left-censoring bias (Cain et al., 2011) and control for factors which would likely influence healthcare use, such as CVD event type and time relative to each admission.⁵ The final sample includes 75,826 Australians, including 1896 Indigenous peoples, who had their first CVD admission (hereafter, “index admission”) in 2010. This data provides a unique opportunity to analyze the impact of the reform as all Indigenous Australians in the sample were eligible to participate in the IPIP; that is, they definitively had, or were at risk of developing, a chronic disease.

4.2 | Descriptive statistics

The average monthly use of GP services and scripts for Indigenous and non-Indigenous Australians pre and post reform is presented in Figure 2. Prior to the reform in May 2010, Indigenous Australians used fewer GP services and scripts than their non-Indigenous counterparts. Indigenous Australians also received similar levels of chronic disease services but fewer specialist services pre reform (Appendix A.3). Importantly, notwithstanding seasonal fluctuations across both groups over time, the differences in utilization between non-Indigenous and Indigenous Australians appears to be relatively stable in the lead up to the IPIP introduction.

Following the introduction of the IPIP, Indigenous peoples' utilization of GP services, chronic disease services, and prescription medicines all increased and the gap between Indigenous and non-Indigenous Australians reduced. However, the gap in specialist services appeared to increase slightly post reform. Altogether, these graphs suggest that the reform did indeed improve utilization of primary healthcare among Indigenous Australians.

Descriptive statistics for Indigenous and non-Indigenous Australians at their index admission pre and post the introduction of the IPIP is provided in Table 1. Relative to non-Indigenous Australians, Indigenous Australians were younger and more likely to be concessional patients and live in regions with higher levels of remoteness and disadvantage. Indigenous Australians were also more likely to have been referred via ED or admitted to ICU, potentially indicating more severe conditions at their index admission. With the exception of hypertension events, which were more common in those admitted earlier in the year, CVD events were similar for those admitted pre and post reform.

In those admitted post reform, only 4.4% of Indigenous Australians were already enrolled into the IPIP at the time of their index admission. After their admission, Indigenous Australians admitted post reform were more likely to attend a practice delivering the IPIP (in the follow-up observation period), and were quicker to receive CTG scripts, relative to Indigenous Australians who were admitted pre reform (Figure 3). This suggests that the admission itself may have served as a trigger for engaging with the healthcare system. Those who had access to the IPIP at the time of their admission (i.e., admitted post reform) were faster to register with the IPIP. These findings are intuitive relative to the timing of each person's first hospitaliza-

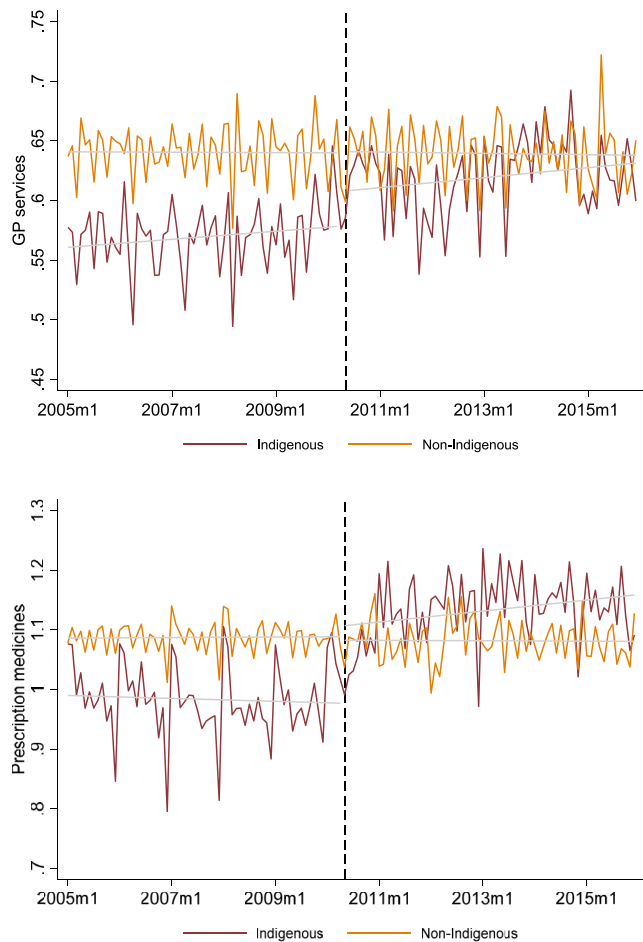


FIGURE 2 Average use of GP services and prescription medicines by Indigenous and non-Indigenous Australians over time. Fitted trend lines for Indigenous and non-Indigenous pre and post IPPI start date shown in gray. Dashed line represents IPPI start date, May 1, 2010. Average out-of-hospital services used and scripts filled per month adjusted for time relative to index admission (in months), fixed effects for Indigenous peoples 6 months before and after admission, month fixed effects, age and its square, CVD event (hypertension, acute myocardial infarction, hypotension, hemorrhoids, angina pectoris, atrial fibrillation, heart failure, chronic ischemic heart disease, phlebitis and thrombosis, paroxysmal tachycardia, cerebral infarction, pulmonary embolism, other cardiac arrhythmia, CVD complications, atherosclerosis, cardiac arrest, and all other CVD events), and patient category (concessional, ordinary) at index admission. Individuals who die in any given month are censored. CVD, cardiovascular disease; IPPI, Indigenous Practice Incentives Program. [Colour figure can be viewed at wileyonlinelibrary.com]

tion; that is, an Indigenous person who was first hospitalized in January 2010 would not have access to the IPPI until 4 months later in May 2010.

Earlier access to the IPPI relative to admission also appears to have affected initial uptake of primary care. The average utilization of primary healthcare for Indigenous and non-Indigenous Australians admitted pre and post reform (Figure 4), indicates that Indigenous peoples admitted post (i.e., with earlier access) had initially higher utilization of GP services and prescription medicines than those admitted pre reform (i.e., with delayed access). At around 2 years post reform, Indigenous peoples admitted pre reform start achieving similar levels of GP services and scripts. Further, Indigenous peoples with earlier access appear to have slightly higher utilization of chronic disease services but fewer specialist services than those with delayed access (Appendix A.4). Altogether, this suggests that Indigenous peoples who had access to the IPPI at time of admission were initially quicker to be registered and receive additional primary care which potentially led to a substitution away from specialist services.

5 | EMPIRICAL STRATEGY

5.1 | Out-of-hospital medical services and prescription medicines

The data on out-of-hospital medical services and prescription medicines is available from January 1, 2004 to December 31, 2015, with all individuals experiencing their index admission in 2010. This allows us to investigate the difference in utilization of these outcomes between Indigenous and non-Indigenous Australians over long time periods, both before and after their index admission and pre and post reform.

A key consideration in estimating the effect of the reform is the possibility of unobserved confounders in those who enrolled into the IPPI versus those who did not. For example, compared to Indigenous peoples who did not register with the IPPI, those who registered may have been sicker, or otherwise possess factors which made them more likely to register, such as social connectedness or greater engagement with the healthcare system (Gibson et al., 2005; Rice & Matsuoka, 2004). We also

TABLE 1 Descriptive statistics for Indigenous and non-Indigenous Australians admitted pre and post IPIP

	Non-Indigenous admit pre reform (<i>n</i> = 24,211)	Non-Indigenous admit post reform (<i>n</i> = 49,719)	Indigenous admit pre reform (<i>n</i> = 658)	Indigenous admit post reform (<i>n</i> = 1238)
	Median (SD)/ proportion	Median (SD)/ proportion	Median (SD)/ proportion	Median (SD)/ proportion
Individual level characteristics^a				
Age	63.00 (16.62)	63.00 (16.79)	50.00 (15.88)	49.00 (16.55)
Female	0.48	0.48	0.53	0.51
Concession card holder	0.50	0.48	0.60	0.55
Referral type at index admission				
Practitioner referred	0.54	0.54	0.28	0.29
ED	0.39	0.40	0.60	0.61
Other	0.07	0.06	0.12	0.10
Admitted to ICU	0.08	0.08	0.13	0.12
CVD event^b				
Hypertension	0.17	0.12	0.34	0.21
Acute myocardial infarction	0.10	0.11	0.11	0.15
Hypotension	0.07	0.07	0.09	0.10
Haemorrhoids	0.23	0.26	0.08	0.12
Angina pectoris	0.06	0.06	0.08	0.09
Atrial fibrillation	0.08	0.08	0.05	0.05
Heart failure	0.02	0.03	0.03	0.04
Chronic ischemic heart disease	0.04	0.05	0.04	0.03
Phlebitis and thrombosis	0.02	0.02	0.02	0.02
Paroxysmal tachycardia	0.02	0.02	0.02	0.01
Other CVD event	0.18	0.18	0.16	0.18
Regional level characteristics^a				
Remoteness area				
Major cities	0.61	0.61	0.27	0.28
Regional	0.38	0.37	0.55	0.54
Remote	0.02	0.02	0.18	0.19
Average quintile disadvantage ^c	3.00 (1.33)	3.00 (1.33)	2.00 (1.29)	2.00 (1.24)
CTG script receipt^d				
Received first CTG script before admission	N/A	N/A	N/A	0.04
Received first CTG script within 1 year after admission	N/A	N/A	0.17	0.25
Received first CTG script within 5 years after admission	N/A	N/A	0.51	0.54
Time from admission to receiving first CTG script (among observed CTG script recipients) within 1 year after admission	N/A	N/A	220 (64)	76 (119)
Time from admission to receiving first CTG script (among observed CTG script recipients) within 5 years after admission	N/A	N/A	575 (494)	417 (57)

Abbreviations: CTG, Closing the Gap; CVD, cardiovascular disease.

^aAll individual level and regional level characteristics reported are based on information at index admission in 2010.

^bCVD events are classified based on the International Statistical Classification of Diseases and Related Health Problems 10th Revision Australian Modification (ICD10-AM) codes I00-I99 (Joshy et al., 2015). All "other CVD events" have been aggregated due to small sample sizes and include, but are not limited to, cerebral infarction, pulmonary embolism, other cardiac arrhythmia, CVD complications, atherosclerosis, and cardiac arrest.

^cAreas in the lowest quintiles have higher levels of disadvantage. Socioeconomic resource status of the region sourced from Australian Bureau of Statistics (ABS, 2011d).

^dData runs from January 1, 2010 through until December 31, 2015, with outcomes specified relative to each individual's index admission in 2010. CTG = "Closing the Gap." First CTG script is the first CVD script received with a reduced co-payment after reform introduction.

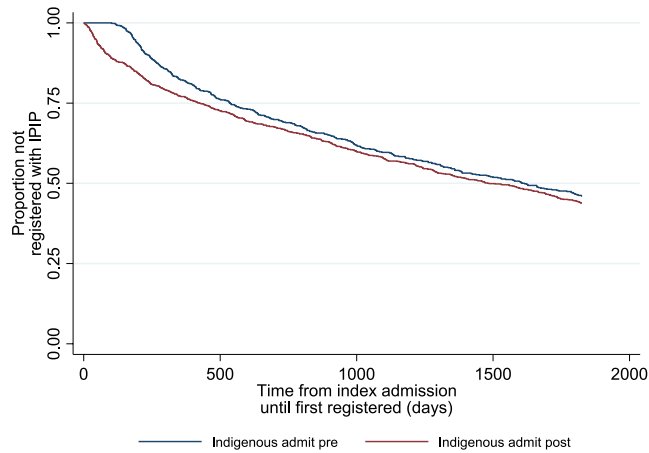


FIGURE 3 Time from index admission until receipt of first CTG script for Indigenous peoples admitted pre and post reform (May 1, 2010). Individuals are censored at their date of death while all other individuals are censored at 5 years after their index admission. As the graph depicts time from each individual's first admission in 2010, the maximum analysis window corresponds to January 1, 2010 to December 31, 2015. CTG, Closing the Gap. IPIP, Indigenous Practice Incentives Program. [Colour figure can be viewed at wileyonlinelibrary.com]

observe that, prior to the reform, Indigenous peoples who received a CTG script used more out-of-hospital healthcare services and scripts relative to Indigenous peoples who never received a CTG script (Appendix A.5). These differences in observable characteristics infer that IPIP participants may differ in other unobservable characteristics. Further, we observe that the gap in out-of-hospital healthcare and script use between those who ever received a CTG script and those who did not was already growing larger in the 2 years before IPIP was introduced (Appendix A.6), suggesting that, at the time of the reform, differences in healthcare need between the two groups (which could be affected by unobserved individual characteristics), likely played a role in selecting into the program. Aside from these selection issues, as aforementioned, it is possible that using “CTG script receipt” as a proxy for IPIP registration could underestimate IPIP's impact, particularly if individuals registered but were not receiving scripts or, in our case, received scripts that were not CVD-related. Altogether, this suggests that estimating the impact of the IPIP with a model comparing outcomes among Indigenous peoples who did and did not ever receive a CTG script (that is, the average treatment effect on the treated [ATT]) would liberate biased results.⁶

In order to address these challenges, we therefore apply a difference-in-differences (DiD) design which compares the outcomes of Indigenous peoples pre and post the policy to non-Indigenous Australians over the same time period. This approach is also desirable as it allows us to determine whether the reform was—by its own definition—successful in “closing the gap” in healthcare use between Indigenous peoples and non-Indigenous Australians.

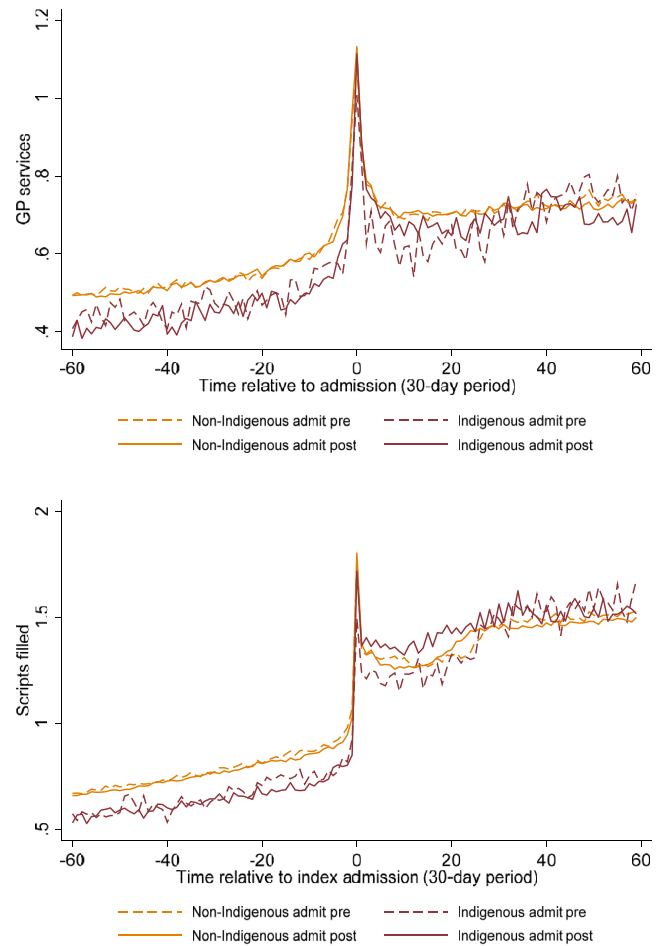
Using OLS regression analysis, we estimate how healthcare use changes among Indigenous peoples pre and post reform to non-Indigenous Australians over the same time period. Specifically, we estimate changes in outcomes for 5 years before and after each individual's index admission (corresponding to January 1, 2005 to December 31, 2015; 4.33 and 5.66 years pre and post IPIP respectively). The model is defined as:

$$y_{it} = \beta_0 + \beta_1 I_i + \beta_2 D_t + \beta_3 (I_i \times D_t) + \beta_4 X_i + \lambda_{r(i,t)} + \rho_t + \beta_5 (I_i \times b_t) + \beta_6 (I_i \times a_t) + \tau_t + m_t + \varepsilon_{it} \quad (1)$$

where y_{it} represents the outcome for person i in period t (30-day period relative to index admission); I_i is an indicator variable for whether the person is Indigenous and captures the “baseline” differences in healthcare use between Indigenous and non-Indigenous Australians; D_t represents the proportion of the observation period that was post reform. We also control for a rich set of observable characteristics. These include a vector of individual level characteristics recorded at time of index admission (X_i), which includes age and its square, patient category (ordinary or concessional), sex, CVD event type (hypertension, acute myocardial infarction, hypotension, hemorrhoids, angina pectoris, atrial fibrillation, heart failure, chronic ischemic heart disease, phlebitis and thrombosis, paroxysmal tachycardia, cerebral infarction, pulmonary embolism, other cardiac arrhythmia, CVD complications, atherosclerosis, cardiac arrest, and all other CVD events), whether the individual was in ICU and whether they were admitted via ED. In order to estimate the effect of the reform relative to time of admission, we include a vector of time fixed effects, ρ_t , which includes every 30-day period relative to each individuals' index admission between 2005 and 2015. In addition, to capture changes over calendar time we also allow for a linear monthly trend in calendar time (τ_t) and capture seasonal variation with dummies variables for each month (m_t). By including these variables, the model controls for both time relative to index admission and calendar time. Lastly, we control for a vector of region fixed effects (at the SA4 level) based on patient location at time of admission (λ_r). The main coefficient of interest, β_3 , estimates the effect of the policy on healthcare use among all Indigenous peoples; including those who were and were not registered with the IPIP (that is, the Intention to Treat [ITT] effect).

A key threat to this identification approach is the potential for Indigenous and non-Indigenous Australians to have a differential response, in terms of healthcare use, relative to their CVD admission. For example, higher income Australians are more

FIGURE 4 Average use of GP services (top) and scripts (bottom) by Indigenous and non-Indigenous Australians admitted pre or post the IPIP. Average GP services used and scripts filled per 30-day period adjusted for month fixed effects as well as age and its square, CVD event (hypertension, acute myocardial infarction, hypotension, hemorrhoids, angina pectoris, atrial fibrillation, heart failure, chronic ischemic heart disease, phlebitis and thrombosis, paroxysmal tachycardia, and all other CVD events), and patient category (concessional, ordinary) at index admission. Individuals who die in any given month are censored. CVD, cardiovascular disease; IPIP, Indigenous Practice Health Incentive Program. [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.com)]



likely to consult a specialist, rather than a GP, in response to a health shock (Van Doorslaer et al., 2008). This is particularly important in our set-up as individuals' index admission and the IPIP both occur in 2010. In Appendix A.4, we show that, relative to admission, trends in use among Indigenous and non-Indigenous Australians are very similar, however the use of specialist services and scripts rises more sharply among non-Indigenous Australians just before and after their index admission. To this end, we capture differential responses among Indigenous peoples in the 6 months before and after admission by including interactions of the Indigenous indicator variable with the dummy variables b_t and a_t which respectively indicate the 6 months before and after admission.⁷ Outcomes are conditional on survival and standard errors are robust clustered at the individual level.

A critical identification assumption for this DiD approach is that, in the absence of the reform, the difference in outcomes between Indigenous and non-Indigenous Australians would be constant over time. As we show in Figure 2, visually the difference in outcomes between Indigenous and non-Indigenous appear to evolve in parallel. We also formally test for pre-treatment differences in trends, including an associated power analysis (Roth, 2022), in Appendix A.9. The results indicate that there are not statistically significant differences in pre-treatment trends in outcomes between Indigenous and non-Indigenous Australians.

Our identification strategy depends on there being no other policy changes in our observation window that differentially affected our treatment or control groups. It should be noted that, since 2009, there have been ongoing efforts to increase the Indigenous healthcare workforce, as well as campaigns to reduce smoking rates among Indigenous peoples. In Appendix A.10, we comprehensively outline measures targeted to Indigenous peoples which were introduced during our observation window and discuss why these measures were unlikely to have affected our estimates. In the instance that these measures could have impacted treatment and control group differently in our timeframes, we also estimate the changes in outcomes for a subgroup of Indigenous Australians that had less access to the IPIP; namely, those living in remote locations. In these regions we would anticipate little to no reform effects as practices in more remote parts of the country were less likely to deliver the IPIP (Baillie et al., 2013; Kecmanovic & Hall, 2015; Trivedi et al., 2017). We also allow for differential time trends by Indigenous status to capture differences in approximately linear increases in the rollouts in Indigenous healthcare workforce.

Subsequent to these analyses, we conduct multiple robustness checks. First, to test whether omitted variables or other unobserved differences between Indigenous and non-Indigenous Australians are biasing our results, we re-estimate model 1 when

including individual fixed effects. We then estimate a GLM with an identity link to account for the non-negative skewed distributions of our outcome variables; tighten the window of analysis to 2 years before and after IPIP's introduction (i.e., between 2008 and 2012) to isolate the immediate policy effects; and following the approach by Zeldow and Hatfield (2021), test whether time invariant covariates are spuriously confounding our DiD estimates. Finally, given the importance of geographic location, we test the robustness of our results to specifying smaller area-level "postcode" fixed effects.

5.2 | Dynamics and heterogeneity

Following our main estimation and robustness checks, we estimate whether the reform effects varied over time and across different subgroups. As aforementioned, we explore how the effects varied by rurality (i.e., major cities, regional, and remote). Then, in order to estimate how the reform effects varied post introduction, we estimate how utilization among Indigenous Australians varied in each year post reform, for up to 5 years. Next, we explore differences by patient characteristics. First, we explore whether the effects differed by whether individuals were admitted to ICU at their index admission, with the intuition being that these patients had more severe CVD. It is possible that patients with more severe conditions already use more healthcare than those with less severe conditions and therefore may be more likely to register with the IPIP. However, if they are already using higher levels of care, their relative change in use might be less impacted by the IPIP. Indeed, previous research has indicated that those with less severe medical conditions are more sensitive to price changes (Huang & Gan, 2017). We then explore whether outcomes relative to admission date varied depending on whether individuals were admitted pre or post reform. Indigenous Australians admitted post reform had earlier access to the IPIP, relative to their admission, than those admitted pre reform. We therefore hypothesized that changes in out-of-hospital healthcare utilization among Indigenous Australians post reform might be larger for those admitted post reform versus those admitted pre reform. And finally, as the magnitude of the co-payment reduction for prescription medicines was significantly greater for ordinary patients (changing from AUD33.30 to AUD5.40) relative to concessional patients (changing from AUD5.40 to AUD0.00), it is possible the reform would have a differential impact on the mix and magnitude of healthcare used. We therefore investigate differences by patient category.

6 | RESULTS

The main estimation results are presented in Table 2. They show the impact of the IPIP on use of out-of-hospital healthcare services and prescription medicines among all Indigenous peoples; the ITT effect. The heterogeneous reform effects are presented in Figure 5. The full regression results are available in Appendix A.11.

TABLE 2 Regression analysis results for out-of-hospital medical services and prescription medicines

	GP services (per 30-day period)	Chronic disease services (per 30-day period)	Specialist attendances (per 30-day period)	Scripts filled (per 30-day period)
	β [95% CI]	β [95% CI]	β [95% CI]	β [95% CI]
Indigenous (β_1)	-0.041*** [-0.069; 0.023]	0.005*** [0.003; 0.007]	-0.019*** [-0.024; -0.014]	-0.066*** [-0.015; 0.147]
Post (β_2)	0.020*** [0.012; 0.028]	0.003*** [0.002; 0.005]	0.002 [-0.001; 0.005]	-0.012* [-0.022; -0.003]
Indigenous \times post (β_3)	0.046*** [0.022; 0.069]	0.032*** [0.027; 0.037]	-0.009** [-0.015; -0.003]	0.165*** [0.112; 0.218]
Mean of outcome Indigenous (after admission)	0.692	0.094	0.076	1.280
Mean of outcome Non-Indigenous (after admission)	0.721	0.061	0.147	1.379
No. individuals	75,084	75,084	75,084	75,084
No. person-period observations	8,502,635	8,502,635	8,502,635	8,502,635

Note: As per model 1. All regression analysis results control for described individual level controls (age and its square, sex, CVD event [hypertension, acute myocardial infarction, hypotension, hemorrhoids, angina pectoris, atrial fibrillation, heart failure, chronic ischemic heart disease, phlebitis and thrombosis, paroxysmal tachycardia, and all other CVD events], admitted to ICU, admitted via ED, and patient category [concessional, ordinary] at index admission), SA4-region fixed effects (based on patient location at index admission), time fixed effects (measured in 30-day periods relative to index admission), fixed effects for Indigenous peoples 6 months before and after admission, month fixed effects, and linear time trends. 95% CI in parenthesis. Robust standard errors are clustered at the individual level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Unadjusted means of outcomes presented for individuals across all 30-day periods observed after each individual's index admission.

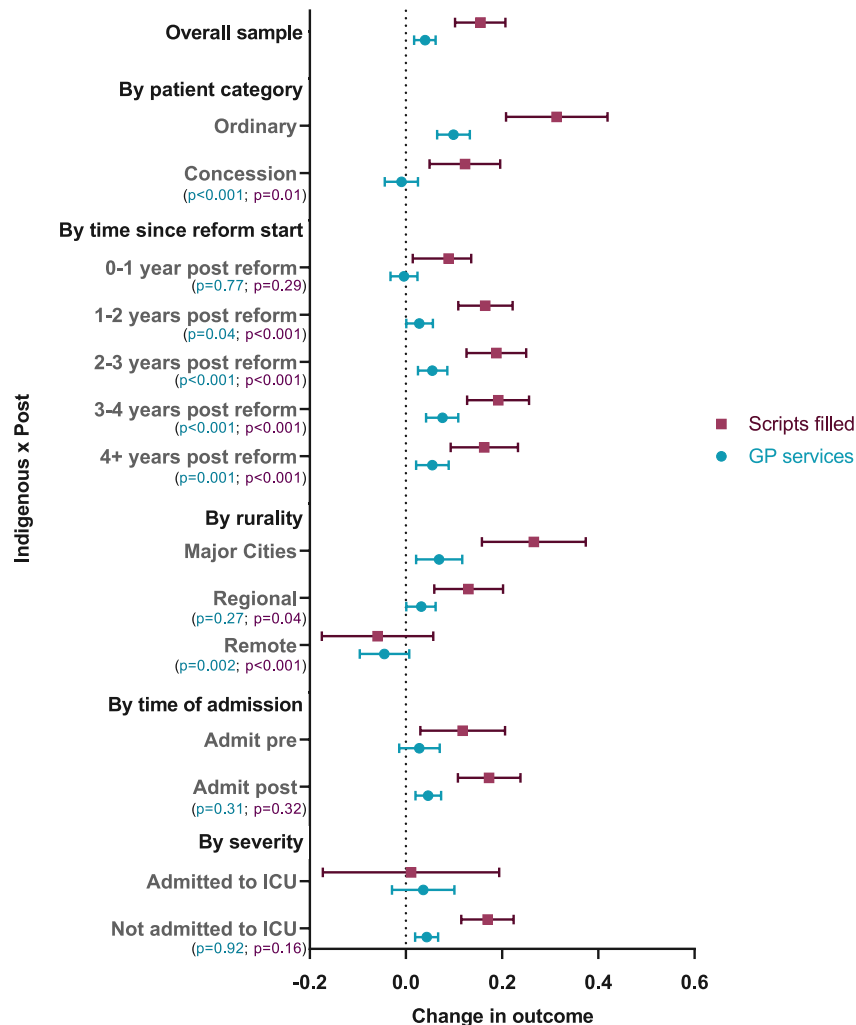


FIGURE 5 Change in use of GP services and scripts filled among Indigenous peoples post IPIP by time of admission, time since reform start, rurality, disease severity, and patient category. DiD estimator shown by subgroups for admission timing, rurality, and patient category (i.e., by splitting the sample) whereas “time post reform” estimates show change in outcome relative to non-Indigenous counterparts in same time frame (i.e., represent the interaction terms). Robust standard errors are clustered at the individual level. Tests for significance reported in order GP services; scripts filled. Subgroup comparisons use Wald Tests for hypothesis testing while “time post reform” uses *t*-tests [Colour figure can be viewed at wileyonlinelibrary.com]

Our main estimation results indicate that pre reform, Indigenous peoples visited GPs and specialists less often and filled fewer scripts than their non-Indigenous counterparts (Table 2). Conversely, pre IPIP they received more chronic disease services. The main effect of interest (β_3) estimates how out-of-hospital healthcare services and prescription medicine use changed among Indigenous peoples relative to non-Indigenous Australians after the introduction of IPIP. Post reform, Indigenous peoples received significantly more GP services (0.046 [95% CI 0.022; 0.069]), chronic disease services (0.032 [95% CI 0.027; 0.037]), and prescription medicines (0.165 [95% CI 0.112; 0.218]) per 30-day period. Altogether, this suggests the reform did reduce Indigenous disparities in primary healthcare; in particular closing the existing “gap” for GP services and scripts. Conversely, post reform Indigenous peoples used 0.009 (95% CI 0.003; 0.015) fewer specialist services per 30-day period than their non-Indigenous counterparts, thereby indicating either substitution away from, or reduced need for, specialist care.

Our results are robust to using individual fixed effects (Appendix A.12), postcode fixed effects for patient location (Appendix A.13), excluding time invariant covariates (Appendix A.14), as well as a non-linear GLM model (Appendix A.15). Further, our conclusions do not significantly change when applying differential time trends by Indigenous status (Appendix A.16) or when tightening the window of analysis to 2 years before and after IPIP's introduction (Appendix A.17). Altogether, this suggests that our results are robust to different functional forms and specifications and are unlikely to be substantively biased by unobserved time-invariant differences between Indigenous and non-Indigenous Australians or other policies introduced during the analysis window.

The heterogeneous effects of the reform on GP services and prescription medicines for Indigenous Australians are presented in Figure 5. We observe that, on average, Indigenous peoples admitted post IPIP used slightly more GP services and scripts than Indigenous peoples admitted pre IPIP.⁸ Utilization of chronic disease care services was also slightly higher among Indigenous peoples with earlier versus later access (Appendix A.18). Taken together, this suggests that access to IPIP at time of admission was indeed important for initial registration.

Validating the potential substitution effects, Indigenous peoples with earlier access to the IPIP—who initially accessed more GP services and scripts—had a larger reduction in specialist services compared to those with later access (Appendix A.19). In general, healthcare use pre IPIP was higher among Indigenous peoples initially admitted to ICU compared to those who were not. Post IPIP, the increase in use of out-of-hospital services, particularly chronic disease services, appeared to be lower among those admitted to ICU compared to those not admitted to ICU. While there is large uncertainty around these estimates, comparing the magnitude of the coefficients, together with their use pre IPIP, suggests that those with more severe conditions may have been less able to change their healthcare use in response to the IPIP.

Indigenous peoples living in major cities and regional areas used more GP services and scripts post reform than those living in remote areas. Analyzing the reform effects over time also suggests that the greatest increases in primary care occurred in the second and third year after the reform was introduced, with the treatment effects stabilizing thereafter. Altogether, these findings are consistent with the reduced availability of the IPIP in remote areas and more practices, and patients, registering with the IPIP over time.

As expected, Indigenous peoples who were eligible for larger reductions in prescription medicine co-payments (those in the “ordinary” patient category) had larger increases in primary care, including chronic disease services, than those eligible for smaller co-payment relief (in the “concessional” category). It is therefore plausible that, beyond the targeted practice incentives, registered patients' increased ability to pay for scripts had positive spillover effects by increasing GP and other primary care services. Although the increase in primary care post reform was larger for ordinary Indigenous patients, the reduction in specialist attendances was greater among concessional patients. This suggests that poorer individuals were more likely to substitute away from costly specialist care in response to improved chronic disease management in the primary care setting.

6.1 | Additional analyses—Hospitalization and survival

After the IPIP was introduced, Indigenous peoples admitted post reform (i.e., with earlier access to the IPIP relative to their admission) used more GP services, chronic disease services, and scripts than those admitted pre reform. We therefore explore whether these differences had flow-on effects to hospitalization and survival. Briefly, as information on hospitalization and mortality is only available after each individual's first hospitalization in 2010, we compare the difference between Indigenous and non-Indigenous Australians admitted pre reform (later access) to the same difference post reform (later access). Full methodology and results are presented in Appendix A.20. Altogether, the results found that there were no significant differences in subsequent hospitalization and survival. This suggests that these initial increases in primary care among those with earlier IPIP access did not lead to improvements in these outcomes.

7 | DISCUSSION

In this paper we estimate the impact of a targeted reform that reduced prescription medicine co-payments and incentivized doctors to better manage chronic disease care for Indigenous peoples with, or at risk of developing, chronic conditions. Applying the framework of a natural experiment, we explore how this reform affected Indigenous disparities in out-of-hospital healthcare use among 75,826 Australians who were first hospitalized with CVD in 2010. Additionally, this study describes the heterogeneous effects of the reform and, by exploiting differences in access to the reform relative to individuals' first admission, estimates whether having earlier versus later access impacted subsequent hospitalization and survival.

The ITT estimates indicate that the reform increased primary healthcare use among Indigenous peoples, including 12.9% more prescription medicines, 6.6% more GP services, and 34.0% more chronic disease services, but reduced specialist attendances by 11.8%. These results are broadly consistent with the large body of research on patient cost-sharing and the demand for healthcare (Atella et al., 2006; Finkelstein, 2007; Newhouse, 1993; Winkelmann, 2004) and physician incentives in healthcare (Chalkley & Listl, 2018; Liu et al., 2009; Scott et al., 2008; Thavam, 2019), albeit provide unique estimates for Indigenous peoples who have been historically understudied in this space.

The largest increase in primary healthcare use post reform was observed among Indigenous Australians who received the greatest reduction in prescription medicine co-payments and lived in major cities. Moreover, the uptick in primary care

utilization was not significant until more than 1 year after the reform was introduced. These findings are consistent with the progressive uptake of the IPIP by practices over time and the reduced uptake of the IPIP by practices in remote areas (Baillie et al., 2013). The differential effects by patient category echo previous findings (Trivedi & Kelaher, 2020), but are the first to demonstrate that this greater co-payment relief had other positive spill over effects in terms of additional GP services and chronic disease services. While the largest increase in primary healthcare use was observed among ordinary patients, the reduction in specialist attendances was larger for Indigenous peoples with concessional status. This suggests that the reform likely led to substitution away from, rather than offset the need for, specialist care and that the out-of-pocket costs associated with specialist care continue to pose particular barriers to those with low income.

Indigenous peoples with earlier access to the IPIP relative to their admission used slightly more GP services and prescription medicines post reform, indicating that having access to the IPIP at the time of an individual's first admission was important for initial registration. However, this did not flow on to changes in utilization of acute care services nor survival. This is at odds with previous research indicating that better engagement with primary care after a CVD event and, specifically, improvements in prescription medicine use, reduces adverse events (Afendulis et al., 2011; Fors et al., 2015; Krum et al., 2007; Stuart et al., 2009). However, it is possible that the magnitude of difference in enhanced primary care between Indigenous Australians with earlier (admit post) versus later access (admit pre) was not sufficient to impact health outcomes. The maximum "lag" between an Indigenous person's index admission and access to the IPIP (i.e., for those that admit pre reform) is 4 months and thus a key drawback of the dataset when aiming to disentangle the reform's downstream effects.

These results should also be considered within the context of other limitations. First, given the reform comprised several measures it is difficult to claim which factors were the "most important" in reducing disparities in primary healthcare use by Indigenous peoples. There are also important data limitations. For example, our dataset lacks information on specialist outpatient services delivered in public hospitals, prescription medicines not pertaining to CVD, and care provided in Aboriginal Community Controlled Health Organisations. To this end, we cannot explore how the reform affected utilization of these care types. Further, the sample size of our dataset does not allow us to develop robust population estimates for temporal and geographical changes in IPIP uptake rates. Improved data integration, including linkage of IPIP uptake to comprehensive information on healthcare utilization and health outcomes, will be essential to better understand the causal impact of this measure.

Despite these limitations, our study demonstrates that targeted reductions in co-payments coupled with physician incentives significantly reduced primary healthcare disparities in Indigenous peoples; a priority population who experience unique barriers to accessing mainstream healthcare. Our findings have clear policy implications. We show that the absolute reduction in expenditure on healthcare was important in improving Indigenous peoples' broader primary healthcare utilization. This suggests there may be scope to consider individuals' overall healthcare expenditure and capacity to pay when implementing patient cost-sharing reforms. In this instance, co-payment reductions across other elements of healthcare, or other incentives for healthcare providers to bulk bill patients experiencing socioeconomic disadvantage, may be warranted. Finally, the limited benefits observed in the first year after the IPIP's introduction and in Indigenous peoples living in remote areas suggests practices, particularly those in remote regions, may need additional support to effectively deliver such programs.

Altogether, this research suggests that affirmative action can reduce disparities in healthcare utilization however careful policy design, and ongoing evidence generation, is required to ensure that reform benefits are equitable, target populations of need, and do not lead to substitution away from valuable, or necessary, care.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to disclose.

DATA AVAILABILITY STATEMENT

Data is available upon application to the Australian Institute of Health and Welfare.

ETHICS STATEMENT

The study was approved by the Griffith University Human Research Ethics Committee (Project 2017/001).

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ENDNOTES

- ¹ CVD hospitalization/events include acute myocardial infarctions, angina pectoris, heart failure, etc. Hospitalization data frequently groups diseases of the circulatory system together as CVD (Joshy et al., 2015).
- ² In 2010, the conversion rate was AUD1.09 to USD1.00 (Trivedi & Kelaher, 2020).
- ³ These are services as provided under the MBS and excludes care provided in Aboriginal Community Controlled Community Health Organisations to which MBS item numbers do not apply. The full list of item numbers is provided in Appendix A.1. GP services include all GP consultations, including those which may not be related to chronic disease. Chronic disease services include preparation/review of a chronic disease management plan as well as adult health assessments and monitoring for a person with chronic disease. Services can be provided by GPs, allied health providers, Aboriginal and Torres Strait Islander health practitioners, and practice nurses.
- ⁴ Information on practice registration with the IPIP (e.g., via other MBS item numbers) and use of non-cardiovascular related scripts is not available in QCard. We therefore cannot identify individuals that received a CTG script under other ATC classes or those who were registered with the IPIP but did not fill a cardiovascular-related CTG script.
- ⁵ Including those who had a prior hospitalization achieves similar results (Appendix A.2).
- ⁶ When estimating this model, we find that compared to Indigenous peoples who never received a CTG script, post reform, Indigenous peoples did receive a CTG script used more GP services, chronic disease services, specialist services, and CVD scripts (Appendix A.7). However, as aforementioned, due to likelihood of selection bias, limitations with using receipt of CTG script as a proxy for participation, and the violation of the parallel trends assumption in pre-treatment periods (Appendix A.6), these are not our preferred causal estimates.
- ⁷ Excluding these terms does not change the results nor our conclusions (Appendix A.8).
- ⁸ While the overall difference between those admitted pre versus post was not significant in all periods post reform, it was significant in the second year post reform for GP services ($p = 0.02$) and the fourth year post reform for scripts ($p = 0.01$).

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SUPPORTING INFORMATION

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