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# Who had access to doctors before and after new universal capitated subsidies in New Zealand?

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ABSTRACT

In 2002, the New Zealand government introduced universal capitated subsidies for general practitioner consultations amid a broader programme of reform intended to reduce inequities in access and encourage more preventive healthcare visits. While consultation numbers increased in the short run, the issue of cost barriers to access has once more garnered significant policy attention, with many commentators concerned that the funding necessary to maintain low fees has not kept up with cost pressures. A longer-term assessment is useful in understanding the relationship between evolving policy conditions and service use.

This article explores how the distribution of access to GPs changed in the short and long run using New Zealand Health Survey data from 2002/03 to 2015/16. I find that the capitation subsidies were associated with improved access for indigenous Māori and more preventive visits as intended by 2006/07. However, from 2006/07 onward patients with the greatest health need began reporting fewer and less frequent doctors' visits per annum. I discuss potential explanations, focussing on the role of capitation subsidies and the successor price-capping scheme. This research contributes evidence to international scholarship on the long-term factors necessary for universal capitated subsidisation to sustainably reduce access inequities, with attention to local nuance.



## 1. Introduction

This study explores how the distribution of access to general practitioner (GP) services in New Zealand changed following the introduction of sizeable capitation-based universal subsidies in 2002. Strong universal primary health care (PHC) systems with reduced or eliminated co-payments have been found to be associated with improved equity of access and health outcomes [1–4], and have been a staple of international policymaking since the Declaration of Alma Ata in 1978 [5].

New Zealand's health system resembles the British National Health Service, with private GP services acting as the first point of contact into an otherwise publicly owned health system. Presently, 20 District Health Boards own public hospitals and contract with GP organisations to deliver primary care services to their geographically-defined populations. GPs successfully lobbied to remain privately owned when the government established a publicly funded health system in 1938, and have hence been free to set comparatively high patient co-payments in addition to government fee-for-service subsidies.

The government initially reimbursed GPs for around 66% of the total fee charged to all patients [6], but by the 1990s only consultations with populations of interest such as low-income earners and children were subsidised [7]. For adults, this amounted to just $15 off the average $37.50-$45 fee, and with an estimated 21% of those eligible for low-income discount cards failing to uptake them [8], contemporary commentators worried that hard-to-reach populations were slipping through the cracks [9–14]. Particular concern was afforded to Māori and Pacific peoples (14.9% and 7.4% of the New Zealand population, respectively [15]), who were respectively 6% and 0.8% less likely to visit a GP in a 12-month period than other New Zealanders [16] despite having had avoidable mortality rates 2.3 and 1.9 times that of other New Zealanders [17].

In response, the government reformed the organisation of health services and substantially increased funding for PHC in 2002 with the intent to reduce patient co-payments and improve access, particularly for indigenous Māori [14,18]. The reforms also sought to shift the financial incentives for providers away from maximising consultations and toward effectively managing the drivers of population health, by subsidising *expected* service use via a formula derived from population characteristics at the planner/provider level through newly established Primary Health Organisations, rather than by retrospectively reimbursing fees-for-service at the GP level [8]. New funds were prioritised for 'Access' practices

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**Table 1**
Implementation timeline of key co-payment reduction funding.

| | |
|---|---|
| July 2002: | Access enrolees receive funding |
| October 2003: | 6–17 year old Interim enrolees receive funding |
| July 2004: | 65+ year old Interim enrolees receive funding |
| July 2005: | 18–24 year old Interim enrolees receive funding |
| July 2006: | 45–64 year old Interim enrolees receive funding |
| October 2006: | VLCA established |
| July 2007: | 25–44 year old Interim enrolees receive funding |
| October 2009: | VLCA restricted to practices with >50% 'vulnerable' enrolees |

Source: Adapted from Barnett et al., 2009 [64]

where over 50% of enrolees were Māori, Pacific, or from low-socioeconomic areas, and were subsequently staggered annually by age-group to patients in the remaining 'Interim' practices between 2003-07. Adult fees in Access practices decreased from roughly $18-20 in 2001/02 to $15-17 in 2004/05, and when funding was rolled out to patients aged 65 and older in Interim practices, their average fees fell from $26.12 in 2003/04 to $21.18 in 2004/05 [7].

The government also introduced the supplementary Very-Low Cost Access (VLCA) scheme in 2006 when it became apparent funding was insufficiently translating into lowered co-payments. The VLCA system grants access to higher capitation payments for practices voluntarily agreeing to cap consultation fees for adults (currently at $18.50) and eliminate co-payments for children (initially those under six, but now extended to under-14 s [19,20]. The scheme was later restricted to PHOs and contracted practices where greater than 50% of the enrolled population were considered vulnerable [21]. Table 1 describes the timeline of key funding initiatives.

While the reforms greatly expanded the size and coverage of PHC subsidies, the residual co-payments – estimated at 30 percent of the total cost on average [22] – are the subject of ongoing policy attention. The government is presently considering a policy to reduce GP co-payments by $10 universally, bringing VLCA consultation fees to an $8.50 price cap and non-VLCA fees to an average of $32 [20,23]. Studies examining access both before and after the previous reforms suggest inequities in access are ongoing, particularly for younger women, Māori and Pacific Islanders, and people living with chronic conditions [19,24,16]. International studies in jurisdictions with predominantly publicly-financed universal systems find unmet health need to be most prevalent among, *inter alia,* women, younger age-groups, minority ethnicities, low-income earners, those without affiliation to a primary care provider, those without medical insurance, and those with chronic conditions [24,16,25–28].

The New Zealand case study lends insight into the long-term factors necessary for universal capitated subsidisation to lead to sustained equity improvements. The existing evidence base could be strengthened with attention to a number of present shortcomings. First, while prior studies have covered the immediate roll-out period of subsidies, examining longer-term trends is desirable to unravel the influence of evolving policy conditions [7,8,16,29]. Second, no studies of access in New Zealand currently control for systematic differences in the way different social groups self-report their health, which biases estimates of the effects of health and simultaneously determined covariates [30,31]. This study builds upon earlier works to produce a more definitive account of the distributive changes following new capitation subsidies in New Zealand.

## 2. Materials and methods

### 2.1. Data

Data come from seven waves of the cross-sectional, nationally representative New Zealand Health Survey (NZHS), from 2002/03 to 2015/16 [32]. The core survey consists of cognitively-tested questions covering long-term conditions, health status & development, health behaviours, service utilisation and experience, and sociodemographic characteristics collected in face-to-face interviews, and also includes anthropometric measurement of variables such as height, weight, and blood pressure. The analytic sample was restricted to adults aged 18 years and older.

The 2002/03 wave acts as a baseline prior to widespread implementation [33]. Approximately 10% of the population became newly eligible for subsidisation by September 2003 [14], and very little change in co-payments occurred at either Access or Interim practices before the fiscal year 2003/04 [7]. Data for 2006/07 lends insight into the effects of the near-completed roll-out of capitation subsidies. Data from 2011/12–2015/16 is used to track how utilisation rates fared in later years, characterised by division between VLCA and non-VLCA practices. The distribution of fees between these waves is relatively stable, and the year dummies included in each analysis do not display monotonic significance, suggesting it is defensible to pool these data waves. Probability weights from each survey were pooled following standard recommendations from Korn and Graubard [34] such that for individual $i$ in survey wave $j$, with weight $w$ and with a sample size $n$, the final weight $W^*_{ij}$ was given by the expression:

$$W^*_{ij} = w_{ij}\left(\frac{n_j}{n_{jsum}}\right)$$

### 2.2. Variables

The dependent variables in this study are the likelihood of reporting having visited a doctor in the past 12 months, the number of GP visits reported in the past 12 months, and likelihood of reporting having a medical problem but failing to visit a GP in the past 12 months due to cost. The two likelihood variables come from probit transformations of binary indicators, while the number of visits is a continuous variable, top-coded at 55 visits to reduce skew from outlying observations. Data on unmet need due to cost are only available in consistent format from 2011/12 to 2015/16.

These dependent variables are regressed on a vector of demographic and socioeconomic characteristics, indicators of secondary and tertiary service use, health behaviours, and health status variables. Demographic and socioeconomic variables included sex, age-group (categorised to match the age-brackets used in scheduled GP fees and government funding, with disaggregation between those aged 65–79 and 80+ to allow for exponentiating health need in later years), ethnicity (assigned a single value according to the standard Statistics New Zealand priority order: Māori, Pacific Islander, Asian, NZ European/Other [35]), highest educational qualification (secondary, vocational, undergraduate and postgraduate, with an "Other" category combined with vocational qualifications due to low sample sizes and inconsistencies across waves), household income (adjusted to 2015 Q4 $NZD by transforming to a continuous mid-point value and re-transforming back to categories matching those used in the 2015/16 NZHS, with a separate category for participants who reported not knowing their income or refused to answer), number of hours worked per week, socioeconomic deprivation (measured through NZDep, a census-based small-area index of deprivation [36]), having been born outside New Zealand, and having a 'usual practice' to attend when sick.

The models indicated whether the respondent visited a public hospital, private hospital, or specialist service in the past 12 months, respectively, as well as whether the respondent is covered by any health or medical insurance. Hazardous consumption of alcohol was identified by an Alcohol Use Disorders Identification

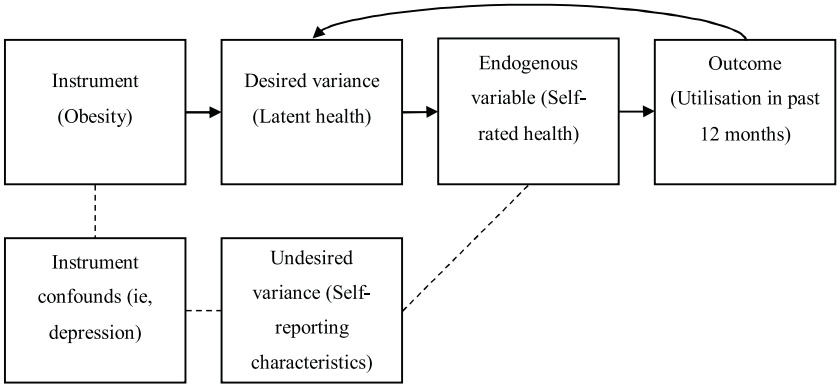


**Fig. 1.** Conceptual model for instrumenting self-rated health to purge self-reporting characteristics. Solid lines represent the pathway identified by the instrumentation strategy. Dotted lines represent confounding pathways.

Test (AUDIT) score of greater than or equal to 8 as recommended by the World Health Organisation [37]. Current smokers were identified in 2002/03 as smoking a cigarette daily, and thereafter as having smoked more than 100 cigarettes in their lifetime, and currently smoking at least once a month, due to data inconsistencies. Health status was identified through a variable indicating "fair" or "poor" self-rated global health and an index of co-morbidity incorporating information on diabetes, heart problems (angina, heart failure, and heart attacks), arthritis, strokes, high blood pressure, and high blood cholesterol. I added an indicator of the most consistent question on depression (whether the patient reported feeling "down-and-depressed" all or most of the time in the past four weeks) predominantly as a control for the instrumentation strategy.

### 2.3. Identification strategy

A key empirical challenge with analysing cross-sectional survey data is controlling for two sources of endogeneity associated with health status. First, the coefficient for self-rated health is a function of both latent objective health and measurement error caused by systematic differences in the way different population groups self-report their health. For example, more educated respondents have been found to self-report more negatively due to better self-triaging of health conditions and self-comparisons to healthier peers, amongst other reasons [31]. An important exception to this is in the regression for unmet need due to cost. Because this question already involves a subjective evaluation of health need, reporting characteristics will already be included in both the left and right-hand side of the equation and therefore the estimates are not biased across groups. Secondly, it is unclear from cross-sectional data whether poor health preceded poor access or vice-versa, engendering a problem of simultaneous determination which serves to bias co-determined coefficients such as those on household income.

In a study demonstrating how the instrumental variables approach improves estimates of the relationship between self-reported disease morbidity and GP utilisation, Sutton et al. [30] use objective anthropometric health measures such as body mass index (BMI) and forced exhalation volume (FEV) as instruments for self-reported morbidities. The intuition is that objective measures of health are strong predictors of latent health but are independent of the factors which bias self-reporting. An alternative strategy uses anchoring vignettes describing fixed health states to identify and adjust for how each respondent is likely to self-report [31].

This study uses a similar identification strategy to Sutton et al. [30] with available data, using anthropometric measurement of BMI to construct categories representing the World Health Organisation's [38] categories I, II and III of obesity. I differ from Sutton and colleagues in operationalising BMI as classes of obesity, rather than by normalising the variable and including its squared term, in order to allow very clear theoretical expectation and validation of the link between the variable's functional form and the latent concept of health. That is, higher classes of obesity should relate more strongly to objective health status. The instrument is relevant because obesity is predictive of a wide array of poor health conditions, including all-cause mortality, hypertension, Type II diabetes, heart disease, stroke, and some cancers [39–41]. The instrument is valid, too, because there is no reason to expect that anthropometric measurements of obesity are related to personal self-reporting characteristics after conditioning on controls and accounting for missing data (see Appendix A). The results are robust to alternative variable specifications and alternative instruments, strengthening their claim to internal and external validity (see Appendix A). Fig. 1 displays the hypothesised relationships.

While the instrumentation strategy can deal with measurement error, the simultaneity issue is explored through robustness checks which assess the impact of removing and including health variables on other model coefficients (see Appendix B). The results suggest health and service use are simultaneous via socioeconomic variables, which is a limitation of the cross-sectional data and necessitates associative interpretation.

### 2.4. Analysis

All analyses were conducted in StataSE 14.2, accounting for survey design strata, clusters, and pooled probability weights. All models were estimated using the Limited Information Maximum Likelihood (LIML) estimator where applicable. In practice, results were robust to specification of alternative estimators.

## 3. Results

### 3.1. Descriptive results

Table 2 displays the descriptive means of utilisation variables and sample sizes for respondents to the 2002/03, 2006/07 and pooled 2011/12–2015/16 NZHS waves by selected demographic, socioeconomic and health variables. I also observe the proportion of participants reporting poor or fair health to explore the extent to which utilisation patterns might be explained by secular changes in health rather than access.

The results show that the proportion of males, non-NZ Europeans, and people on middle incomes visiting a doctor rose in 2006/07. For Pacific Islanders and the group earning $30,001–50,000, this may be driven by a substantially rising pro-

**Table 2**
Average past-year service use for respondents to the New Zealand Health Survey, by selected demographic, socioeconomic and health variables (adjusted with probability weights).

| | *% visiting a doctor in past 12 months (N)* | | | *Average number of visits in past 12 months (N)* | | | *% reporting poor or fair health (N)* | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2002/03 | 2006/07 | 2011–16 | 2002/03 | 2006/07 | 2011–16 | 2002/03 | 2006/07 | 2011–16 |
| Gender | | | | | | | | | |
| *Male* | 76.7% | 78.6% | 75.2% | 2.8 | 2.6 | 2.6 | 11.0% | 10.8% | 10.9% |
| | *(4710)* | *(5001)* | *(27,139)* | *(4710)* | *(4766)* | *(27,070)* | *(4712)* | *(5002)* | *(27,125)* |
| *Female* | 85.3% | 85.2% | 84.0% | 3.7 | 3.4 | 3.4 | 10.3% | 10.4% | 11.1% |
| | *(7456)* | *(6922)* | *(36,823)* | *(7452)* | *(6660)* | *(36,644)* | *(7463)* | *(6921)* | *(36,814)* |
| Age-group | | | | | | | | | |
| *18-24* | 76.8% | 77.1% | 69.7% | 3.0 | 2.6 | 2.5 | 10.3% | 8.7% | 9.2% |
| | *(1212)* | *(1099)* | *(5899)* | *(1212)* | *(989)* | *(5885)* | *(1214)* | *(1099)* | *(5895)* |
| *25-44* | 76.3% | 77.0% | 73.4% | 2.6 | 2.4 | 2.5 | 8.4% | 8.8% | 9.7% |
| | *(5033)* | *(4657)* | *(21,822)* | *(5032)* | *(4417)* | *(21,780)* | *(5038)* | *(4657)* | *(21,829)* |
| *45-64* | 83.0% | 83.4% | 82.4% | 3.2 | 3.0 | 3.0 | 10.2% | 10.3% | 11.7% |
| | *(3715)* | *(3807)* | *(21,231)* | *(3713)* | *(3697)* | *(21,159)* | *(3717)* | *(3808)* | *(21,225)* |
| *65-79* | 93.8% | 94.3% | 92.5% | 4.9 | 4.4 | 4.1 | 16.6% | 15.3% | 12.4% |
| | *(1711)* | *(1793)* | *(11,020)* | *(1711)* | *(1765)* | *(10,959)* | *(1711)* | *(1793)* | *(11,004)* |
| *80+* | 96.2% | 96.6% | 96.6% | 5.9 | 5.8 | 5.0 | 20.5% | 21.8% | 17.3% |
| | *(495)* | *(567)* | *(3990)* | *(494)* | *(558)* | *(3931)* | *(495)* | *(566)* | *(3986)* |
| Ethnicity | | | | | | | | | |
| *NZ European/ Other* | 83.4% | 83.6% | 82.3% | 3.3 | 3.0 | 3.0 | 10.3% | 9.8% | 10.0% |
| | *(6213)* | *(6759)* | *(42,187)* | *(6211)* | *(6534)* | *(42,018)* | *(6218)* | *(6759)* | *(42,185)* |
| *Māori* | 74.3% | 79.9% | 74.9% | 3.5 | 3.3 | 3.4 | 14.1% | 14.1% | 16.9% |
| | *(3949)* | *(2926)* | *(13,236)* | *(3947)* | *(2791)* | *(13,187)* | *(3952)* | *(2926)* | *(13,226)* |
| *Pacific* | 77.1% | 80.7% | 77.3% | 3.3 | 3.3 | 3.3 | 9.0% | 14.4% | 15.0% |
| | *(875)* | *(836)* | *(3517)* | *(875)* | *(794)* | *(3502)* | *(874)* | *(836)* | *(3510)* |
| *Asian* | 66.5% | 71.9% | 69.8% | 2.1 | 2.3 | 2.1 | 10.6% | 10.7% | 9.1% |
| | *(1129)* | *(1402)* | *(5022)* | *(1129)* | *(1307)* | *(5007)* | *(1131)* | *(1402)* | *(5018)* |
| Household income | | | | | | | | | |
| *Loss or up to $20,000* | 84.6% | 83.3% | 83.7% | 4.6 | 4.4 | 4.4 | 21.1% | 21.4% | 21.5% |
| | *(1737)* | *(1025)* | *(6483)* | *(1737)* | *(977)* | *(6445)* | *(1737)* | *(1025)* | *(6473)* |
| *$20,001 to $30,000* | 86.5% | 88.1% | 86.1% | 4.2 | 4.4 | 4.2 | 16.6% | 17.8% | 17.2% |
| | *(1694)* | *(1665)* | *(6161)* | *(1694)* | *(1616)* | *(6142)* | *(1694)* | *(1665)* | *(6157)* |
| *$30,001 to $50,000* | 81.6% | 83.1% | 82.5% | 3.4 | 3.4 | 3.4 | 9.5% | 14.8% | 12.5% |
| | *(1885)* | *(1798)* | *(8978)* | *(1885)* | *(1737)* | *(8962)* | *(1889)* | *(1798)* | *(8982)* |
| *$50,001 to $70,000* | 80.5% | 80.2% | 79.2% | 3.1 | 2.7 | 2.7 | 10.8% | 9.6% | 9.0% |
| | *(911)* | *(1903)* | *(8073)* | *(911)* | *(1829)* | *(8065)* | *(910)* | *(1903)* | *(8079)* |
| *$70,001 to $100,000* | 80.1% | 80.8% | 79.2% | 2.6 | 2.5 | 2.6 | 7.9% | 8.0% | 7.9% |
| | *(1267)* | *(1472)* | *(8010)* | *(1267)* | *(1408)* | *(8005)* | *(1268)* | *(1472)* | *(8007)* |
| *$100,001 and above* | 81.2% | 81.9% | 79.8% | 2.5 | 2.5 | 2.4 | 4.6% | 5.9% | 6.3% |
| | *(1864)* | *(2644)* | *(10,818)* | *(1863)* | *(2530)* | *(10,812)* | *(1867)* | *(2644)* | *(10,834)* |
| *Don't know/ refused* | 77.7% | 80.1% | 76.2% | 3.4 | 3.3 | 3.1 | 12.5% | 11.7% | 13.5% |
| | *(2808)* | *(1416)* | *(15,439)* | *(2805)* | *(1329)* | *(15,283)* | *(2810)* | *(1416)* | *(15,407)* |
| Self-rated health | | | | | | | | | |
| *Poor/ fair* | 94.0% | 91.6% | 89.2% | 7.1 | 6.2 | 5.7 | – | – | – |
| | *(1484)* | *(1440)* | *(8289)* | *(1483)* | *(1394)* | *(8213)* | – | – | – |
| *Good* | 85.1% | 87.2% | 82.9% | 3.6 | 3.4 | 3.4 | – | – | – |
| | *(3965)* | *(3719)* | *(20,841)* | *(3964)* | *(3549)* | *(20,744)* | – | – | – |
| *Very good* | 80.4% | 80.5% | 79.1% | 2.6 | 2.4 | 2.5 | – | – | – |
| | *(4624)* | *(4706)* | *(24,827)* | *(4623)* | *(4524)* | *(24,775)* | – | – | – |
| *Excellent* | 68.7% | 72.2% | 69.5% | 1.9 | 1.8 | 1.8 | – | – | – |
| | *(2091)* | *(2057)* | *(9891)* | *(2090)* | *(1958)* | *(9872)* | – | – | – |
| Total | 81.2% | 82.1% | 79.8% | 3.2 | 3.0 | 3.0 | 10.6% | 10.6% | 11.0% |
| | *(12,166)* | *(11,923)* | *(63,961)* | *(12,162)* | *(11,426)* | *(63,713)* | *(12,175)* | *(11,923)* | *(63,938)* |

portion of people reporting poor health, or inversely, contact with a doctor may have affected their self-triaging. Looking at the sample sizes by income groups, another explanation might be that real wage rises altered the health composition of groups. Fewer people with poor health reported visiting a doctor in 2006/07, while more people in good and excellent health reported visiting a doctor. In tandem with the generally lowered number of visits made per year across most groups, this suggests that new utilisers in 2006/07 were people with good or better health.

Respondents in 2011/12–2015/16 were less likely to visit doctors than in 2006/07 and visited fewer times on average. The proportion of 18–24 year olds visiting a doctor dropped substantially. Compared to 2006/07, the proportion of people reporting good health who visited a doctor declined substantially. Unfortunately, NZHS data does not distinguish between VLCA and non-VLCA patients, and it is likely that the population averages hide important distinctions between these groups.

Taken together, most groups appear to have made more doctors' visits by 2006/07 (particularly for Māori, middle-income earners, and people with "good" or better health) but the increased service use did not persist in recent years.

### 3.2. Main results

Table 3 compares the distribution of service use across population groups at different time points, with supplementary comparison to the distribution of unmet need due to cost where data is available. Only instrumented results are reported for the utilisation models, but non-instrumented estimates are available for comparison in Appendix A. Instrumenting more than tripled the self-rated health coefficient in both models, and substantially broadened differences between groups with simultaneously determined relationships like gender, ethnicity, and household income. Table 3 demonstrates that classes of obesity are mono-

**Table 3**
Difference in probability of GP service use and unmet need relative to baseline groups in 2002/03, 2006/07, and 2011/12–2015/16 (adjusted with probability weights).

| | *Likelihood of visiting a GP in past 12 months [SE]* | | | *Number of visits in past 12 months [SE]* | | | *Unmet need [SE]* |
|---|---|---|---|---|---|---|---|
| | 2002/03 | 2006/07 | 2011/12-2015/16 | 2002/03 | 2006/07 | 2011/12-2015/16 | 2011/12-2015/16 |
| Female | 0.253*** | 0.182*** | 0.251*** | 0.620*** | 0.462*** | 0.523*** | 0.267*** |
| | [0.043] | [0.043] | [0.018] | [0.162] | [0.092] | [0.044] | [0.019] |
| Age (base: 25-44) | | | | | | | |
| *18-24* | 0.162* | 0.137* | 0.069* | 0.396 | 0.266 | 0.149* | −0.157*** |
| | [0.073] | [0.069] | [0.029] | [0.209] | [0.170] | [0.076] | [0.030] |
| *45-64* | 0.083 | 0.042 | 0.153*** | 0.228 | 0.160 | 0.154*** | −0.414*** |
| | [0.047] | [0.043] | [0.020] | [0.119] | [0.103] | [0.046] | [0.021] |
| *65-79* | 0.486*** | 0.416*** | 0.618*** | 0.707** | 0.240 | 0.781*** | −1.029*** |
| | [0.106] | [0.077] | [0.032] | [0.245] | [0.169] | [0.077] | [0.035] |
| *80+* | 0.621** | 0.611*** | 0.939*** | 1.409*** | 0.981** | 1.161*** | −1.523*** |
| | [0.193] | [0.136] | [0.055] | [0.378] | [0.336] | [0.108] | [0.059] |
| Ethnicity (base: NZ European/ Other) | | | | | | | |
| *Māori* | −0.210*** | −0.068 | −0.194*** | 0.046 | 0.178 | 0.031 | 0.131*** |
| | [0.061] | [0.049] | [0.023] | [0.196] | [0.123] | [0.076] | [0.023] |
| *Pacific* | 0.015 | −0.029 | −0.076 | 0.426 | 0.342 | 0.052 | 0.088* |
| | [0.083] | [0.074] | [0.040] | [0.258] | [0.190] | [0.111] | [0.041] |
| *Asian* | −0.166* | −0.169* | −0.091** | −0.344 | −0.137 | −0.264*** | −0.244*** |
| | [0.080] | [0.066] | [0.031] | [0.220] | [0.158] | [0.069] | [0.041] |
| Qualifications (base: none) | | | | | | | |
| *Secondary* | 0.141** | 0.087 | 0.013 | −0.056 | −0.246 | −0.036 | 0.044 |
| | [0.054] | [0.060] | [0.027] | [0.205] | [0.158] | [0.070] | [0.027] |
| *Vocational* | 0.197*** | 0.003 | 0.055* | 0.018 | −0.323* | 0.030 | 0.009 |
| | [0.053] | [0.053] | [0.022] | [0.193] | [0.137] | [0.051] | [0.024] |
| *Undergraduate* | 0.089 | 0.080 | 0.121*** | −0.248 | −0.345 | 0.055 | −0.025 |
| | [0.074] | [0.072] | [0.027] | [0.207] | [0.177] | [0.060] | [0.032] |
| *Postgraduate* | 0.235* | 0.181* | 0.064 | 0.189 | −0.185 | −0.088 | −0.034 |
| | [0.108] | [0.088] | [0.035] | [0.297] | [0.191] | [0.070] | [0.041] |
| Household income (base: loss or up to $20,000) | | | | | | | |
| *$20,001 to $30,000* | 0.122 | 0.135 | 0.087* | −0.042 | 0.045 | 0.080 | −0.043 |
| | [0.085] | [0.088] | [0.044] | [0.273] | [0.231] | [0.123] | [0.039] |
| *$30,001 to $50,000* | 0.266** | 0.087 | 0.156*** | 0.233 | −0.453* | 0.051 | −0.222*** |
| | [0.085] | [0.087] | [0.039] | [0.353] | [0.220] | [0.110] | [0.037] |
| *$50,001 to $70,000* | 0.174 | 0.154 | 0.168*** | 0.078 | −0.422 | −0.099 | −0.344*** |
| | [0.096] | [0.092] | [0.041] | [0.338] | [0.224] | [0.114] | [0.039] |
| *$70,001 to $100,000* | 0.232* | 0.248** | 0.205*** | −0.204 | −0.259 | −0.038 | −0.498*** |
| | [0.094] | [0.090] | [0.042] | [0.341] | [0.238] | [0.111] | [0.040] |
| *$100,001 and above* | 0.350*** | 0.244** | 0.231*** | 0.196 | −0.200 | −0.059 | −0.735*** |
| | [0.090] | [0.095] | [0.041] | [0.387] | [0.248] | [0.112] | [0.043] |
| *Don't know/refused* | 0.091 | 0.108 | 0.086* | 0.072 | −0.227 | −0.085 | −0.308*** |
| | [0.084] | [0.098] | [0.036] | [0.272] | [0.235] | [0.104] | [0.034] |
| Hours worked | 0.002 | −0.001 | 0.001* | −0.006 | −0.011*** | −0.004** | −0.003*** |
| | [0.001] | [0.001] | [0.001] | [0.004] | [0.003] | [0.001] | [0.001] |
| Born overseas | −0.020 | 0.024 | 0.009 | −0.189 | −0.128 | 0.071 | −0.002 |
| | [0.049] | [0.053] | [0.024] | [0.128] | [0.116] | [0.050] | [0.027] |
| Has usual practice | 0.659*** | 1.099*** | 1.118*** | 1.360*** | 1.819*** | 1.400*** | 0.033 |
| | [0.184] | [0.122] | [0.047] | [0.163] | [0.091] | [0.055] | [0.041] |
| NZDep Quintile (base: NZDep 1) | | | | | | | |
| *NZDep 2* | 0.104 | −0.001 | 0.018 | 0.364* | 0.336** | −0.039 | 0.071 |
| | [0.065] | [0.065] | [0.029] | [0.144] | [0.130] | [0.063] | [0.038] |
| *NZDep 3* | 0.115 | −0.008 | −0.052 | 0.415** | 0.248* | −0.097 | 0.109** |
| | [0.064] | [0.066] | [0.029] | [0.147] | [0.110] | [0.064] | [0.038] |
| *NZDep 4* | 0.033 | 0.020 | −0.002 | 0.217 | 0.382** | 0.040 | 0.139*** |
| | [0.073] | [0.071] | [0.030] | [0.192] | [0.137] | [0.068] | [0.037] |
| *NZDep 5 (most deprived)* | 0.123 | 0.051 | −0.017 | 0.519* | 0.316* | 0.212** | 0.142*** |
| | [0.080] | [0.078] | [0.031] | [0.206] | [0.140] | [0.077] | [0.038] |
| Public hospital | 0.141 | 0.272** | 0.258*** | 1.289*** | 1.031*** | 1.03*** | 0.226*** |
| | [0.122] | [0.085] | [0.031] | [0.262] | [0.185] | [0.069] | [0.022] |
| Private hospital | 0.330** | 0.361** | 0.273*** | 0.704** | 0.593* | 0.712*** | −0.048 |
| | [0.117] | [0.117] | [0.050] | [0.258] | [0.243] | [0.115] | [0.042] |
| Specialist | 0.247 | 0.489*** | 0.403*** | 1.348*** | 1.256*** | 1.013*** | 0.036 |
| | [0.133] | [0.098] | [0.035] | [0.241] | [0.135] | [0.066] | [0.023] |
| Current smoker | 0.038 | −0.103* | 0.039 | 0.094 | −0.140 | 0.102* | 0.045* |
| | [0.040] | [0.051] | [0.021] | [0.107] | [0.127] | [0.050] | [0.022] |
| Heavy drinker | −0.025 | 0.017 | −0.013 | 0.142 | −0.051 | −0.053 | −0.029 |
| | [0.050] | [0.058] | [0.023] | [0.165] | [0.114] | [0.051] | [0.025] |
| Has insurance | 0.032 | 0.171*** | 0.015 | 0.013 | 0.121 | −0.038 | 0.005 |
| | [0.036] | [0.041] | [0.018] | [0.118] | [0.093] | [0.042] | [0.020] |
| Self-rated health | 2.877*** | 1.503* | 1.650*** | 7.010* | 4.138** | 6.704*** | 0.417*** |
| | [0.467] | [0.595] | [0.187] | [2.917] | [1.580] | [0.659] | [0.025] |
| Chronic conditions (base: no conditions) | | | | | | | |
| *1 condition* | −0.001 | 0.161** | 0.134*** | 0.325 | 0.338** | 0.276*** | 0.060** |
| | [0.062] | [0.056] | [0.024] | [0.174] | [0.103] | [0.052] | [0.022] |

Table 3 (*Continued*)

| | *Likelihood of visiting a GP in past 12 months [SE]* | | | *Number of visits in past 12 months [SE]* | | | *Unmet need [SE]* |
|---|---|---|---|---|---|---|---|
| | 2002/03 | 2006/07 | 2011/12-2015/16 | 2002/03 | 2006/07 | 2011/12-2015/16 | 2011/12-2015/16 |
| *≥ 2 conditions* | −0.156 | 0.622*** | 0.064* | 0.601 | 1.500*** | 0.318*** | 0.100*** |
| | [0.126] | [0.176] | [0.031] | [0.431] | [0.265] | [0.076] | [0.025] |
| Depressed | −0.824*** | 0.086 | −0.074 | 0.836 | 1.359 | 0.177 | 0.413*** |
| | [0.222] | [0.240] | [0.082] | [1.386] | [0.725] | [0.077] | [0.044] |
| Obesity[a] | | | | | | | |
| *Class I* | 0.032** | 0.018 | 0.029*** | 0.031** | 0.017 | 0.033*** | – |
| | [0.011] | [0.010] | [0.004] | [0.012] | [0.010] | [0.004] | – |
| *Class II* | 0.037 | 0.069*** | 0.082*** | 0.045* | 0.068*** | 0.083 | – |
| | [0.020] | [0.016] | [0.008] | [0.020] | [0.016] | [0.007] | – |
| *Class III* | 0.088*** | 0.132*** | 0.161*** | 0.085** | 0.133*** | 0.158*** | – |
| | [0.024] | [0.024] | [0.010] | [0.026] | [0.022] | [0.010] | – |
| Kleibergen-Paap F | F(3, 1167) = 5.78*** | F(3, 1353) = 15.08*** | F(3, 6497) = 115.05*** | F(3, 1167) = 5.72*** | F(3, 1353) = 15.12*** | F(3, 6496) = 117.33*** | – |
| N | 11730 | 11705 | 58588 | 11727 | 11706 | 58404 | 58623 |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Unreported controls: Year dummies (2012/13–2015/16), indicators of instrument missingness, and their interactions.
[a]First-stage estimates.

tonically related to self-rated health and significantly reject the Kleibergen-Paap weak-instrument F test [42]. With the exception of the 2002/03 models, the F-statistics exceed the rule-of-thumb of 10 denoting a strong instrument [43].

Women visited doctors more than men in all years, but the difference declined in 2006/07 before increasing again in later years. The descriptive results suggest these patterns have largely been driven by increased utilisation among men, with women still likely to report unmet need due to cost in recent years. All age-groups aside from 25 to 44 year olds were eligible for new subsidies at Interim practices at least part of the last 12 months during data collection in 2006/07, but the growth in utilisation between groups does not seem substantially different, suggesting patients at these practices were less sensitive to fees changes than those at Access practices. 25–44 year olds became much less likely to use services than older age-groups. While the subsidies rolled out by 2006/07 eased disparities of utilisation for Māori, these gains have been lost subsequently, and Māori remain more likely to report cost barriers to access. Service use has remained relatively static across qualification types, with the only major changes being between those with no qualifications and those with secondary or vocational qualifications.

High-income groups remained more likely to visit a doctor over all periods, but the gap between richest and poorest was somewhat ameliorated by 2006/07. While deprivation was not associated with different odds of past-year GP visits, in 2011/12–2015/16 the number of visits made only varied for respondents in the most deprived quintile, coinciding with the eligibility criteria for the VLCA scheme.

Access to new subsidies was made contingent on enrolment with a GP, and accordingly, differences between patients reporting and not reporting having a 'usual' practice became much more pronounced from 2006/07 onward. Use of secondary and tertiary services was more closely linked to GP service use from 2006/07 onwards, although it is difficult to disentangle why different services were used together from these results. However, the fact that public hospitals and not other services were significantly associated with unmet need for GPs may suggest that those with poor access to PHC substituted with the fully publicly-funded secondary system. Interestingly, having medical insurance became temporarily relevant to use of GP services in 2006/07 despite little change in coverage.

Subsidies were heavily targeted at those with the poorest health prior to the universal reforms, and while poor health remained strongly associated with service use in later years, the size of the relationship was notably moderated. People with multiple chronic conditions made much more use of GP services following the introduction of capitation payments and new funding for intensive healthcare management in the 2006/07 data, but in later years the relationship was curtailed. All three health variables were strongly predictive of cost barriers to access in 2011/12–2015/16. The visits associated with feeling 'down-and-depressed' changed drastically across waves, which might reflect the addition in later survey waves of a question on whether respondents had ever received a formal diagnosis of depression. I explore the implications of this in Appendix C.

Unmet need due to cost was more common among women, 25–44 year olds, Māori, low-income earners, people in more deprived areas, and people with poor health, chronic conditions, and depressive feelings.

## 4. Discussion

### 4.1. Utilisation patterns after universal capitation subsidies

The distributional changes following New Zealand's new funding arrangements are broadly consistent with what is known about universal subsidisation, namely that it increases service use for vulnerable groups and encourages preventive visits as intended but can place strain on service capacity if increased demand is not adequately offset by increased efficiency or staffing levels [2,3,44]. The subsidies appear to be associated with improved utilisation for intended groups (Māori and low-to-middle income earners) without particularly affecting utilisation for better-off groups. While subsidising high-income earners might seem inefficient, there are a number of reasons why it might be defensible. First, universal access to subsidies prevents the hardest-to-reach populations from 'slipping through the cracks', particularly those who fail to uptake their eligibility for discounts in a targeted system [8]. Secondly, encouraging healthier people to seek preventive care is an intentional and desirable component of a strong PHC system, and is thought to be justified by associations with reduced hospitalisations, illness and death [1,45]. The present results appear consistent with a preventive re-orientation, with most new utilisation coming from people with "good" or better health, low-to-middle income earners, and men. Thirdly, public support for welfare systems is stronger when the non-poor also receive benefit [46].

Nevertheless, the results provide grounds to worry that the increased service demand has displaced visits among those with ongoing health issues due to increased difficulty making an appointment. Approximately 18% of the analytic sample reported

being unable to access a GP in the past 12 months in both 2006/07 and 2015/16, with no data available for 2002/03 and attenuated but rising prevalence in the years 2011/12–2014/15. It is worth interpreting the cross-sectional associations here with caution. If the subsidies have succeeded in improving health outcomes, then people reporting 'poor/fair' health whose utilisation was enabled by new subsidies may subsequently report their health as 'good' in 2006/07, making it appear as though people with poor/fair health who were unresponsive to new subsidies were less able to access services.

### 4.2. Utilisation patterns in later years

The distributional features observed in 2006/07 appear largely preserved in 2011/12–2015/16, but Māori were once again less likely than NZ Europeans to visit a doctor, those with the poorest health made more visits again, and only the most deprived group made more visits than the least deprived group. Overall, most population groups appeared to make less use of GP services, but the results likely understate the disadvantage faced by groups targeted by VLCA by failing to indicate which patients received low-cost access.

One interpretation of these results is that the transient surge of utilisation in 2006/07 reflects "pent-up demand" among the previously unsubsidised who delayed visiting a GP until they were eligible for new funding [47]. After relieving this pent-up demand, service capacity has been once more freed up for higher-needs patients. While this explanation can account for the changing composition of visits by health need, it does not explain why Māori – already heavily targeted by subsidisation prior to reform – no longer exhibited improved access in later years.

The results should be viewed in the context of widespread stakeholder criticisms of increasing divisions between those inside and outside of the VLCA system [48–50]. Many low-needs patients enrolled in VLCA practices prior to its restriction to practices with high-needs populations in 2009, with 44% of the approximately 1.277 million patients enrolled in VLCA practices failing to fit the definition of the funding policy's "high-needs" population [48]. Similarly, approximately 563,000 or 44% of high-needs patients have been left arbitrarily excluded from access to low-cost consultations. Problems for these patients may have been compounded by rising real fees in non-VLCA practices [19], which critics argue is due to the government's insistence since 2008 on holding health spending constant at the rate of inflation without accounting for changes in population and cost pressures, purportedly to force providers to find efficiency gains [51–54]. These rising fees may account for the lack of sustained increases in utilisation rates for Māori, but inference to this effect is limited by the data.

The results may also have been affected by the Global Financial Crisis, which international research suggests depressed demand particularly for treatment of lesser-intensity health issues such as those addressed at PHC settings [55]. The expected effect is small, given that New Zealand experienced a relatively shallow recession compared to other developed countries [56]. A mitigating factor to this explanation is that utilisation of services has not fully recovered with the economy in the later survey waves. Another possibility is increased substitution of GPs by practice nurses as part of a multidisciplinary transformation of PHC under the PHCS [18]. In supplementary analyses, I found that this appears to be truer for lower-income earners and Māori than other population groups (see Appendix D).

### 4.3. Policy implications

The results in this study have demonstrated that universal capitated subsidies as implemented in New Zealand appear to encourage greater equity of access and more preventive visits. However, policymakers need to ensure GP services are equipped to cope with increased service demand to avoid trading cost barriers for waiting-lists. Previous research in New Zealand and elsewhere suggests patients who are unable book a timely GP appointment are more likely to use ED departments, thereby undermining the justification that stronger PHC systems alleviate strain on secondary services [57–59]. While the VLCA price-capping system reduced 'average' co-payment levels, it has excluded patients with similar need. Previous research suggests low-cost price-caps should follow individuals rather than aggregate groupings, or else should cover all patients to avoid leaving some vulnerable patients without low-cost access [48].

The results are relevant to the Government's health system review and particularly for its review of PHC funding. First and foremost, the results justify revision of current PHC settings due to evidence of ongoing inequities in health care access. While this study focuses on cost barriers to access and untimely appointments, other sources demonstrate the need to consider barriers such as transport, time restrictions, and inadequate cultural sensitivity [19,60,61]. Policy-makers need to consider how to resolve disparities between high-needs patients inside and outside VLCA practices before any increases in universal capitation payments can be considered effective in resolving current access barriers. Previous work suggests policy-makers should also counterbalance the financial risk borne by GPs as their share of prospective government funding increases, by introducing new subsidies as retrospective fee-for-service payments [62].

### 4.4. Strengths and limitations

This study builds upon prior evaluations of New Zealand's universal subsidies by observing a longer time-frame and addressing multiple hitherto unexamined sources of endogeneity through instrumentation for self-reporting bias and sensitivity analyses for simultaneity bias.

There are, however, limitations which must be taken into account when interpreting the findings. Firstly, the data from 2011/12 onward are limited by their inability to distinguish VLCA patients. Patients in VLCA practices pay much lower fees and would be expected to have significantly greater access than patients outside the system, holding other factors equal. The present study likely understates the magnitude of inequities experienced by disadvantaged groups by failing to control for selection into, and effects of, the VLCA system.

Secondly, the missing time points between 2002/03 and 2006/07, and again between the latter and 2011/12 prevent firm conclusions on the timing of particular causes and effects. Observation of more time points would allow better inference into the causal flow between new subsidisation, reductions in co-payments, and changes in utilisation behaviour. It also would allow better disentanglement of the distributions associated with the initial capitation subsidy injection and the establishment of the VLCA system of price-capping.

Finally, the validity of obesity as an instrument may vary between different drivers of service use for different population groups. It is possible that younger age-groups make more preventive and sexual health visits, but these visits are not likely to be related to obesity. Alternatively, because the relative risk of higher BMI levels declines with age, the instrument may be less valid for older groups [63].

## 5. Conclusions

This study has examined how the distribution of GP service use has changed in the years following significant new investment in

capitation-based subsidies in New Zealand. I find evidence that the subsidy expansions were able to achieve their policy goals of improving access for Māori and encouraging healthier people to seek preventive care in the short-term, but this may have come at the expense of capacity to serve those with the greatest health needs. The long-term success of the reforms are called into question by resurgent access barriers for Māori, but future research is needed to formally investigate why this occurred.

The government's health system review presents a timely opportunity to amend the shortcomings in present institutional healthcare arrangements, and to redress the inequities facing groups with little means or high health need. Policy reform offers a chance to affirm and strengthen the PHCS's Alma-Ata inspired vision of a primary care system accessible for all, at cost the community can afford.

## Conflicts of interest

This research was completed in partial fulfilment of a Master's degree at Victoria University of Wellington. The author has since taken employment with The New Zealand Treasury. The Treasury is in no way affiliated with the research and the author declares no conflict of interest.

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## Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.healthpol.2019.04.004.

## References

[1] Kringos DS, Boerma W, van der Zee J, Groenewegen P. Europe's strong primary care systems are linked to better population health but also to higher health spending. Health Affairs 2013;32(4):686–94.
[2] Nolan A, Smith S. The effect of differential eligibility for free GP services on GP utilisation in Ireland. Social Science & Medicine 2012;74(10):1644–51.
[3] Manning WG, Newhouse JP, Duan N, Keeler EB, Leibowitz A. Health insurance and the demand for medical care: evidence from a randomized experiment. The American Economic Review 1987:251–77.
[4] Detollenaere J, Van Pottelberge A, Hanssens L, Boerma W, Greß S, et al. Patients' financially driven delay of GP visits: is it less likely to occur in stronger primary care systems? Medical Care Research and Review 2018;75(3):292–311.
[5] World Health Organisation. Alma ata declaration. Geneva: World Health Organisation; 1978.
[6] McGuigan T. A health service for New Zealand. Wellington: Department of Health; 1975.
[7] Cumming J, Gribben B. Evaluation of the primary health care strategy: practice data analysis 2001–2005. Wellington: Health Services Research Centre, Victoria University of Wellington; 2007.
[8] Cumming J, Mays N. New Zealand's Primary Health Care Strategy: early effects of the new financing and payment system for general practice and future challenges. Health Economics, Policy and Law 2011;6(1):1–21.
[9] Cumming J, Mays N. Shifting to capitation in primary care: What might the impact be in New Zealand? Australian Health Review 1999;22(4):8–24.
[10] Raymont A. Cost barriers to health care: provisional analysis from the New Zealand Health Survey 2002/03. Wellington: Health Services Research Centre, Victoria University of Wellington; 2004.
[11] Crengle S. Māori primary care services. Wellington: National Health Committee; 1999.
[12] Sarfati D, Scott K, Haslett S, Johnston G, Hodges I. Taking the pulse: the 1996/97 new zealand health survey. Wellington: Ministry of Health; 1999.
[13] Smith J. Critical analysis of the implementation of the Primary Health Care Strategy implementation and framing of issues for the next phase. Wellington: Ministry of Health; 2009.
[14] Hefford M, Crampton P, Foley J. Reducing health disparities through primary care reform: the New Zealand experiment. Health Policy 2005;72(1):9–23.
[15] Statistics New Zealand. New zealand census of population and dwellings 2013; 2013.
[16] Cumming J, Stillman S, Liang Y, Poland M, Hannis G. The determinants of GP visits in New Zealand. Australian and New Zealand Journal of Public Health 2010;34(5):451–7.
[17] Ministry of Health. Our health our future: the health of New Zealanders. Wellington: Ministry of Health; 1999.
[18] King A. The primary health care strategy. Wellington: Ministry of Health; 2001.
[19] Downs A. From theory to practice: the promise of primary care in New Zealand. Wellington: Fulbright New Zealand; 2017.
[20] Ministry of Health. Very low cost access scheme; 2018. Accessed Feb 02 2019 https://www.health.govt.nz/our-work/primary-health-care/primary-health-care-subsidies-and-services/very-low-cost-access-scheme.
[21] Cumming J, McDonald J, Barr C, Martin G, Gerring Z, Daubé J. New Zealand health system review. Health system in transition. Manila: World Health Organization; 2014.
[22] Paris V, Hewlett E, Auraaen A, Alexa J, Lisa S. Health care coverage in OECD countries in 2012; 2016. Paris, France; Contract No.: 88.
[23] New Zealand Labour Party, Wellington Reducing GP fees; 2018 http://www.labour.org.nz/gp_fees.
[24] Jatrana S, Crampton P. Primary health care in New Zealand: Who has access? Health Policy 2009;93(1):1–10.
[25] Socías ME, Koehoorn M, Shoveller J. Gender inequalities in access to health care among adults living in British Columbia, canada. Women's Health Issues 2016;26(1):74–9.
[26] Marshall EG. Do young adults have unmet healthcare needs? Journal of Adolescent Health 2011;49(5):490–7.
[27] Devaux M. Income-related inequalities and inequities in health care services utilisation in 18 selected OECD countries. European Journal of Health Economics 2013;16(1):21–33, http://dx.doi.org/10.1007/s10198-013-0546-4).
[28] Terraneo M. Inequities in health care utilization by people aged 50+: evidence from 12 European countries. Social Science & Medicine 2015;126:154–63.
[29] Schoen C, Osborn R, Doty MM, Bishop M, Peugh J, Murukutla N. Toward higher-performance health systems: Adults' health care experiences in seven countries, 2007. Health Affairs 2007;26(6):w717–34.
[30] Sutton M, Carr-Hill R, Gravelle H, Rice N. Do measures of self-reported morbidity bias the estimation of the determinants of health care utilisation? Social Science & Medicine 1999;49(7):867–78.
[31] Bago d'Uva T, Lindeboom M, O'Donnell O, et al. Education-related inequity in healthcare with heterogeneous reporting of health. Journal of the Royal Statistical Society: Series A (Statistics in Society) 2011;174(3):639–64.
[32] Statistics New Zealand, Wellington New zealand health survey; 2016.
[33] Perera R, McDonald J, Cumming J, Goodhead A. Primary Health Organisations: the first year (July 2002-June 2003) from the PHO perspective. Wellington: Health Services Research Centre, Victoria University of Wellington; 2003.
[34] Korn EL, Graubard BI. Analysis of health surveys. Toronto: John Wiley & Sons, Inc.; 1999.
[35] Ministry of Health. Methodology report 2015/16: new Zealand health survey. Wellington: Ministry of Health; 2016.
[36] Salmond C, Crampton P, Atkinson J. NZDep2006 index of deprivation. Department of Public Health, University of Otago Wellington; 2007.
[37] Babor TF, Higgins-Biddle J, Saunders J, Monteiro M. The alcohol use disorders identification test–Guidelines for use in primary care. Geneva, Switzerland: World Health Organization; 2001.
[38] World Health Organisation. Obesity: preventing and managing the global epidemic. Geneva: World Health Organisation; 2000. Report No.: 894.
[39] Bhaskaran K, Douglas I, Forbes H, dos-Santos-Silva I, Leon DA, Smeeth L. Body-mass index and risk of 22 specific cancers: a population-based cohort study of 5· 24 million UK adults. The Lancet 2014;384(9945):755–65.
[40] Jensen MD, Ryan DH, Apovian CM, Ard JD, Comuzzie AG, Donato KA, et al. AHA/ACC/TOS guideline for the management of overweight and obesity in adults: a report of the american college of Cardiology/American heart association task force on practice guidelines and the obesity society. Journal of the American College of Cardiology 2013;63(25 Part B):2985–3023, 2014.
[41] National Heart L, Blood Institute. Managing overweight and obesity in adults: systematic evidence review from the Obesity Expert Panel, 2013. Washington, DC: US Department of Health and Human Services; 2013.
[42] Kleibergen F, Paap R. Generalized reduced rank tests using the singular value decomposition. Journal of Econometrics 2006;133(1):97–126.
[43] Staiger DO, Stock JH. Instrumental variables regression with weak instruments. Econometrica 1997;65:557–86.
[44] Newhouse JP. Free for all? Lessons from the RAND health insurance experiment. Harvard University Press; 1993.
[45] Starfield B, Shi L, Macinko J. Contribution of primary care to health systems and health. The Milbank Quarterly 2005;83(3):457–502.
[46] Goodin RE, Le Grand J. Not only the poor: the middle classes and the welfare state. London: Routledge; 2018.
[47] Fertig AR, Carlin CS, Ode S, Long SK. Evidence of pent-up demand for care after Medicaid expansion. Medical Care Research and Review 2018;75(4):516–24.
[48] Love T, Blick G. Primary care funding – a discussion paper. Wellington: Sapere Research Group; 2014.
[49] Taylor C. Q&A: 'Scrap it!' Malloy draws line in sand over vexed VLCA debate. New Zealand Doctor; 2017.

[50] Primary Care Working Group, Wellington Primary care working group on general practice sustainability: report to the minister of health; 2015.
[51] Keene L, Bagshaw P, Nicholls MG, Rosenberg B, Frampton CM, Powell I. Funding New Zealand's public healthcare system: time for an honest appraisal and public debate. New Zealand Medical Journal 2016;129:10–20.
[52] Gauld R. New Zealand's post-2008 health system reforms: toward re-centralization of organizational arrangements. Health Policy 2012;106(2):110–3.
[53] Brown R. Sapere reasonable fees method 'not keeping up with GP costs'; 2018.
[54] Taylor C. Primary care keeps Budget hopes in check as Govt faces tough choices. New Zealand Doctor 2018.
[55] Chen J, Vargas-Bustamante A, Mortensen K, Thomas SB. Using quantile regression to examine health care expenditures during the great recession. Health Services Research 2014;49(2):705–30.
[56] Treasury, Wellington Economic and financial overview 2014; 2014.
[57] Shaw E, Howard J, Clark E, Etz R, Arya R, Tallia A. Decision-making processes of patients who use the emergency department for primary care needs. Journal of Health Care for the Poor and Underserved 2013;24(3):1288–305, http://dx.doi.org/10.1353/hpu.2013.0140.
[58] Milne BJ, Parker K, McLay J, Von Randow M, Lay-Yee R, et al. Primary health care access and ambulatory sensitive hospitalizations in New Zealand. The Journal of Ambulatory Care Management 2015;38(2):178–87.
[59] Cowling TE, Cecil EV, Soljak MA, Lee JT, Millett C, Majeed A, et al. Access to primary care and visits to emergency departments in England: a cross-sectional, population-based study. PLoS One 2013;8(6):e66699, http://dx.doi.org/10.1371/journal.pone.0066699.
[60] Ministry of Health. Annual data explorer 2016/17: new zealand health survey. Wellington: Ministry of Health; 2017 https://minhealthnz.shinyapps.io/nz-health-survey-2016-17-annual-update.
[61] Levesque J-F, Pineault R, Hamel M, Roberge D, Kapetanakis C, Simard B, et al. Emerging organisational models of primary healthcare and unmet needs for care: Insights from a population-based survey in Quebec province. BMC Family Practice 2012;13(1):66.
[62] Howell BE. Funding populations and paying providers: the role of financial risk in the New Zealand Primary Health Care Strategy. Wellington: Victoria University of Wellington; 2016.
[63] Stevens J, Cai J, Pamuk ER, Williamson DF, Thun MJ, Wood JL. The effect of age on the association between body-mass index and mortality. The New England Journal of Medicine 1998;338(1):1–7.
[64] Barnett P, Smith J, Cumming J. The roles and functions of primary health organisations. Wellington: Health Services Research Centre, Victoria University of Wellington; 2009.