



## Scorecards for health system performance assessment: The New Zealand example

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### ABSTRACT

**Objective:** To develop a national scorecard for assessing health system performance derived from routine data.

**Methods:** We drew upon national and international data to develop benchmarks for health system performance, then applied basic ratio scores to compare New Zealand performances to the benchmark. 64 indicators were included in four assessment categories: healthy lives, quality, access, and efficiency. In a fifth category, 27 of these indicators were used to score health system equity. Indicator scores in each category were then averaged to give a health system score out of 100.

**Results:** New Zealand's health system achieved an overall score of 71 out of 100. The system scored relatively well on quality and efficiency, but poorly on equity despite considerable government investment in reducing inequalities.

**Conclusions:** The scorecard offers a useful method for combining a range of data to give an overall picture of health system performance, highlighting strengths, weaknesses and areas for improvement. This initial study provides a baseline for assessing New Zealand's performance over time and, where data permit, a template for other countries to follow.

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### 1. Background

In recent years interest in health system performance measurement has grown [1]. This has been driven by a range of factors including the demand for performance improvement with increasing expenditure yet confined resources, for delivering high-quality services in a timely manner to the right population groups, and concerns about equity [2]. A variety of approaches to measuring health system performance have been developed. The WHO and the OECD have sought to compare and rank health systems across a range of functions and performance indicators [3–5]. These exercises have sometimes been controversial,

but also difficult because of the complexity of comparing different health systems. Organizations such as the Commonwealth Fund conduct annual surveys that result in ranking selected high-income countries with one another, highlighting where improvement efforts might be focused [6,7]. The health system scorecard concept is more recent and derived from the private business 'balanced scorecard' approach [8]. The idea is that a scorecard provides information on areas of strategic importance to guide future planning, but also a snapshot of how well an organization or system is performing.

In 2002, a group in the Netherlands began developing a framework for scoring that country's health system performance, outlining four dimensions of importance: consumer orientation, finances, delivery of high quality care, and capability for the health system to grow and learn [9]. This fed into production of the Dutch Health Care

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Performance Report, now into its third iteration [10]. There have been various similar efforts to produce scorecards that draw various indicators together, although these have been specifically designed for domestic health systems in developing world countries and are focused on issues unique to each [11,12]. The Commonwealth Fund (CWF), in creating a national scorecard for the US health care system builds on the earlier Dutch work, and remains the only one to give an overall numerical score out of 100 to a system [13]. The CWF therefore employed a framework containing different performance categories that had been validated in prior exercises, but extended upon this by providing a final score. The CWF scorecard featured data on 37 indicators within five sections: healthy lives, quality, access, efficiency, and equity of the health care system. The aim was to provide 'a unique whole-system view', a baseline for tracking changes in performance over time, and to identify weaknesses [13]. First published in 2006, the US national scorecard was repeated in 2008 with a 2010 update expected [14].

Following the CWF approach, we developed a scorecard for the New Zealand health system as a first endeavour to do so for a country other than the US. New Zealand's health system, which caters to a population of 4.4 million, is around 80% government-funded from general taxes with the remainder from private sources. In 2008, total expenditure was 9.9% of GDP [15]. The public sector dominates hospital care and public hospitals are free of charges; private hospitals offer only elective services without government subsidy, and there are no private emergency services. Primary medical care, by contrast, is largely privately provided, albeit with considerable government subsidies to offset patient co-payments. To date, as with most countries, a variety of measures have been used to assess New Zealand's health system making it difficult to get an overall picture of performance. These variously cover public hospital performance, performance of government District Health Boards that plan and purchase services in their localities, and selected health outcomes. Progress toward a set of six national health targets is reported quarterly by the government and, while such data are useful, we felt a scorecard would provide a broader, more comprehensive and coherent method for health system assessment. This article reports on the methods and results of our scorecard. The discussion outlines the benefits and shortcomings of health system scorecards, indicating where further research would be useful.

## 2. Methods

We sought to emulate the CWF methods in order to enable comparison with the US performance. As such, we looked to score the New Zealand system across the same categories using the same approach as the US scorecard. However, for many indicators requiring domestic data sources were incomparable, meaning some fundamental differences. We also incorporated a wider range of data, including from the New Zealand Ministry of Health and New Zealand Health Survey conducted by the government statistics department, and made more use of OECD data. The end result was a scorecard featuring 64 indicators

across four dimensions: healthy lives, quality, access and efficiency. The fifth equity section comprised 27 indicators drawn from the four other sections that had available data pertaining to ethnicity and deprivation. Scores were calculated as a simple ratio comparing New Zealand's performance to a benchmark level that should be aimed for.

Benchmarks for each indicator were established using various means. For indicators derived from international data, we set the benchmark by averaging the indicator values of the three top-performing countries. Where international data were unavailable, benchmarks were calculated by averaging the scores of the top performing New Zealand District Health Boards. Some scores were based on government health targets, for example, 95% of the population should be within 30 min of primary care providers. When benchmark data were unavailable, ideal benchmarks were set. For example, the benchmark for 'unmet need for GP in the previous 12 months' should ideally be 0; this was set at 1 as the value 0 cannot give a ratio score.

Each indicator was scored as a percentage with a maximum score of 100. Where higher values meant the health care system was performing better (e.g. healthy life expectancy) scores were calculated with the New Zealand value as a numerator and the benchmark value as the denominator. If lower indicator values indicated a positively performing health care system (e.g. infant mortality) then the score was calculated using the New Zealand value as the denominator and the benchmark as the numerator. Within sections, indicators were averaged to give an overall score, and the scores from each section averaged to give a total health system score out of 100.

Our method for scoring equity differed from the CWF scorecard which compared African American to white people, white to Hispanic, insured to uninsured, and high income to low income groups. Following the aim that New Zealand should be an equitable society, we focused on highlighting the maximum disparity between different groups within the population and therefore compared the best and worst scores for each indicator. An ethnicity score was calculated by comparing the score for the worst-performing ethnic group (calculated by a simple ratio of raw performance to benchmark) with the score for the best performing ethnic group. The same was done to compare the best and worst socioeconomic groups. Ethnicity scores for indicators were averaged to give a total score for ethnic disparity; the same was done to obtain a total score for socioeconomic disparity. The equity section differs from the other four in that we permitted scores of over 100 for groups performing above the benchmark in order to highlight the true level of disparity as restricting scores to 100 would have masked this. Scores were again averaged to give an overall score.

## 3. Results

The New Zealand health system received a score of 71, reflecting a strong performance in some areas and shortcomings in others. Indicators and scores in each of the five categories are presented below.



**Table 1**  
Healthy Lives.

Indicator	NZ value	Benchmark (number of countries data available for)	Score
1 Potential years of life lost, per 100,000 people [15]	3635	2645.7 <sup>a(26)</sup>	72.8
2 Amenable mortality, deaths per 100,000 [40]	95.6	69.1 <sup>b</sup>	72.3
3 Deaths from cancer, deaths per 100,000 [15]	164.2	124.0 <sup>a(27)</sup>	75.5
4 Infant mortality, deaths per 1000 live births [15]	5.2	2.2 <sup>a(28)</sup>	41.7
5 Healthy life expectancy at the age of 65 (males), years [15]	18.1	18.6 <sup>a(28)</sup>	97.5
Healthy life expectancy at the age of 65 (females), years	20.7	22.7 <sup>a(28)</sup>	91.2
Healthy life expectancy at the age of 65, years (m/f average scores)			94.3
6 Self-rated general health $\geq$ very good in adults [41]	60.6	62.4 <sup>c</sup>	97.1
7 Self-rated general health $\geq$ very good in children aged 0–14 years [41]	87.2	90.0 <sup>c</sup>	96.9
8 Justified school absence rate, per school year (2006) [42]	7.4	6.9 <sup>d</sup>	93.2
9 Obesity, BMI $\geq$ 30 [15]	20.9	5.0 <sup>a(7)</sup>	24.1
10 Daily smoker [15]	18.1	16.7 <sup>a(18)</sup>	92.3
11 Hazardous alcohol consumption (audit $\geq$ 8) [41]	17.7	14.8 <sup>c</sup>	83.3
12 Prevalence of diagnosed diabetes mellitus [15]	5.2	2.9 <sup>a(30)</sup>	56.4
Overall healthy lives score			75.0

<sup>a</sup> Top 3 OECD countries.<sup>b</sup> Top 3 countries.<sup>c</sup> Top 2 of 9 NZ District Health Board areas.<sup>d</sup> Top 3 New Zealand regions.

### 3.1. Healthy lives

This category aimed to evaluate the current state of New Zealand population health (Table 1). Ten indicators assess population health as a whole. Standard measures of health such as amenable mortality, infant mortality and life expectancy were included to facilitate international comparison. In addition, two lifestyle indicators, obesity and smoking, assess behaviours which impact on preventable disease. New Zealand performed reasonably well in this section with half the indicators scoring above 80. It compared well with the OECD average on potential years of life lost, but below the benchmark of the top three countries. However, performance was worse on infant mortality, obesity and prevalence of diabetes, lowering the healthy lives score to 75.

### 3.2. Quality

When assessing quality multiple factors need to be taken into account [4,16]. These include preventive care such as screening programmes, coordination between primary care and other providers, and care received during hospitalization. Care should also be patient-centred and delivered in a safe environment. Twenty-three indicators were used to determine the quality of care, giving an overall quality score of 78.5 (Table 2). Indicators measuring the quality of children's health services achieved the highest scores, with immunization and pre-school "B4 5" checks scoring 100. Cervical screening and cardiovascular assessment scored 96.3 and 92.3 respectively, with a lower score for mammography screening. Solid scores were obtained for the quality of doctor consultations, encouraging patients to ask questions,

explaining treatment options and involving patients in decisions. Scope for improvement could be seen in the scores for diabetics with their condition under control (65.5), rate of hospitalized patients prescribed new treatment with medication reviewed at discharge (47), and hospitalized patient infection rates (57). The lowest scoring indicator was for potentially preventable adverse events, although New Zealand's performance here was not dissimilar to that of other developed countries.

### 3.3. Access

Assessing access requires consideration of workforce and services capacity as well as whether services are accessible [17]. We therefore selected a range of indicators pertaining to these issues, along with barriers to access such as cost, distance, and availability of appointments when needed (Table 3). As primary care is the foundation of a high-performing health system, it must be accessible to all [18]. Therefore, of 17 indicators used in this component of the scorecard, 11 relate to primary care. A further four relate to oral health. The remainder assess the number of doctors per capita and geographical distance of the population from services. The score of 63.9 indicates room for improvement. New Zealand has comparatively low scores on doctors per capita, but high scores for adults with a regular general practitioner (GP) (93) and reporting being able to see a GP within 24 h (81.6). Children have even better primary care access with almost 98% having a regular GP. As care for under-6 year olds is fully funded in New Zealand, a score of 100 might be expected. However, for adults cost is the principal reason for unmet need in primary care reflected in the poor score of 52.6. Oral health is

**Table 2**

Quality.

Indicator	NZ value	Benchmark (number of countries data available for)	Score
Adults receiving recommended screening and preventive care			
13 Flu vaccination [15]	66.4	76.9 <sup>a(21)</sup>	86.3
14 Cervical screening [15]	75.5	78.4 <sup>a(20)</sup>	96.3
15 Mammograms [15]	66.9	82 <sup>a(18)</sup>	81.6
16 Cardiovascular assessment [43]	75	81.3 <sup>b</sup>	92.3
Children receiving recommended screening and preventive care			
17 Children's immunisations [43]	87	85 <sup>c</sup>	100.0
18 Children who had one or more teeth removed due to decay/abscess/infection/gum disease [41]	11.2	8.2 <sup>d</sup>	73.2
19 "B4 school checks" [44]	83	67 <sup>c</sup>	100.0
Others			
20 Better help for smokers to quit [41]	57	80 <sup>d</sup>	71.3
21 Adults with mood disorder receiving medication [41]	47.6	55.5 <sup>d</sup>	85.8
22 Children who are receiving treatment for asthma [41]	39.2	43.9 <sup>d</sup>	89.3
23 Diabetes not under control (HbA1c < 8%) [45]	29	19 <sup>b</sup>	65.5
24 Adults with Hypertension who received plans for self management or have a nurse [46]	82	90.7 <sup>f(6)</sup>	90.4
25 Hospitalised patients with new treatment: medications reviewed at discharge [6]	47	100 <sup>f(8)</sup>	47.0
26 Any discharge gaps after hospitalisation* [6]	53	46.3 <sup>f(8)</sup>	87.4
27 Chronic patients readmitted to hospital due to complications [6]	11	8.7 <sup>f(8)</sup>	79.1
28 Patients who developed infections while in hospital [46]	10	5.7 <sup>f(6)</sup>	57.0
29 Reported medications or laboratory errors [6]	25	18 <sup>f(8)</sup>	72.0
30 Adverse events while in public hospital [47]	13.1	1 <sup>e</sup>	7.6
31 Patients with chronic conditions who think the health system needs to be rebuilt [6]	21	12.3 <sup>f(8)</sup>	58.6
32 Doctor rarely or never encourages you to ask questions [6]	29	26.7 <sup>f(8)</sup>	92.1
33 Doctor rarely or never tells you about treatment options or involves you in decisions [6]	17	16 <sup>f(8)</sup>	94.1
34 Chronic patients not given clear instructions from health professionals regarding further symptoms or when to seek help [6]	17	16.3 <sup>f(8)</sup>	95.9
35 Adults with chronic health problems given written instruction or plan for home care [6]	43	52 <sup>f(8)</sup>	82.7
Overall quality score			78.5

\* Discharge gaps: no clear instructions after discharge, no contacts given, no written plan after discharge, no further arrangements made.

<sup>a</sup> Top 3 OECD countries.

<sup>b</sup> Top 3 NZ District Health Boards.

<sup>c</sup> NZ ministry of health target.

<sup>d</sup> Deprivation quintile with best score.

<sup>e</sup> Based on ideal value.

<sup>f</sup> Top 3 countries included in Commonwealth Fund study indicator drawn from.

a major area of concern with low scores on several of these indicators and, with subsidies only available to children, considerable cost barriers for adults.

### 3.4. Efficiency

Health system efficiency might be defined as functioning in the most cost-effective manner with the least waste of time and effort [3]. We used 14 indicators to measure efficiency, divided into four categories: hospital throughput, acute throughput, wastage/incorrect use of services and added costs. The overall score of 80.9 reflects a relatively efficient health system, with scope for improvement. Strengths include in-hospital and acute care throughput, with 90.7 for day surgery rates, 100 for meeting elective surgery targets, scoring above the international benchmark for average length of stay and correct use of emergency and specialty services. Emergency triage times were scored against the Australasian College of Emergency Medicine

recommendations [19]. New Zealand scored well for triage one but performance declined in lower triage categories. Efforts for improvement could also be directed toward wastage, such as repeat laboratory tests and New Zealand's comparatively high administrative expenditure (Table 4).

### 3.5. Equity

A health system should provide services equitably, regardless of population ethnicity or socioeconomic status [20]. This is especially important in countries such as New Zealand, given population diversity, but also as its Treaty of Waitangi guarantees equal rights to indigenous Maori and other New Zealanders. As noted, the equity score was calculated using data by ethnicity and deprivation quintiles for several indicators from other scorecard sections. Lower scores represent greater inequity between population groups.



**Table 3**  
Access.

Indicator	NZ values	Benchmark (number of countries data available for)	Score	
36	GPs per thousand population [15]	0.85	1.7 <sup>a(29)</sup>	51.0
37	Physicians per thousand population [15]	2.5	4.1 <sup>a(29)</sup>	59.4
38	Regular GP [41]	93	100 <sup>b</sup>	93
39	Regular GP (children) [41]	97.9	100 <sup>b</sup>	97.9
40	Unmet need for GP in the previous 12 months [41]	6.8	1 <sup>b</sup>	14.7
41	Unmet need for GP in the previous 12 months (children) [41]	4.1	1 <sup>b</sup>	24.4
42	Cost barrier for GP access in the previous 12 months [41]	1.9	1 <sup>b</sup>	52.6
43	Cost barrier for GP access in the previous 12 months (children) [41]	0.8	1 <sup>b</sup>	100
44	Uncollected prescription due to cost in the previous 12 months [41]	1.5	1 <sup>b</sup>	66.7
45	Uncollected prescription due to cost in the previous 12 months (children) [41]	1.1	1 <sup>b</sup>	90.9
46	Never visited oral health care worker [41]	2.3	1 <sup>b</sup>	43.5
47	Never visited oral health care worker (children) [41]	9.2	10 <sup>c</sup>	100.0
48	Unmet need for oral health care services in the previous 12 months [41]	10.6	1 <sup>b</sup>	9.4
49	Unmet need for oral health care services in the previous 12 months (children) [41]	3.4	1 <sup>b</sup>	29.4
50	Primary health care provider available within 24 h [41]	81.6	100 <sup>b</sup>	81.6
51	Population over 60 min from ED [48]	7	5 <sup>c</sup>	71.4
52	Population over 30 min from GP [49]	3.4	5 <sup>c</sup>	100
Overall access score			63.9	

<sup>a</sup> Top 3 OECD countries.<sup>b</sup> Based on ideal value.<sup>c</sup> Based on NZ ministry of health targets [50].**Table 4**  
Efficiency.

Indicator		NZ value	Benchmark (number of countries data available for)	Score
Hospital throughput				
53	Day surgery rates, % of elective and arranged surgery [30]	60.25	66.4 <sup>a</sup>	90.7
54	Average length of stay, days [15]	4.4	4.5 <sup>b(28)</sup>	100
55	Improved access to elective surgery, % meeting target [43]	105	100 <sup>c</sup>	100
56	Shorter waits for cancer treatment, % meeting target* [43]	99	100 <sup>c</sup>	99
Acute throughput				
57	Shorter stays in emergency department (ED), % meeting target [43]	87	95 <sup>c</sup>	91.6
58.1	Emergency triage times – triage 1, % meeting target* [30]	99.7	100 <sup>a</sup>	99.7
58.2	Emergency triage times – triage 2, % meeting target** [30]	70.1	80 <sup>a</sup>	87.6
58.3	Emergency triage times – triage 3, % meeting target*** [30]	49.1	75 <sup>a</sup>	65.5
Wastage/errors				
59	Test results not available or test repeated unnecessarily [6]	21	14 <sup>d</sup>	66.7
60	Went to ED for condition that could have been treated by regular doctor [6]	8	6 <sup>d</sup>	75
61	Perception of inefficient care [6]	34	27 <sup>d</sup>	79.4
62	Attendance at speciality clinics [30]	91.2	100 <sup>a</sup>	91.2
Additional costs				
63	Health administration costs <sup>5</sup> [15]	7.2	0.83 <sup>b(23)</sup>	11.5
64	Sick leave <sup>#</sup> [30]	2.85	2.14 <sup>a</sup>	75.1
Overall efficiency score				80.9

%; radiotherapy within 6 weeks of first specialist appointment; \$: as a percentage of total health expenditure; #: as a percentage of accrued fulltime equivalent hours; \*: triage 1 represents the percentage of triage 1 patients in ED seen immediately by a health professional; \*\*: triage 2 represents the percentage of triage 2 patients in ED seen within 10 min by a health professional; \*\*\*: triage 3 represents the percentage of triage 3 patients in ED seen within 30 min by a health professional.

<sup>a</sup> Top 3 NZ District Health Boards.<sup>b</sup> Top 3 OECD countries.<sup>c</sup> NZ ministry of health targets.<sup>d</sup> Best of 8 countries.

**Table 5**  
Equity.

Healthy lives indicator		Ethnicity scores			Socioeconomic scores		
		Worst	Best	Score	Worst	Best	Score
1	Infant mortality [51]	30.1	57.0	52.8	27.8	77.4	35.9
2	Healthy life expectancy at the age of 65, males [52]	74.3	98.0	75.8	NA	NA	NA
	Healthy life expectancy at the age of 65, females	70.9	92.1	77.0	NA	NA	NA
	Healthy life expectancy at the age of 65, total			76.4	NA	NA	NA
3	Self-rated general health $\geq$ very good in adults [41]	80.6	101.4	79.5	82.5	111.4	74.1
4	Self-rated general health $\geq$ very good in children aged 0–14 years [41]	90.4	98.7	91.7	92.8	101.8	91.2
5	Justified school absence rate* [42]	85.2	160.5	53.1	88.5	97.2	91.0
6	Obesity, BMI $\geq$ 30 [41]	7.7	42.3	18.3	13.4	24.4	54.8
7	Daily smoker [41]	39.0	159.0	24.5	48.3	151.8	31.8
8	Hazardous alcohol consumption (audit $\geq$ 8) [41]	44.8	263.4	17.0	61.0	87.8	69.4
9	Prevalence of diagnosed diabetes mellitus [41]	29.3	68.1	43.0	47.3	108.5	43.5
Quality indicator							
10	Cardiovascular assessment [43]	82.7	95.1	87.0	NA	NA	NA
11	Children's immunisations [43]	97.6	104.7	93.3	NA	NA	NA
12	Children who had one or more teeth removed due to decay/abscess/infection/gum disease [41]	50.0	80.0	62.5	50.0	100.0	50.0
13	Adults who are receiving medications for mood disorder [41]	64.3	85.7	75.0	73.2	100.0	73.2
14	Children who are receiving treatment for asthma [41]	72.7	95.5	76.2	81.8	100.0	81.8
Access indicator							
15	Regular GP, per thousand population [41]	86.0	93.9	91.6	91.2	94.7	96.3
16	Regular GP (children), per thousand population [41]	92.5	98.6	93.8	97.0	98.5	98.5
17	Unmet need for GP in the previous 12 months [41]	8.5	16.1	53.0	9.9	21.7	45.5
18	Unmet need for GP in the previous 12 months (children) [41]	14.9	26.3	56.7	18.9	41.7	45.3
19	Cost barrier for GP access in the previous 12 months [41]	24.4	76.9	31.7	33.3	83.3	40.0
20	Cost barrier for GP access in the previous 12 months (children) [41]	55.6	333.3	16.7	90.9	333.3	27.3
21	Uncollected prescription due to cost in the previous 12 months [41]	23.3	90.9	25.6	30.3	166.7	18.2
22	Uncollected prescription due to cost in the previous 12 months (children) [41]	50.0	100.0	50.0	45.5	250.0	18.2
23	Never visited oral health care worker [41]	9.2	125.0	7.3	20.4	142.9	14.3
24	Never visited oral health care worker (children) [41]	37.0	64.1	57.8	41.7	78.1	53.3
25	Unmet need for oral health care services in the previous 12 months [41]	5.6	12.0	46.1	7.6	14.1	53.8
26	Unmet need for oral health care services in the previous 12 months (children) [41]	21.7	43.5	50.0	24.4	35.7	68.3
27	Primary health care provider available within 24 h [41]	78.2	84.3	92.8	78.8	83.2	94.7
Total of ethnicity and SES				56.4			57.1
Overall equity score							56.8

\* 2006 semester year; SES: socioeconomic status.

The equity score was a concerning 56.8, consistent with other research showing considerable variation in the outcomes of different New Zealand population groups [21,22]. Specific areas of concern include differences in infant mortality rates with scores of 57 for New Zealand Europeans compared with 30.1 for Maori and a wider gap between socioeconomic groups; in obesity rates by ethnicity, with 42.3 for Asians contrasting with 7.7 in Pacific Islanders;

in smoking, with Maori four times as likely to be daily smokers than Asians and those from lower socioeconomic groups twice as likely than those in higher groups; discrepancies in primary care cost barriers between ethnic and deprivation groups, even for children despite full government subsidies; and differences in oral health access. The best performances were in quality of care and access indicators related to having a regular GP (Table 5).



#### 4. Discussion

This first-ever scorecard on New Zealand's health system portrays mixed results. It implies a relatively good performance in terms of efficiency, with quality of care and healthy lives not far behind. It also highlights the considerable scope for improvement when it comes to access and equity. Performances were also varied within each of the five scorecard categories. The value of the scorecard is that it shows areas where more effort is demanded but also the specific issues that require attention which can be critical when resources are limited. The results indicate that New Zealand's future policy activities could be directed toward: reducing infant mortality, obesity and diabetes; medicine reconciliation for hospitalized patients and reducing adverse events; eliminating unmet need and cost barriers in primary care settings and improving oral health access; lowering administrative costs; and reversing the inequities that are commonplace. These findings align with New Zealand's performance as portrayed in other health system assessment material such as that produced by the OECD, the WHO and the CWF [5–7,15,23]. However, the scorecard approach makes accessing such information and being able to look at a country's overall performance 'at a glance' much more straightforward [5]. In producing this New Zealand scorecard, we have been able to show that it is both practicable to assemble data in this way for a country other than the US, while establishing a prototype for those outside the US to build upon. In this regard, we believe there is considerable scope for health system scorecards to be developed elsewhere and, with wider use of international datasets as we have attempted, to be able to use these for comparative analysis.

New Zealand's scores for access and equity are of particular concern as values of equality underpin New Zealand health policy and society [24]. Furthermore, there have been ongoing government efforts over the past decade to reduce health inequalities and improve service access with specific programmes designed for people from disadvantaged ethnic and socio-economic groups [25,26]. In this regard, the scorecard provides baseline data and will be a useful mechanism for tracking progress.

Of course, the scorecard approach as used in this article bears little resemblance to the original balanced scorecard model developed for use by private business. As noted by its originators, the balanced scorecard model differed from other measurement systems in that it explicitly asked users to identify and acknowledge links between scorecard sections [27]. For example, a company might look at how internal processes aimed at product development and marketing align with the perspectives of customers and whether customer satisfaction is the key to making a profit. Performance measurement across the different sections of the scorecard, using relevant indicators, facilitated insights into the interrelationships amongst the perspectives deemed relevant to the company. It was this characteristic of the balanced scorecard that distinguished it from simply grouping indicators into different domains. Following this, when deciding on how to improve an area of sub-standard performance when using the results of the New Zealand or another health system scorecard, the

interrelationships between the five sections need to be taken into account. There should be awareness of how specific improvements in access, equity, efficiency and quality relate to improvements in healthy lives. This may be the fundamental benefit of the scorecard approach in that insights into interrelationships can be gained when data on all scorecard indicators are collected routinely [28].

Potential benefits aside, questions remain around how to use a scorecard in practical health policy settings. Gaining agreement on the goals inherent within a scorecard and reorienting health planners and professionals toward these may be a highly involved and complex undertaking [28,29]. Especially so in a public health care system such as New Zealand's where there is limited scope for linking performance incentives at the local level to national scorecard goals.

The New Zealand scorecard is subject to limitations. First, any scorecard is only as good as its data sources. Ideally, all indicators would have been drawn from data that is collected routinely and consistently. However, routine data were unavailable for some indicators, such as incidence of in-hospital adverse events, meaning a need to rely on stand-alone studies that will require repeating for subsequent scorecards. For other possible indicators, such as access to antenatal and psychiatric services, no data were available. Data for some indicators in the efficiency section were from government Hospital Benchmark Information reports [30]. From 2011, these will be produced in a different format, by hospitals themselves, which will complicate future scorecard efforts. Equity data were not available for all indicators, excluding some from the equity section. Our scorecard was also focused mostly on performance of the publicly funded health system, responsible for around 80% of total health expenditure, although several indicators pertain to services predominantly provided by private GPs who receive public subsidies. It could be useful to incorporate specific private sector indicators in further scorecard iterations.

Second, our approach of establishing national benchmarks for various indicators by averaging the scores of the top three District Health Boards has an implication that we were measuring performance variations rather than performance per se, as has been the approach in other health system scorecards [11,13]. This means a high scoring district or service area simply scores as well as the best, with the remainder varying to differing degrees from the benchmark.

Third, ideally, the New Zealand scorecard would have contributed to international work on health systems by being directly comparable to the CWF's scorecards. As noted, the setting of benchmarks differed, in that we made wider use of international data, as did the methods for scoring equity. This means direct comparison was not possible. That said, some general observations about the comparative performances of the two countries can be made. New Zealand's score of 80.9 for efficiency is considerably higher than the CWF's scores for the US in this category of 52 and 53 in 2006 and 2008 respectively [14]. As often implied elsewhere, this may be a function of New Zealand's single-payer, tax funded health system with a strong policy focus on primary care [7,31,32]. New Zealand's lower



scores on equity – 56.8 compared with the CWF's 71 in 2008 – could be considered an anomaly, although health inequalities are well documented in both countries and, in the US, are perpetuated by the number of people who lack health insurance coverage [21,33–35]. Furthermore, unlike the US, New Zealand has universal and free access to hospital care, although primary care charges often pose a barrier for poorer people [6]. The variation in scores between the two countries may be a function of the different method for scoring equity used for the New Zealand scorecard.

Fourth, following the CWF's approach, each section in the New Zealand scorecard was given equal weighting in composing the overall score. It is arguable that some indicators or sections could have greater weightings than others based on the perceived importance of their contribution to the performance of the health system. In the absence of such information each section remained equally weighted. Future research efforts could be directed to probing societal preferences which, if reflected in weightings, could have implications for the overall score. Determining preferences is, of course, an inherently difficult undertaking with various approaches available. One method, developed originally for marketing research, that might be applicable to weighting scorecard sections, is conjoint analysis which may involve a range of communities [36]. More recently, this has been used to guide health care prioritization decisions [37,38]. Final decisions over scorecard section weightings could be subject to further conjoint analysis, complemented with other techniques such as the Delphi method [39]. The lack of within-section weights within our scorecard is another possible design limitation that could have implications for policy. For example, the finding that New Zealand scores poorly on doctors per capita compared with an international benchmark suggests workforce investments are required. Yet this is countered by high scores on access to general practitioners. Future scorecard iterations could, therefore, look to incorporate weightings on items within sections to adjust for such factors.

Finally, as previously highlighted by the CWF, it would have been useful to include a sixth scorecard section on capacity to innovate and improve [13]. Like the CWF, we encountered difficulty locating data that would accurately represent such capacity and so excluded this section. Future scorecard work might look to develop indicators relating to research, training and resourcing in quality improvement and innovation, and continuing workforce education.

These caveats aside, this scorecard highlights the strengths and weaknesses of the New Zealand health system in a concise, potentially reproducible manner. The scorecard approach allows data to be viewed clearly and ensures areas of concern are not overlooked. The score of 71 for New Zealand indicates an adequate performance and baseline from which to assess progress over time. Very importantly, our New Zealand version of the CWF's scorecard shows that this is a model for health system assessment that can be applied in different country contexts. The challenge now is for researchers elsewhere to follow suit.

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