

## POLICY NOTE:

### Exploring factors driving the performance of rural health care in Papua New Guinea <sup>1</sup>

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#### Key messages:

- Papua New Guinea faces particular geographic challenges and is under-performing in relation to its neighbours on core health outputs.
- Analysis of the determinants of health service performance at sub-national levels is critical, and can be performed using basic health information (including financial data) even in settings where the data is limited.
- We find that provinces with the highest overall performance rankings also do well specifically in supervision, outreach and immunisation. These provinces are not advantaged by proximity – four of the seven which do the most outreach have to deal with some of the hardest to reach populations. This suggests that the challenge of proximity, whilst undoubtedly significant, is surmountable with strong management.
- It is also interesting that the seven provinces which do well with outreach (and overall performance) do typically spend more on frontline services. This suggests that provinces with strong management which prioritise frontline spending can better support supervision and outreach and see better immunisation levels.

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## Summary

Examining performance patterns of sub-national units, such as provinces and districts, within a health system is important to understand their drivers and what might be needed to improve outputs. Such literature is relatively rare in low and middle-income countries. It is particularly relevant for Papua New Guinea, which is underperforming in relation to its neighbours and targets for core health indicators and faces particular geographical challenges, with a dispersed and diverse population.

In this analysis, we undertake simple correlation analysis between remoteness of populations, expenditure on frontline services and core outputs by provinces and regions, such as antenatal care, outpatient visits, outreach clinics, referrals of patients and facility supervision in 2012. In the context of the challenging geography of Papua New Guinea, these are expected to be important factors. Some expected patterns were found – for example, between remoteness and higher service costs, as well as between remoteness and higher outreach services. Outpatient visits, however, increased with remoteness, which was surprising. Our correlation analyses suggest a virtuous circle operating in some areas (even in the most geographically challenged) between outreach clinics, immunisation coverage, supervision, frontline spending and overall health system performance, which merits further investigation into the factors supporting these and how they can be reinforced elsewhere. Whilst expenditure did not correlate closely with provincial performance, it was evident that the provinces with higher performance across the selection of metrics typically were also the higher spenders on frontline services. There was some correlation of higher performance with density of public provision. More fine-grained assessment, including at the district level, will be needed to understand the low levels of outreach clinics, transfers and supervision, all of which are critical for quality health care in these kinds of contexts.

The analysis illustrates what can be learned from combining routine data sources, as well as the limits and the need to complement such analysis with more detailed local qualitative investigations. It also reinforces the message that local leadership, supportive supervision and resources directed to frontline services can be effective in raising health system performance, even in challenging settings.

## Introduction

National health systems performance assessments are critical to understanding how well the delivery of healthcare meets the needs of citizens. Benchmarking has often been done between countries to inform the global public health space(1993). However, its impact is likely to be far greater when implemented sub-nationally to inform actual decisions on resource allocations and performance improvements, especially in high disease burden, low-income countries, where the resource envelope available for health is inadequate(Noor 2015).

Papua New Guinea (PNG) had a population of just over 8 million in 2016, but faces particular geographical challenges, with its provinces being mountainous and spread over more than 600 islands. There is also wide cultural diversity, with more than 800 indigenous languages across the country(2012). PNG has experienced a steady improvement in health indicators since independence in 1975(2016). Life expectancy increased from less than 40 years in 1960 to 63 years in 2014. Under-five mortality declined from 200 per 1,000 live births in 1960 to 57 in 2015. Infant mortality in Papua New Guinea in 2013 is recorded as 47 per 1,000 live births, which is a significant improvement on the level of 57 reported in 2003. However, the pace of progress has slowed and PNG still lags behind other countries in the region and those of similar income status.

Access to health services is particularly challenging in rural PNG. The majority of the population (85% or more) live in rural villages, which are often difficult to access. The challenging terrain of PNG limits the population's access to health services and health providers' ability to reach remote populations for even basic programs such as immunization. In PNG, many villages can only be reached on foot and less than 39 percent of the limited road network is in good condition (Department of National Planning and Monitoring 2015). In coastal areas, the main mode of transport is by boat. In addition to rural challenges, there is an increasing population in unplanned urban settlements, which is presenting a new set of health demands.

PNG has a formal government-funded health system throughout much of the country. It is supplemented by government-subsidized health services provided by various faith-based organizations. At the time of independence from Australia in 1975, a centralized National Department of Health (NDOH) managed the whole health system. Since independence, the government has taken successive steps to decentralize the provision of services to provincial and local governments, including the introduction of two significant Organic (Constitutional) Laws (in 1977 and 1995). This legislation gives provinces and local level governments' enhanced control over health service delivery and resources. The 1995 Organic Law devolved primary health care services to the provincial level(1995).

Total health expenditure, as a proportion of Gross Domestic Product, has been stagnating at between four to five percent in recent years, despite steady economic growth. Health financing is predominately public. In 2014, government spending (including government spending financed by external sources) accounted for over 80 percent of total health spending; the remaining 20 percent was attributed to private expenditure. In principle, all public health and primary health care services are free of charge(2012), and out-of-pocket payments are estimated at 15.9%, which is below the threshold where they are likely to create catastrophic payments for households (WHO, 2010).

This paper aims to understand the differential performance of provinces in relation to health care in PNG, and especially to understand the relationship between expenditure, proximity to facilities and core health outputs. By combining routine data analysis with existing reports and interviews with key informants, explanations for patterns can be found which point to areas of strength and weakness on which the health system can build.

In addition to contributing to the small but growing number of studies of sub-national efficiency in low and middle income countries(Ensor, So et al. 2016), this analysis contributes to the literature on the relationship between health spending and outputs. It is well understood that the likelihood of health spending leading to better health outputs depends on health system efficiency (WHO 2010). A recent WHO report highlights the limited utility of spending targets to inform country policy dialogue and decision making(Jowett, Brunal et al. 2016). However, in general, low-income countries and poorer populations within countries are likely to benefit more from increased health expenditure. One paper estimated that a one percent increase in public spending on health had twice the impact on child mortality for the poor- than for the non-poor(Gupta, Verhoeven et al. 2001). Equally, a study in Nigeria (Olaniyan and Lawanson 2010) found that lower per capita expenditure in health in northern states made insufficient health funding a primary issue, while the context of greater per capita expenditure on health in southern states and higher public funding made efficiency of expenditure a greater issue.

## Methods

In order to understand the overall performance of the health system in PNG, as a first step, core universal health coverage (UHC) tracking indicators which were relevant for PNG and for which data were available were compared with neighbouring countries in the East Asia and Pacific region. PNG's close Pacific neighbours - Fiji, Solomon Islands and Vanuatu - and Cambodia, Laos and Myanmar in East Asia were included. The analysis included essential health prevention, promotion and treatment outputs – elements which contribute to longer life expectancy and lower infant mortality.

The study then compared the spending on a set of frontline service delivery activities with a set of relevant performance indicators, using 2012 data provided by the National Department of Health (NDOH) and the National Economic and Fiscal Commission (NEFC), PNG. All provinces in PNG were included in the analysis, with the exception of the Autonomous Region of Bougainville (ABG) and the National Capital District. The ABG and NCD have different funding arrangements to provinces. The health expenditure data at provincial level includes spending by provincial governments from health function grants and internal revenue, but excludes spending by church-run facilities from church operating grants. The expenditures cover the non-salary recurrent costs which are critical to the functioning of frontline service delivery activities.

The performance indicators were identified in a review of facility data from the National Department of Health information system (NHIS). The performance data were reviewed for consistency. Six indicators were chosen:

(1) Antenatal fourth visit, defined as the percentage of pregnant women that attend their 4<sup>th</sup> antenatal visit at a health centre or outreach clinic during the pregnancy. This visit presents opportunities for reaching pregnant women with interventions that may be vital to their health and well-being and that of their infants;

(2) Outreach clinics held per 1,000 population per year. This indicator was chosen because rural outreach provides the key platform for preventive child health programmes, and an opportunity for individual community health education;

(3) Outpatient visits per person per year. This provides a measure of general use of health facilities by the local community, as well as being a sign of confidence in the services available;

(4) Patient referrals, defined as the number of patients recorded as being transferred from health centres to other health facilities per 1,000 people per year. This indicator is important as in rural settings health centres often need to assist patients to transfer to another hospital for urgent medical care;

(5) Essential medicine stock outs, monitoring the proportion of months in a year that have nil stock out of eight essential medical supplies. This indicator is included as the availability of basic drugs and medical supplies are critical enabling elements for health centre staff; and

(6) Supervision, defined as the proportion of health centres that have received at least one supervisory visit by provincial health officers (PHOs) and doctors in one year.

A frontline performance index was created, allowing for comparison between the provinces. It included the following outputs reported by rural facilities (excluding hospitals) within a province: antenatal fourth visit & antenatal TT; outreach clinics held; outpatient visits; patient referrals; essential medicine stock outs; supervision activities by doctors and by provincial health officers. The results for each output were ranked from 1 to 18 for each province, with the best performing province highest and the lowest performing province lowest. Each output was given equal weighting, with the average of the output results providing the index score.

Spending was also compared against an independent costing study (Commission 2014), which acts as a benchmark for the adequacy of the spending. Proximity was also included (2014), based on local government scores for accessibility and remoteness; this allowed the study to consider the influence of remoteness and isolation upon the health system, which is particularly relevant for PNG. Finally, the findings were explored through ten interviews with senior provincial health officials from a selection of provinces in October 2015 and compared with the findings of other recent studies on rural health care in Papua New Guinea.

We could not use regression method in this study because the number of observations is too small. Therefore, we used correlation diagrams to explore the factors driving the performance of rural health care in Papua New Guinea.

## Limitations

The study has several limitations. The first is the quality of the data. Efforts have been made to clean the data to ensure consistency, however variability in the recording, coding and accuracy of both the NHIS output data and the expenditure data are noted. The second is that our methods are primarily descriptive, focusing on the correlation between the performance indicators in respect to proximity to health services and the spending, rather than using multivariate regressions. This method is partly driven by limited data points. The analysis, while limited, still serves to illustrate the importance of different factors in driving local system performance.

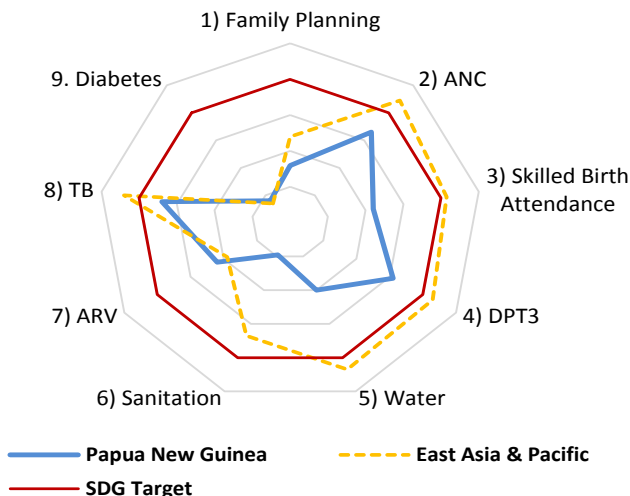
## Results

### Overall performance of the health system

Figure 1 shows how PNG as a country performs relative to its neighbours and the Sustainable Development Goal (SDG) targets for key indicators of health prevention and promotion. It demonstrates

that overall it is performing below the regional average, especially for indicators such as skilled birth attendance which are closely linked to functional health systems, as well as falling short of SDG targets.

Figure 1 PNG in the regional context, comparing key UHC indicators



Source: Indicators are from WDI database; the SDG target was defined as 80% coverage(2015)

Three of the indicators focus on reproductive health. Achieving family planning coverage with modern methods (i.e. contraceptives) promotes women’s health and family wellbeing. Against this indicator PNG recorded 32%, compared to a regional average of 48%. Good practice in antenatal care requires at least four visits to a care provider during a pregnancy. Against this indicator PNG recorded 66%, compared to a regional average of 89%. When births are attended by skilled health professionals, the outcomes for mother and child improve markedly. Against this indicator PNG recorded 44%, compared to a regional average of 89%.

Three are focused on prevention. DPT3 – the percentage of children receiving the third dose of the combined diphtheria, pertussis and tetanus vaccine - is an indicator of how well countries provide routine immunization. Against this indicator PNG recorded 62%, compared to the regional average of 86%. Access to clean water for drinking and personal use is a basic need. It combats disease and helps promotes a healthy community. Against this indicator PNG recorded 40%, compared to a regional average of 87%. For PNG’s rural majority, the situation is even worse, with 33% of people in rural areas having access to improved water sources. Access to sanitation and hygiene facilities combats the spread of disease and promotes a healthy community. Against this indicator PNG recorded a very low 19%, less than one-third of the regional average of 67%. Again, the situation is even worse for people in rural areas, with only 13% recorded as having improved sanitary facilities.

The final three indicators focus on treatment of diseases. The coverage of antiretroviral therapy enables people to live with HIV. Against this indicator PNG recorded 44%, slightly higher than the regional average of 38%. For TB treatment, PNG recorded 68%, below the regional average of 88%. In relation to treatment of diabetes, PNG recorded 16%, which is slightly higher than the regional average of 14% (which is however extremely low).

## Performance at provincial level

Within this overall context, it is important to analyse and understand the drivers of health system performance at the provincial level. Table 1 gives an overview of the regions, provinces and their context, including the distance to health facilities within each province (proximity), the proportion of health centres which are state-owned in each, and the expenditure on frontline services. Six indicators of health system performance are reported, grouped into quartiles. It is clear that there is considerable variation across provinces and domains, with however broadly higher performance in some regions (for example, Islands) compared to other (e.g. Highlands).

Table 1 Context, frontline spending and performance metrics, by province

Region	Province	Proximity challenge	% State health centres	Frontline spending	Antenatal 4th visit	Outpatient numbers	Drug supplies	Outreach clinics held	Patient transfers	Supervision (PHO's)	Supervision (doctors)
Southern	Western	■	42%	■	Low	High	Low	Low	Higher	Low	Medium
	Gulf	■	43%	■	Higher	High	Low	Low	Medium	Low	Low
	Central	■	49%	■	Medium	Low	Low	Medium	High	High	High
	Milne Bay <sup>^</sup>	■	39%	■	Higher	Medium	Medium	Higher	Medium	Higher	Higher
	Oro	■	74%	■	Medium	Low	Low	Low	Medium	Medium	Low
Highlands	Southern Highlands	■	41%	■	Low	Low	Low	Low	Medium	Medium	Low
	Enga	■	57%	■	Medium	Low	Medium	Low	Low	Medium	Medium
	Western Highlands <sup>^</sup>	■	39%	■	Medium	Low	Medium	Low	Low	Higher	Higher
	Simbu	■	68%	■	Higher	Low	Medium	High	Medium	High	High
	Eastern Highlands <sup>^</sup>	■	53%	■	Higher	Low	High	Low	Low	Medium	Low
Momase	Morobe	■	71%	■	Medium	Low	High	Low	Low	Low	Medium
	Madang	■	53%	■	Medium	Medium	Higher	Low	Medium	Low	Higher
	East Sepik	■	36%	■	Low	Low	High	Low	Medium	Low	Low
	Sandaun	■	24%	■	Low	High	Low	Low	Medium	Low	High
Islands	Manus	■	73%	■	Medium	Medium	High	Higher	Medium	High	Medium
	New Ireland	■	63%	■	Higher	Higher	Medium	High	Higher	Medium	Higher
	East New Britain	■	57%	■	Higher	Medium	High	Medium	Medium	Medium	Medium
	West New Britain	■	54%	■	Higher	High	Low	Medium	Medium	Medium	Medium

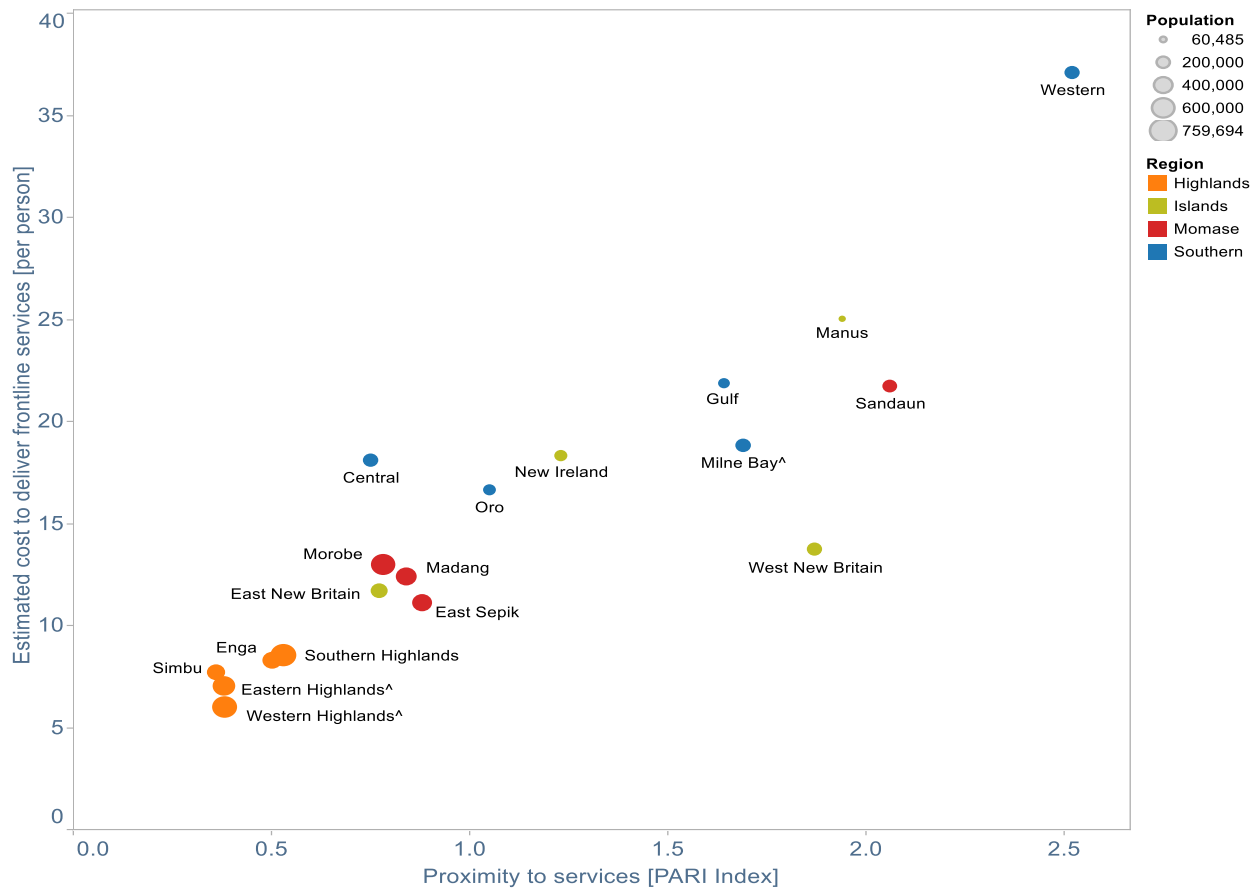
<sup>^</sup> operating under a Provincial Health Authority model in 2012

Source: Performance data from the National Health Information System (NDoH) and proximity and expenditure data from the National Economic & Fiscal Commission.

## The relationship between service delivery costs and remoteness

In this dispersed and geographically challenging context, it is important to understand the relationship between the proximity of people to health services and the estimated cost to deliver health services in each province. This is depicted in Figure 2, which shows a strong correlation between increased remoteness and higher costs of rural health service delivery (2014, NEFC 2014). Maritime provinces and other provinces with small and dispersed populations (such as Western Province) often have higher costs of service delivery. Provinces in the Highlands and much of Momase have larger populations, and are generally closer to services and have lower service delivery costs. That said, particular districts in the Highlands can also be remote and suffer the challenge of proximity.

Figure 2 Estimated cost of services and proximity



Source: The cost estimates are from *The Thin Blue Line* report (NEFC, 2014), and the proximity measures are derived from the PARI Index recorded in the *Go Long Ples* report (NEFC, 2014).

### Performance in relation to health expenditure at the frontline

In Figure 3, we see how well each province performed on the vertical axis against a selection of frontline performance metrics. The horizontal axis records all spending on frontline public health activities by province. Higher spending levels, relative to costs in each area, are to the right, and lower spending levels, relative to costs, to the left. The colour of the circles indicates their region, so that regional patterns can be visualised. Their size reflects their population size.

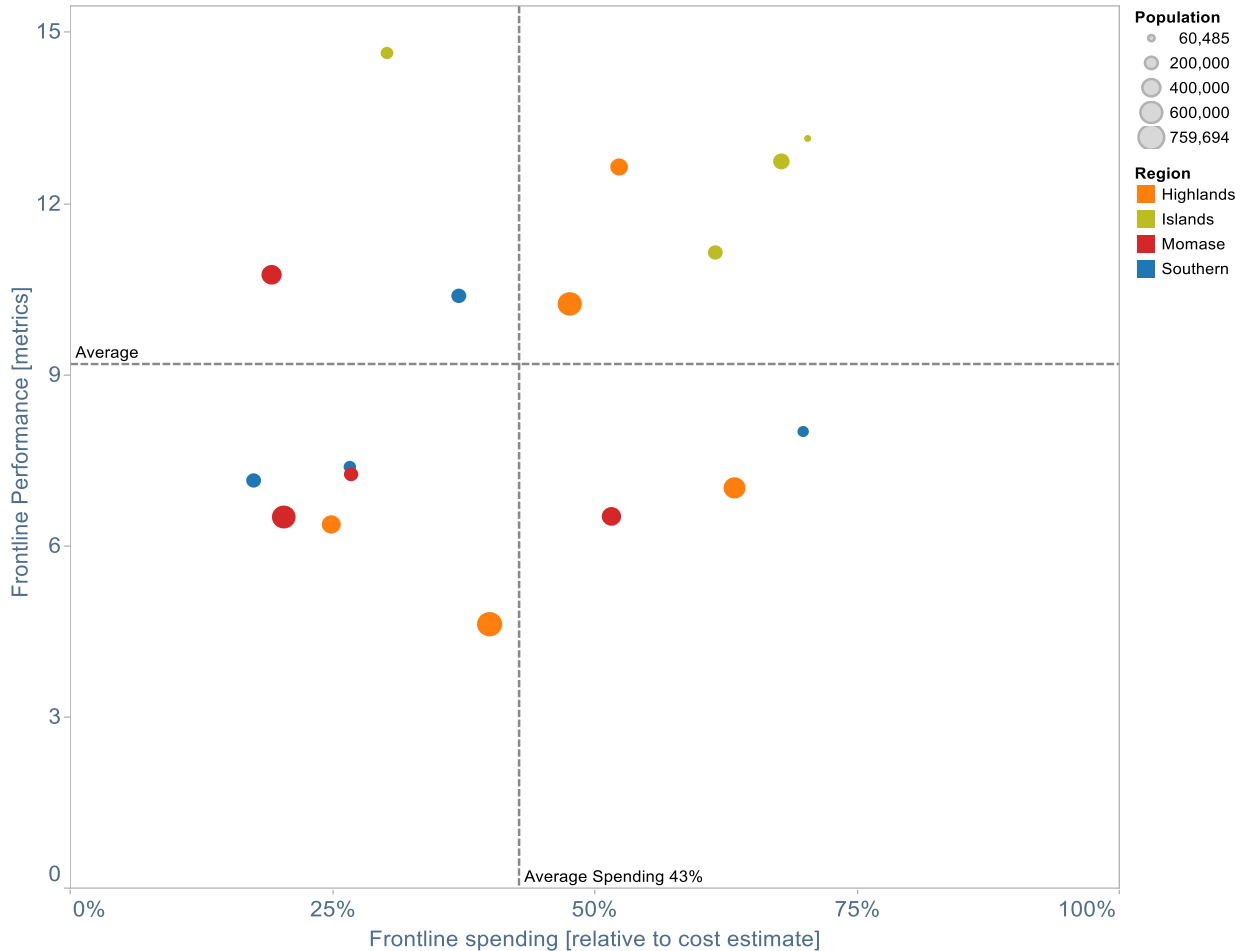
The chart helps assess the relationship between frontline spending and frontline performance, which is clearly varied. By using reference lines that delineate the average level of performance and average level of spending, four groups can be observed:

- The first group is in the upper left hand quadrant. These provinces have a relatively high performance despite spending lower amounts on frontline activities. Their performance could therefore be characterised as efficient;
- The second group in the upper right hand quadrant demonstrates higher spending and higher performance.
- The lower quadrants report lower performance results. For the provinces in the lower left hand quadrant this may be explained by the corresponding lower levels of spending. However, for the



group in the lower right hand quadrant, their higher spending levels suggest there may be other factors contributing to their lower performance.

Figure 3 Front-line spending and performance, by province

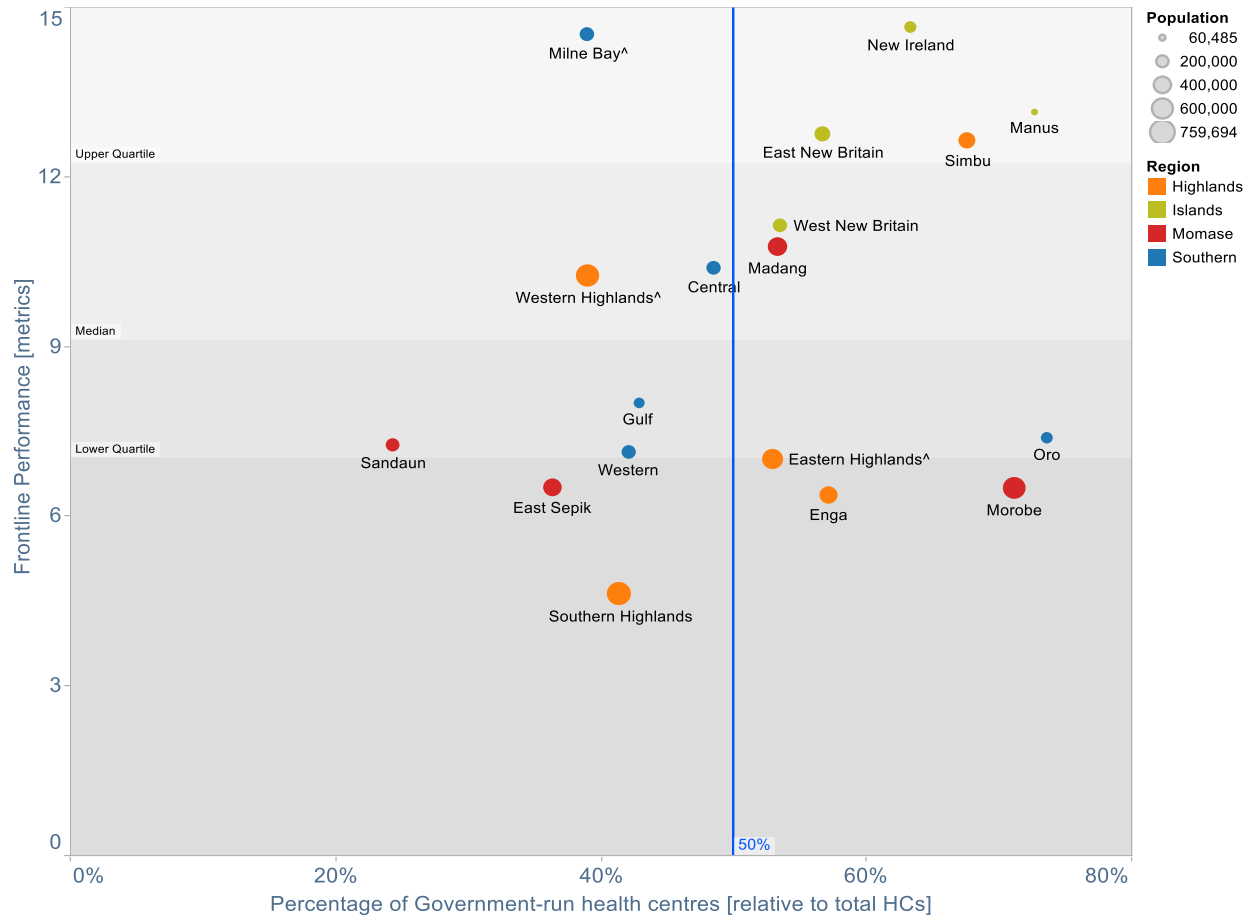


### Performance relative to health centre ownership

In PNG, rural health services are delivered from a network of health centres, most of these are run by either the government or by church-based organisations, which run almost half of the country’s network of health centres. The proportion of government-run versus church-run health centres varies considerably across provinces (from 74% government-run in Oro to only 24% in Sandaun), which might play a part in explaining differential performance. In

Figure 4 below, front line performance (for all health centres within a province) is set against the proportion of health centres in the province that are government-run. Results are mixed, however four of the five higher performing provinces have more government-run health centres (Milne Bay being the exception). Outside of the higher performers, there are no strong discernible patterns evident across provinces relating to the proportions of public or church-run service providers.

Figure 4 Front line performance indicators and percentage of government-run health centres, by province



## Outpatient visits

Looking at each health service indicator, it is important to analyse how far performance is driven by proximity and expenditure.

Figure 5 displays the average outpatient attendances per person per year at health centres as recorded in each province on the vertical axis and the proximity to services within a province on the horizontal axis. In relation to access, a negative relationship between utilisation and remoteness would be expected. It is clear however that there is a group of provinces that record higher outpatient numbers despite their services being less proximate to the local people. By contrast, the Highlands provinces record fewer outpatient visits despite services being more proximate and accessible to the local populations.

The situation with outpatients' attendances is concerning: the country's largest most populace provinces typically have the lowest attendances at lower-level facilities despite having favourable average proximity. There are a number of possible explanations including: a cultural aspect, education and awareness, but it may also reflect the quality of care (real or perceived) that is available at the lower level facilities in these provinces. Another possible explanation is that, given the advantage of relative proximity in Highland provinces, people attend provincial hospitals rather than their rural health centres – a hypothesis which would require further investigation.

Figure 5 Outpatient attendances and proximity, by province

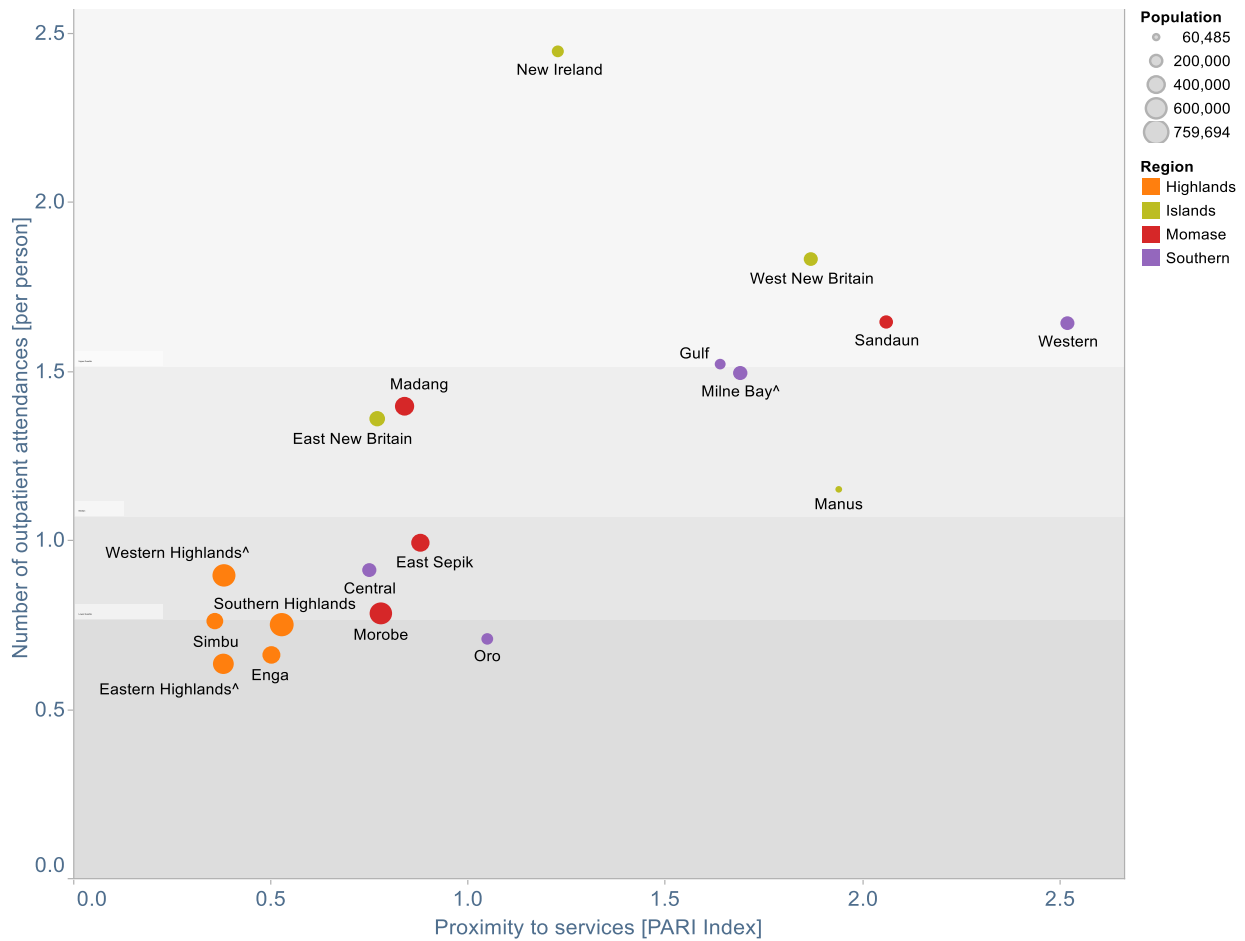
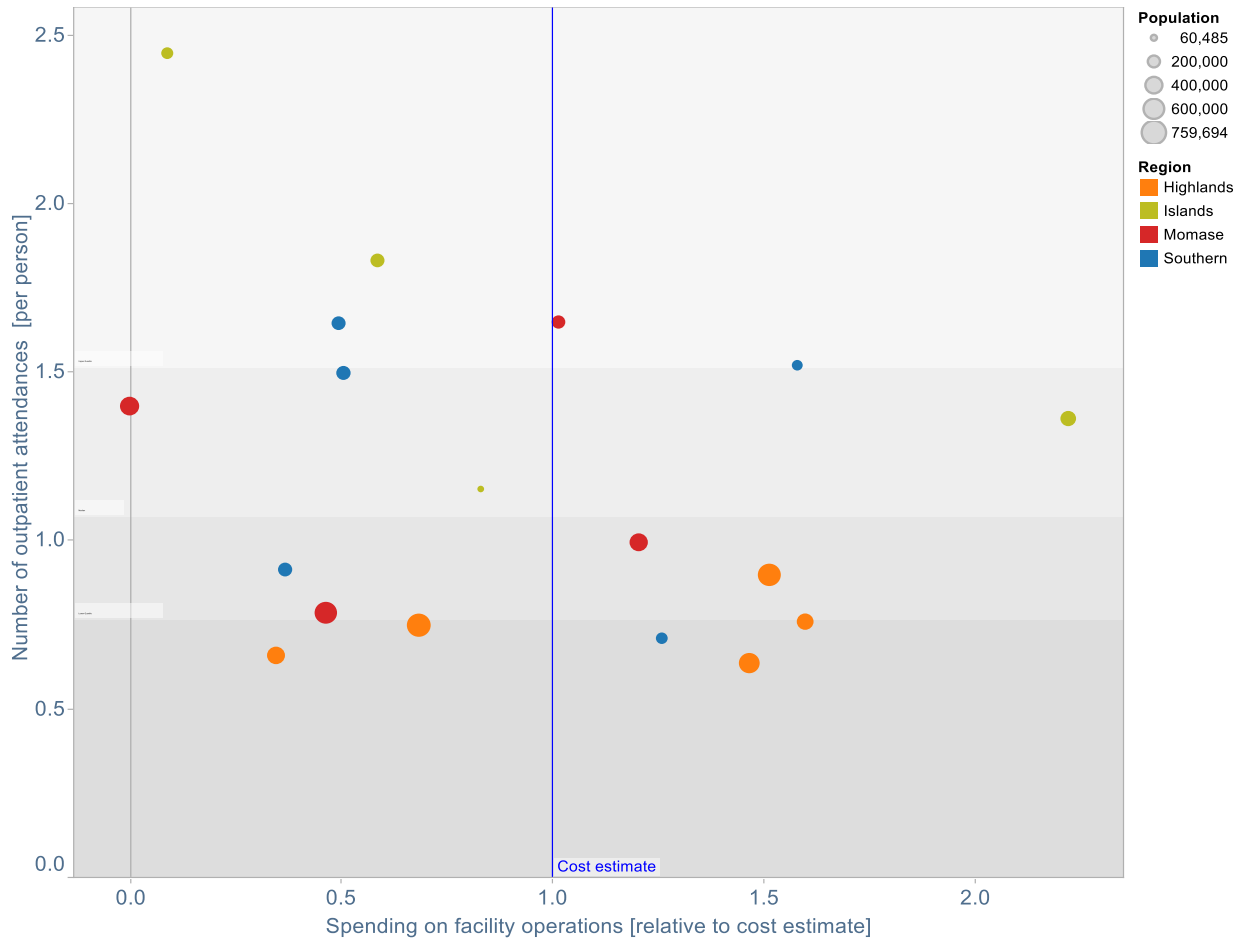


Figure 6 displays the average outpatient attendances per person per year at a health centre as recorded in each province on the vertical axis, and the spending on facility operations within a province on the horizontal axis. The chart helps us assess how much health centres within a province are used by their local community, and the relationship that spending may have in influencing the level of use.<sup>2</sup> A positive relationship would be the *a priori* expectation.

The results are however mixed. There is no strong relationship between increased spending on facility operations and improved attendances at health centres (which has a wide range from around 0.5 per person per year to just fewer than 2.5). For example, New Ireland Province recorded the highest level of outpatient visits – with a ratio of 2.4 outpatient visits at health centres per person in 2012. Yet, provincial spending on facilities appears to be very low relative to what is estimated necessary. This suggests that in New Ireland, factors other than spending on facility operations are major influences on patient attendance.

Figure 6 Outpatient attendances and spending, by province

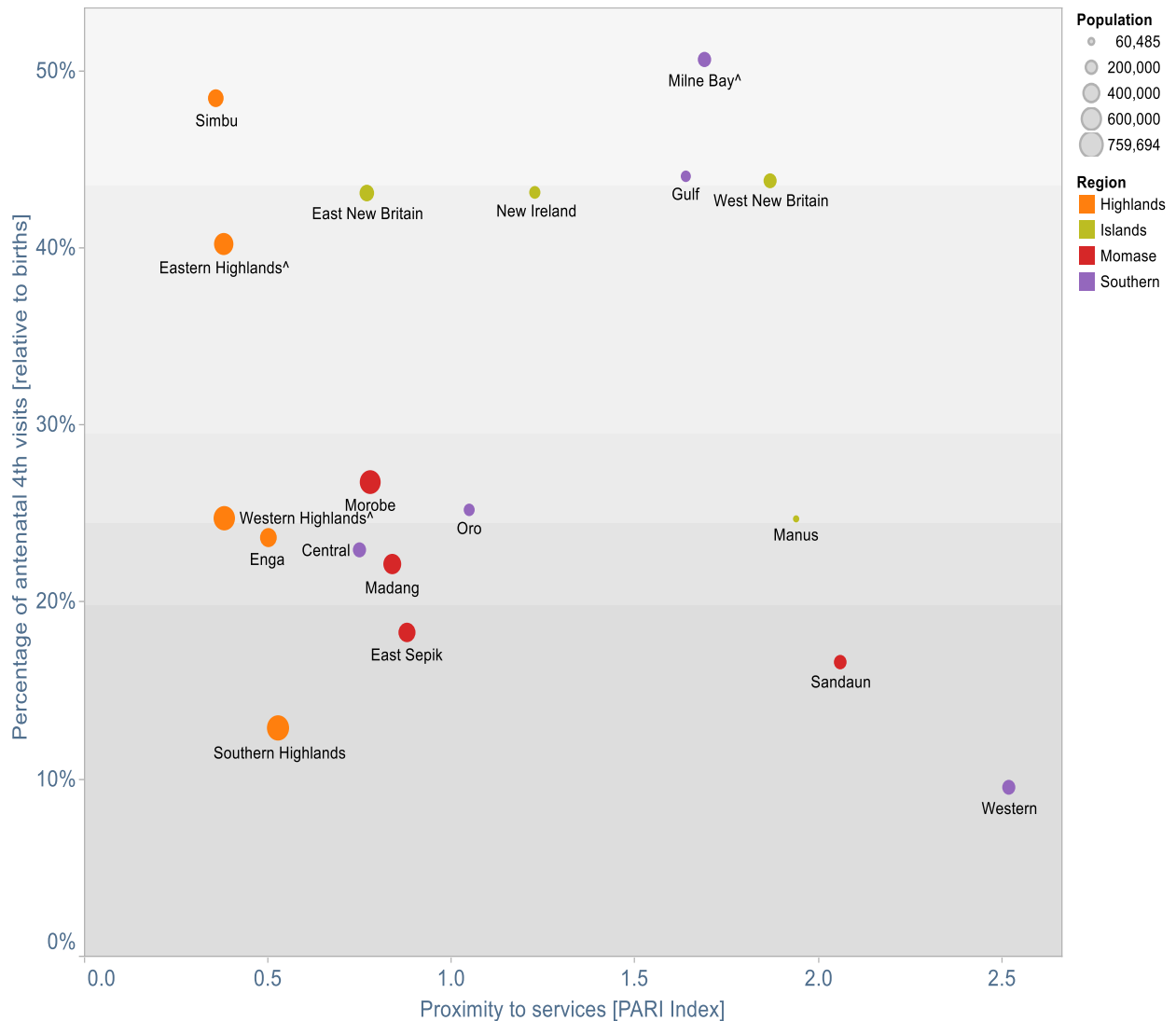
<sup>2</sup> This accepts that there may be a delay between the timing of improved spending practices and any resulting improvement in facility performance and improved outpatient attendances at health centres.



### Antenatal visits

Figure 7 displays the percentage of women in the province who received their fourth antenatal visit on the vertical axis, and the proximity to services within a province on the horizontal axis. As with outpatient care, we might expect a negative relationship between utilisation and remoteness. However, the group of seven provinces that recorded higher percentages (40-50%) of women receiving the fourth antenatal visit vary markedly in terms of proximity. Better performance is spread across regions and provinces, with differing levels of proximity. None of the large Momase provinces are in the higher performing group. As for outpatient visits, no clear relationship was found between ANC coverage and health expenditure.

Figure 7 4th antenatal visit and proximity, by province



Discussions with provinces that achieved better results emphasized the priority the province placed on maternal and child health. East New Britain promotes attendance through radio advertisements and, similar to the Eastern Highlands and Milne Bay, runs outreach programs that include extension patrols and school visits. Eastern Highlands Province stressed the important role the village birth attendant plays in encouraging women to attend antenatal care. Milne Bay Province values the use of waiting houses where women find care and can stay before and after labour. Waiting houses are at most health centres in the province, and provide women with basic personal needs. After the birth, women are given a ‘baby bundle’ of gifts. NHIS and PEPE (Howes, Mako et al. 2014) data also indicates that women are more likely to access antenatal care in facilities with toilets. This affirms the importance of sanitation and hygiene, particularly for women.

### Outreach clinics

Figure 8 displays the number of outreach clinics per 1,000 people performed each year by health centres within a province on the vertical axis, and the proximity to services within a province on the horizontal axis. A positive correlation might be expected, in terms of population need in more remote areas.

Some patterns can be observed, with the larger provinces all conducting lower numbers of outreach clinics (between 1 and 4 outreach clinics per 1,000 people). This may relate to the relative proximity of their communities, and higher population density, meaning that extension activities are less required. However, there are outliers. Simbu Province, also from the Highlands region, reported more than ten outreach clinics per 1,000 people in 2012. It is also clear that there is a group of three provinces with remote communities and a high proximity challenge, which would be expected to be carrying out more outreach but which are reporting low numbers of outreach patrols. In contrast, four provinces with significant remote communities and a high proximity challenge did conduct higher numbers of outreach clinics. Manus, Milne Bay, New Ireland and West New Britain recorded between 9 and 17 outreach clinics per 1,000 people.

Figure 8 Health centre extension work and proximity, by province

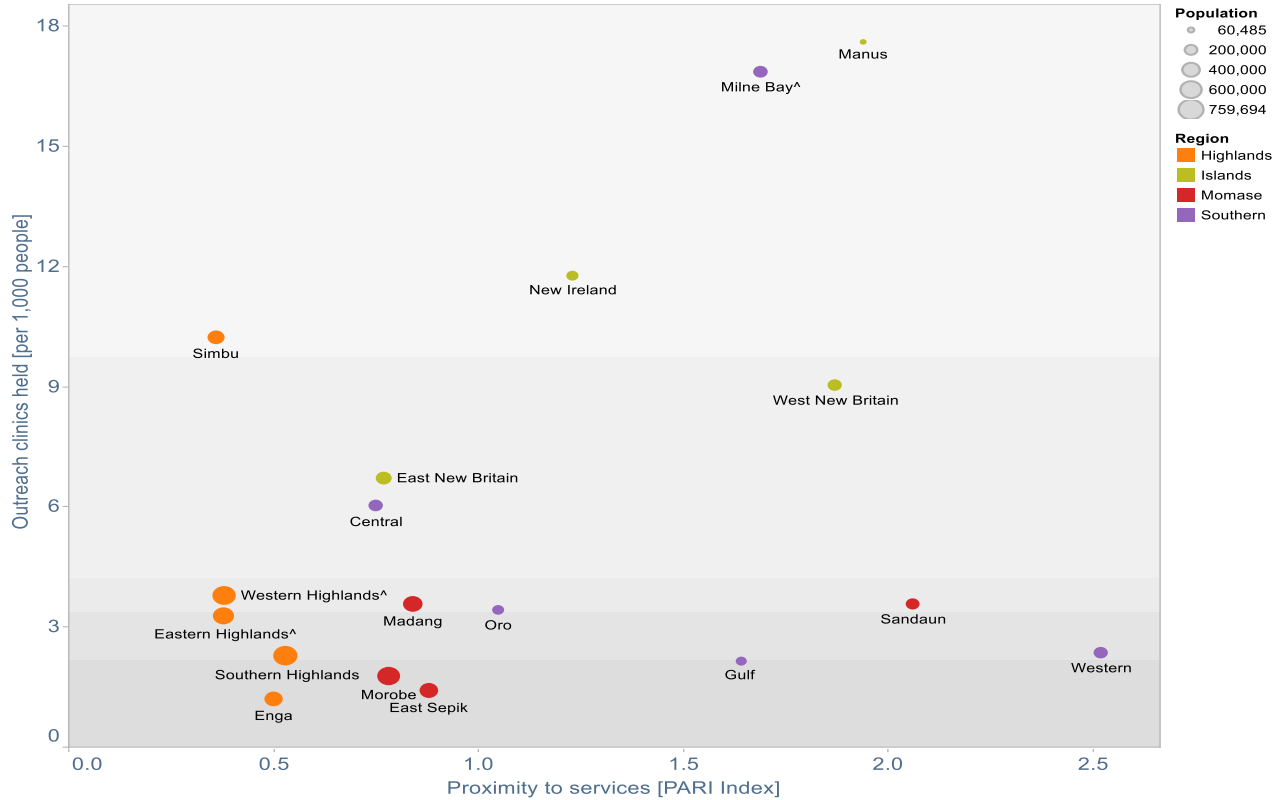
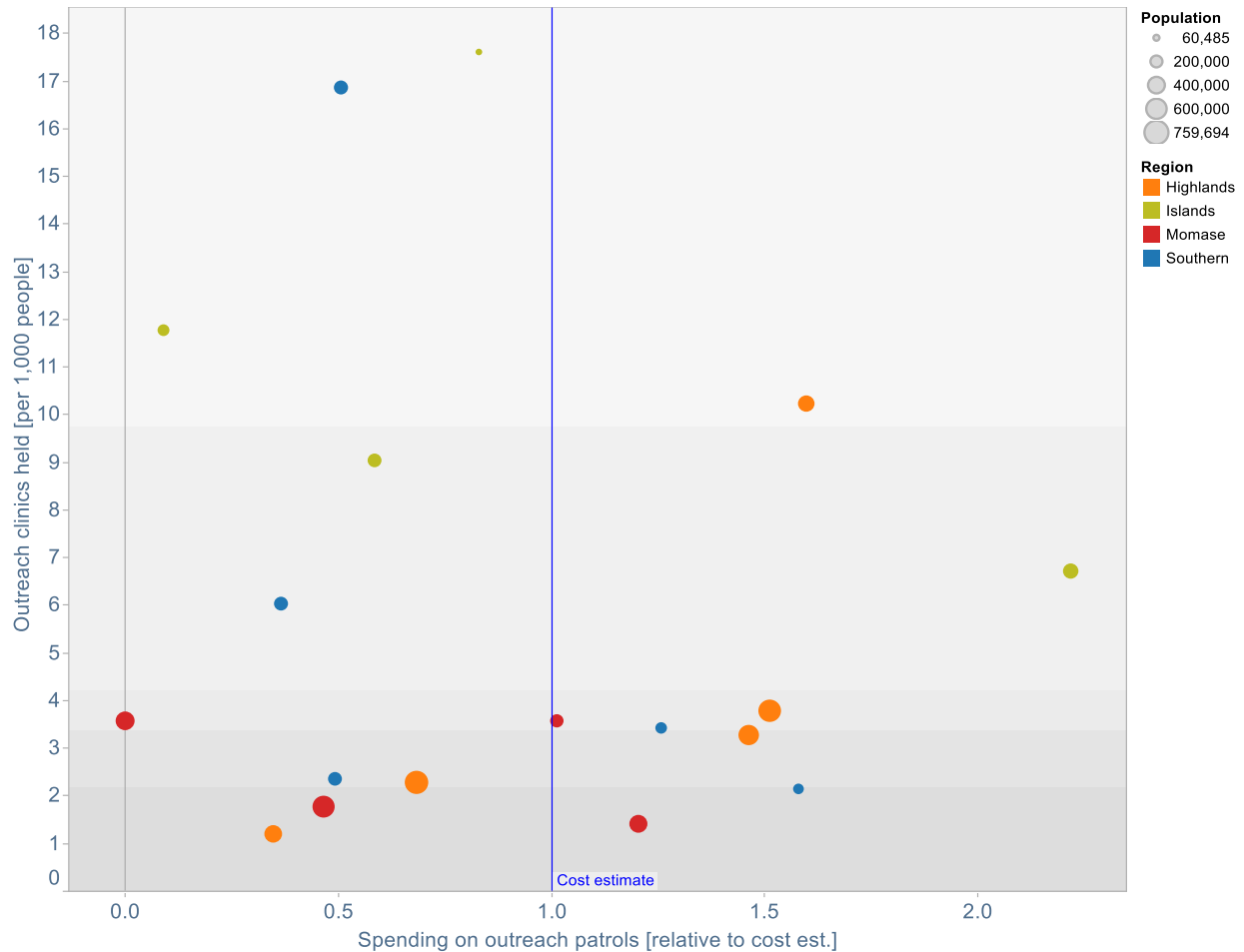


Figure 9 displays the number of outreach clinics per 1,000 people performed each year by health centres within a province on the vertical axis, and the spending on outreach within a province on the horizontal axis. A starting hypothesis might be that spending should be positively correlated with outreach clinics. However, there is no evidence of this. Indeed, the numbers of outreach clinics recorded in the NHIS data for many provinces is low. This is concerning given the important role this activity ought to play in delivering health care to a largely rural population. Some provincial officials cited innovations to increase access, though these were not necessarily in provinces with greatest access challenges. For example, in West Highlands a number of mobile ambulances operated by permanent staff are being introduced as an initiative to take health care to local communities.

Figure 9 Health centre extension work and spending, by province



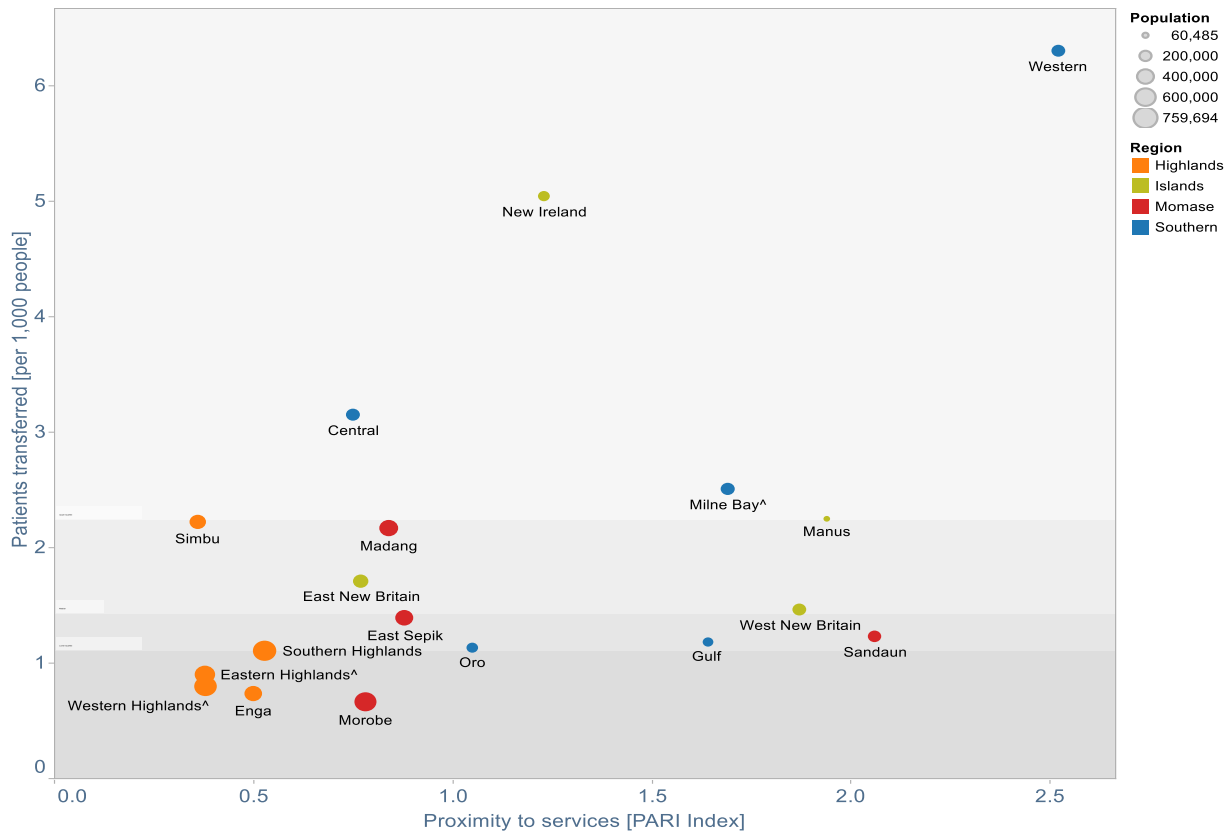
We also examined the relationship between outreach clinics and immunisation and found a strong positive correlation (0.6798), as also between outreach and supervision (0.6065). There is a very strong relationship between outreach and the overall performance rankings (0.8577). The finding is similar with the finding in Feeny (2013)). A strong relationship was also established between outreach clinics and frontline spending (0.6640).

Indeed, provinces which do well overall also do well specifically in supervision, outreach and immunisation. Interestingly, these provinces are not advantaged by proximity – quite the opposite, four of the seven who do the most outreach have to deal with some of the hardest to reach populations. This would suggest that the challenge of proximity, whilst undoubtedly significant, is surmountable with strong management. It's also interesting that the seven which do well with outreach (and overall performance) do typically spend more on frontline services. This is intuitive and suggests that provinces which prioritise frontline spending can better support supervision and outreach and see better immunisation levels, or that strong local leadership is able to promote both simultaneously.

### Patient transfers

Figure 10 displays the number of patients transferred each year (per 1,000 people) from health centres to referral health facilities on the vertical axis, and the proximity to services within a province on the horizontal axis. Based on need, a positive relationship might be expected.

Figure 10 Patient transfers and proximity, by province



Overall, the number of reported transfers is low and the link with proximity not clear. The NEFC in its cost estimates(2014) conservatively assumes that 1% of the population are referred each year. This would equate to 10 people per 1,000. However, fifteen of the eighteen provinces report rates of transfer of between 0.6 and 2.5 people per 1,000. Two provinces report significantly higher levels of patient transfer – Western and New Ireland Provinces. Western Province reported 6.3 per 1,000 people transferred – despite a high proximity challenge, while New Ireland reported 5 per 1,000 people transferred. The practice in Papua New Guinea is for referral cases involving women in child birth to be prioritised. The PNG Promoting Effective Public Expenditure report (Howes, Mako et al. 2014) records that 45% of the health centres surveyed reported that they were able to transfer patients either ‘always’ or ‘most of the time’. This may merit further analysis, given the low levels of transfer actually reported. Expenditure on transfers is also very low and does not correlate with transfer rates in any clear pattern.

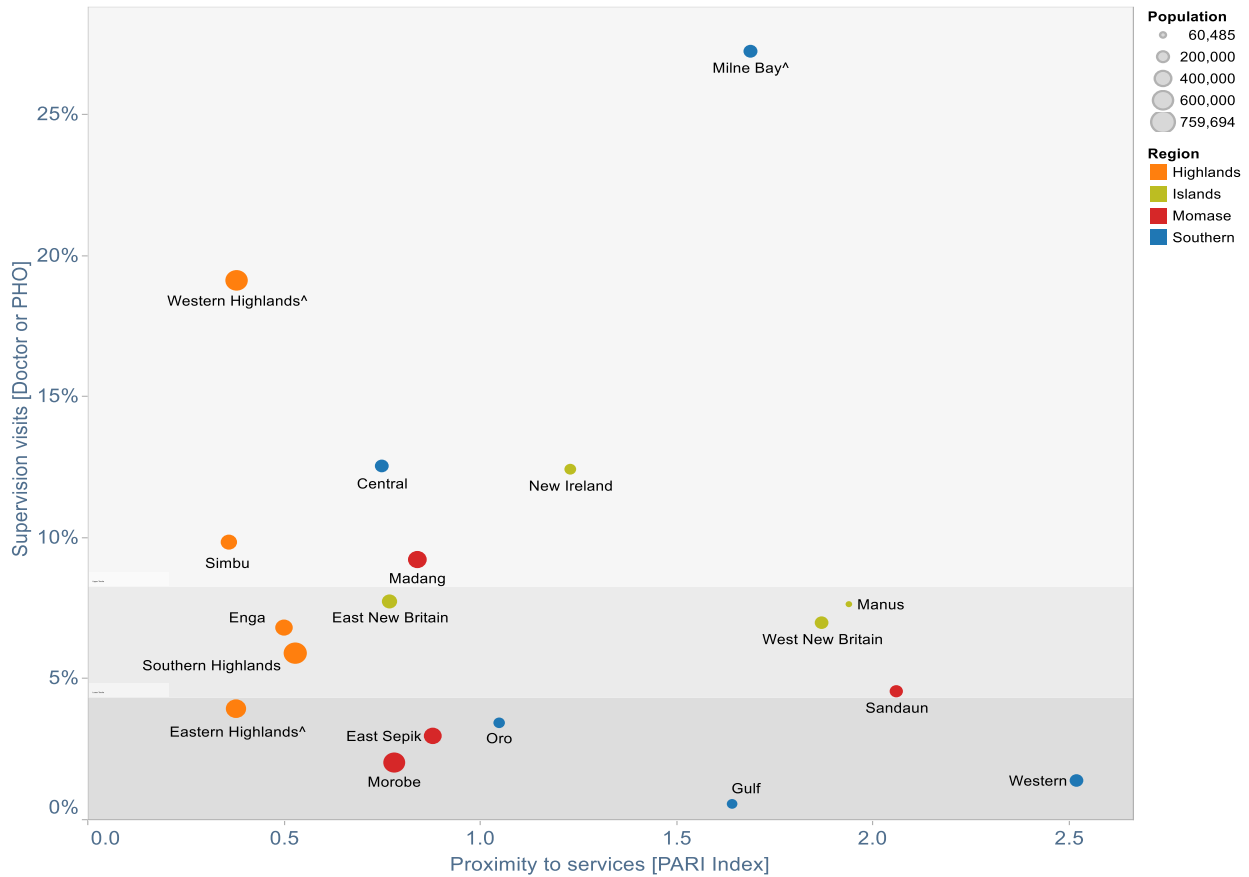
### Facility supervision

In Figure 11 aggregated visits by doctors and PHOs to health centres are displayed on the vertical axis, and the proximity to services within a province on the horizontal axis. A negative relationship might be expected, given the greater challenge of reaching more remote facilities. From the data, it seems that overall supervision is low and that proximity may influence the level of supervision received. Only Milne Bay Province appears to effectively overcome the challenge of proximity and prioritise supervision visits by both doctors and PHOs. The Western Highlands Province also performs well, though it is less remote. Officials here reported that they employ two doctors to visit rural health centres. These doctors normally stay about one week in a particular location, and provide supervision, outreach programs and training in



the area. These findings are supported by the PEPE study(Howes, Mako et al. 2014), which found that overall 60% of clinics did not receive a visit from a supervisor in 2012.

Figure 11 Supervisory visits and proximity, by province



## Discussion

This study has combined routine datasets with some secondary reports and interviews to examine the performance of sub-national units (provinces) in delivering core health interventions to the large majority of the population of PNG which lives in rural areas. Our expectation was that geography and recurrent non-salary expenditure on frontline services would be major determinants of outputs. Recurrent non-salary expenditure is generally important as it enables other key inputs, such as drugs, fuel and other essential recurrent costs. Proximity of population to facilities is important in all contexts but was expected to play a particularly strong role given the terrain and dispersion of populations in PNG. Our findings suggest that while these do play a role – for example, there is an obvious correlation between a less proximate population and a higher cost of service delivery - the correlation with performance is not strong, and what is most useful is to study the characteristics and behaviours of the outliers – particularly the high performers, such as New Ireland and Milne Bay, who perform well across a range of measures.

The number of facilities receiving any supervisory visitation is typically low, yet we can see that better performing provinces typically do receive higher levels of supervision, reinforcing the importance of supervisory capacity to support the effectiveness of the network of rural health facilities. Our correlation analyses suggest a virtuous circle operating in some areas (often the most geographically challenged) between outreach clinics, immunisation coverage, supervision, frontline spending and overall health system performance. More qualitative research is called for to better understand the contextual factors (such as local priority setting or mobilisation of additional resources) which may be supporting higher performance.

Some of the services (such as four antenatal visits) are showing low absolute coverage, which is worrying, as these are essential services. Transfers are also areas for concern as they are both reported to be low. Factors such as lack of access to funding to pay the costs associated with the extension visits, or concerns over safety in travelling to more isolated areas may be relevant issues to consider. The PEPE study (Howes, Mako et al. 2014) suggests that for many health centres getting access to operational funding remains a major impediment to improving the delivery of health services in rural areas. Demand and health seeking behaviour are likely to be factors behind the relatively low outpatient attendances in the highlands provinces. It may be necessary to adapt service delivery to meet the needs of these relatively large populations.

There seems to be a positive relationship between the number of outpatient attendances recorded in the NHIS data and user perceptions that health workers will be at the facility (Howes, Mako et al. 2014). This suggests that if local people think staff will be at the facility, they are more likely to seek medical attention – another area meriting further work. There was some correlation between maintenance being carried out on health facilities and staff housing (Howes, Mako et al. 2014) with higher levels of spending on facility operations, and the number of village health committee meetings held. This suggests that higher levels of spending on facilities and active community engagement each promote the likelihood of rural health infrastructure maintenance (which did not show a clear correlation however with proximity or supervision). A positive relationship was less evident between infrastructure maintenance and outpatient numbers, though this does not negate the importance of basic maintenance.

It is important to note that the results of this study have been aggregated at the provincial level. However, health performance across the province – between districts – is likely to vary, perhaps markedly. With the expanding role of districts in providing support for basic service delivery (2014), there will be a need to monitor and reflect on intra-provincial variation and challenges at district level. Analysis of household survey data would also add more insights into usage of private and informal providers, which lay outside the purview of this analysis of public administrative data.

This study feeds into wider international literature about health expenditure and health system performance, although most of those have been conducted at the national level. Studying cross-national comparison data in Africa from 1990 to 1996, Peters et al found that while public sector health expenditures were quite low and much financing was inefficiently used, expenditures were still associated with greater levels of measles immunization and, to a lesser degree, with higher contraceptive prevalence (Peters, Kandola et al. 1999). Muftaodeen and Bello's study of Nigeria (Muftaodeen and Bello 2014) found a long-run and short-run stable relationship among the variables of government financial commitment to health and sector performance outcomes, as well as a strong coefficient of institutional quality, with a 1% increase in institutional quality yielding a decrease in infant mortality rate and under-5 mortality rate of 5.58% and 1.29% respectively. In 1999, Anyanwu and Erhijakpor found that under-five mortality rates and infant mortality rates have a close, consistent relationship to levels of total and

government expenditure in health across Africa(Anyanwu and Erhijakpor 2009). As noted earlier, the influence of health spending is likely to be higher in lower income countries, where thresholds of affordability of basic packages have not been exceeded.

While higher health expenditure is correlated with better health outcomes across all income groups, our study reinforced wider findings on the importance of understanding differential performance, particularly within one system, and drivers of efficiency(Jowett, Brunal et al. 2016). It is also important to emphasise the contribution of complementary interventions (such as female education) and the focusing of health spending on the needs of the poor in order to reach health goals(Gupta, Verhoeven et al. 2001).

## Conclusion

Examining performance patterns of sub-national units within a health system is important to understand their drivers and what might be needed to improve outputs. In this analysis, we undertake simple correlation analysis between remoteness of populations, expenditure on frontline services and core outputs by provinces and regions, such as antenatal care, outpatient visits, outreach clinics, referrals of patients and facility supervision. In the context of the challenging geography of Papua New Guinea, these are expected to be important factors. Some expected patterns were found – for example, between remoteness and higher service costs, as well as between remoteness and higher outreach services. Outpatient visits, however, increased with remoteness, which was surprising. Our correlation analyses suggest a virtuous circle operating in some areas (often the most geographically challenged) between outreach clinics, immunisation coverage, supervision, frontline spending and overall health system performance, which merits further investigation and possibly emulation. More fine-grained assessment, including at the district level, will be needed to understand the overall low levels of outreach clinics, transfers and supervision, all of which are critical for quality health care in these kinds of contexts. The analysis illustrates what can be learned from combining routine data sources, as well as the limits and the need to complement such analysis with more detailed local qualitative investigations.

At the policy level, it is clear that it takes more than just funding to deliver health services. Financing is necessary but not sufficient condition for improved front line service delivery performance. In some cases, performance is better even with very limited funding. Governance and management matter. Good governance and management can provide the right structure and incentives to improve health services delivery at the frontline. The challenges in Papua New Guinea are the diversified culture and local governance structure across the provinces. The governance and management structure which works in some provinces may not work in other provinces. The National Department of Health need to strike the right balance and provide strong incentives for the decentralized subgovernment to deliver the frontline services. The performance, certainty needs to be monitored more closely and timely.

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